School of Engineering & Technology

ACADEMIC HAND BOOK

Ordinance & Academic Regulations

Engineering Programs (UG/PG/Ph.D.)

INDEX

1. Preamble

As per the recommendations of UGC/Higher Education Institutions in India/ UP Higher Education department, the IIMT-University has introduced Choice Based Credit System (CBCS) and implementation of NEP-2020. Choice Based Credit System (CBCS) is a proven, flexible mode of learning in higher education which facilitates a student to have guided freedom in selecting his/her own choices of courses in the curriculum for completing a degree program.

CBCS offers a flexible system of learning.

The system permits a student to

i. Learn at their own pace through a flexible registration process.
ii. Choose electives from a wide range of courses offered by parent and other departments.
iii. Undergo additional courses to acquire the required number of credits for obtaining B.Tech. Engineering.
iv. Undergo additional courses in their special areas of interest and earn additional credits to obtain B.Tech. Engineering.
v. Adopt an interdisciplinary approach in learning.
vi. Avail transfer of Credits.
vii. Gain Non – CGPA credits to enhance skill/employability by taking up project work, entrepreneurship, co-curricular and vocational training.
viii. Make the best use of the expertise of available faculty.
ix. Learn and earn credits through MOOC, and Project Based Learning.
x. Enhance their Knowledge, Skill and Attitude through participation in innovative Curriculum Design, Delivery and Assessments.

The Curriculum is designed to take into the factors listed in the Choice Based Credit System (CBCS) with focus on Project Based Learning and Industrial Training to enable the students to become eligible and fully equipped for employment in industries choose higher studies or entrepreneurship.

Vice – Chancellor

2. Definitions & Nomenclature

In these Regulations, unless the context otherwise requires:

I. "Program" means Degree/Diploma Program like Computer Science / AIML / Civil / Electrical & Electronics Engineering / Mechanical / Aerospace / Electronics & Communications / Electrical Engineering branches.
II. "Course" means a theory or practical subject that is normally studied in a semester.
III. "Vice–Chancellor of IIMT-University" means the Head of the University.
IV. "Registrar" is the Head of all academic and General Administration of the University.
V. "Dean" means the authority of the school that is responsible for all academic activities of various programs and implementation of relevant rules of these Regulations pertaining to the Academic Programs.
VI. "Controller of Examinations" means the authority of the University who is responsible for all activities related to the University Examinations, publication of results, a ward of grade sheets and degrees.
VII. "Dean – Student Welfare" is responsible for all student related activities including student discipline, extra and co–curricular activities, attendance and meetings with class representatives, Student Council, and parent–teacher meet.
VIII. "HOD" means the Head of the Department concerned.
IX. "University" means IIMT-University, Meerut.
X. "TCH" means Total Contact Hours–refers to the teaching–learning periods.

XI. “DEC” means Department Exam Committee.
XII. “BOS” means Board of Studies.
XIII. “ACM” means Academic Council meeting the highest authoritative body for approval for all Academic Policies.
XIV. “Class Coordinator” is a faculty of the class who takes care of the attendance, academic performance, and the general conduct of the students of that class.
XV. “IA” is Internal Assessment which is assessed for every student for every course during the semester.
XVI. “EA” for External Assessment: This assessment will be carried out at the end of the Semester as per the Academic Schedule.
XVII. “ESE” is End Semester Examination conducted by the University at the End of the Semester for all the courses of that semester.
XVIII. “UGC” means University Grants Commission.
XIX. “MHRD” means Ministry of Human Resource Development, Govt. of India.
XX. “AICTE” means All India Council of Technical Education. 20. “HEI” means Higher Education Institutions.
XXI. “AE” is Aerospace Engineering, “CSE” is Computer Science &Engineering, “CE” is Civil Engineering, “EE” Electrical Engineering, “ME” Mechanical Engineering, “TE” is Transportation Engineering, “CTM” is Construction Technology & Management, “SE” is Structure Engineering, “PED” is Power Electronics & Drive, “ECE” is Electronics & Communication Engineering,

3. Vision and Mission of the School

3.1 VISION

The quality of education must come first to nurture the students of engineering to fit into the global market. As competent professionals is the forefront to compete with latest development engineering by implementing embedded systems with diversified technology.

3.1 MISSION

Apply solutions to real problems, build a skillful team and encourage sustainable & remarkable learning with advanced knowledge of community &ethical commitments. By conducting high quality education and learning to achieve the next step of expertise in trendy software platforms to meet the dynamic needs of innovations and research.

4. Program Outcomes (Common for B.Tech / M.Tech Program)

PO1 - Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 - Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 - The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 - Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 - Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

5. Program Educational Objectives

PEO1- To impart a program oriented knowledge in mathematical, scientific and engineering fundamentals required to solve electrical engineering problems.

PEO2- To make the students able to adopt lifelong learning, act with integrity and have inter-personal skills needed to engage in, lead and nurture diverse teams with commitment to their ethical and social responsibilities

PEO3- To provide students towards a broad understanding of engineering & management principles and apply this knowledge for solving complex and multidisciplinary engineering problems

PEO4- To impart graduates with ethical values so that they can become responsible engineers.

PEO5- To prepare graduates who will be employable in the diversified sections of industry, government organizations, public sector and multinational corporations and/or pursue higher education in electrical engineering or other fields of their interests.

6. Program Specific Objectives

6.1 PSO's for B.Tech Computer Science Engineering/ CSE-AIML

PSO1- Enabling students to learn continuously and to provide effective answers to new computational issues.

PSO2- Understand analyze data and create software to create computer-based systems of varying complexity that are designed effectively.

6.2 PSO's for B.Tech Electrical Engineering

PSO1- Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronics circuits, control systems, electrical machines and Power system.

PSO2- Apply the appropriate techniques and modern engineering hardware and software tools in electrical engineering to engage in life-long learning and to successfully adapt in multi-disciplinary environments.

PSO3- Aware of the impact of professional engineering solutions in societal, environmental context, professional ethics and be able to communicate effectively.

6.3 PSO's for B.Tech Mechanical Engineering

PSO1- Ability to recognize and examine the mechanical parts, machine apparatuses and systems and to get to know platforms, apparatuses, innovative work in the area of Mechanical Engineering.

PSO2- Apply the concepts of Mechanical Engineering and use AUTO CAD, Solid Works and Ansys software for the design and development of industrial problems.

PSO3- Apply the knowledge of Mechanical Engineering in the various fields such as automobile industries, manufacturing units and power plants etc.

PSO4- Apply the principles and knowledge of Mechanical Engineering to analyze the most advanced system.

6.4 PSO's for B.Tech Civil Engineering

PSO1- To develop the professional skills in the area of construction & management and structural engineering.

PSO2- Analyze and design the various structural components by using codal provisions.

PSO3- Analytical and ethical design skills among students to make the capable to started career as a good engineer.

PSO4- To enhance the sustainable development in the word with their skills.

6.5 PSO's for B.Tech Aerospace Engineering

PSO1- After completing the course, the graduate will have strong basics in aeronautical sciences which will help him/her to pursue either higher studies or seek employment in aeronautical / astronautical or allied fields. The strong foundation knowledge will help the graduate to become a brilliant academician, a successful engineer/scientist or even an entrepreneur.

PSO2- The graduate will have the ability to help society by way of his participation in delivering useful products and services to society through his/her work in industry, research organization, educational institution, business organization etc. as he/she has strong basic knowledge in aeronautical / astronautical engineering& ethics and is environmentally conscious.

PSO3- The curriculum and syllabus have been framed in such a way to impart desire to the graduate to acquire knowledge, on continuous basis even after completing the program. This would help the graduate to excel in the line of profession he/she has chosen.

PSO4- Graduate will be able to work as a team member which will be a main requirement in industry or research organization or in any business enterprise. This will pave the way for successful career for the graduate and play a role for the success of the organization in which the graduate is employed.

7. ADMISSION

I. The admission policy and procedure shall be decided from time to time by the Academic Council of the University based on the guidelines issued by the UGC/NEP/AICTE and Ministry of Education (MoE), Government of India. Seats are also made for Non-Resident Indians and foreign nationals, who satisfy the admission eligibility norms of the University. The number of seats in each of the b. Tech. degree program will be decided by the University as per the directives of AICTE / UGC / MOE, Government of India, considering the market demands.

II. The University can take 10% additional admission, in view of the short fall expected in 2nd year due to failure of students or students leaving the University.

8. Eligibility for Admission

8.1 Eligibility for Admission to UG Program in Engineering (CSE/CE/EE/ME/AE)

Table No: 1.1

1	B.Tech in (CSE/CE/EE/ ME/AE)#	4years	Passed 10+2 examination with Physics / Mathematics /Chemistry/ Computer Science / Electronics / Information Technology/Biology/Informatics Practices/ Biotechnology/Technical Vocational subject/Agriculture/Engineering Graphics / Business Studies / Entrepreneurship as pertable 1.2 & 1.3 Agriculture stream (for Agriculture Engineering) Obtained at least 45% marks (40% marks in case of candidates belonging to reserved category) in the above subjects taken together. OR Passed min. 3 years Diploma examination with at least 45%marks (40% marks in case of candidates belonging to reserved category) subject to vacancies in the First Year, in case the vacancies at lateral entry are exhausted. (The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to prepare Level playing field and desired learning outcomes of the program)
2	B.Tech in (CSE/CE/EE/ ME/AE)(Lateral Entry to Second year)#	3 years	Passed Minimum THREE years / TWO years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) in ANY branch of Engineering and Technology. OR Passed B.Sc. Degree from a recognized University as defined by UGC, with at least 45% marks (40% marks in case of candidates belonging to reserved category) and passed 10+2 examination with Mathematics as a subject. OR Passed D.Voc. Stream in the same or allied sector. (The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to achieve desired learning outcomes of the program).
3	B.Tech in (CSE/CE/EE/ ME/AE) (Lateral Entry to Third year)#	2years	Refer Table No: 1.2 & 1.3
4	B.Tech in (CSE/CE/EE/ ME/AE) (Lateral Entryto Final year)#	1year	Refer Table No: 1.2 & 1.3

#Respective State Government/ Affiliating University/Board may decide the eligibility criteria for entry level Qualification for different Program/Courses.

Table No:1.2

Undergraduate Program offered By SET	Optional Subjects in class 10+2 (12th) or equivalent
Aerospace Engineering	Physics or and Maths
Electrical Engineering	Physics and Maths
Civil Engineering	Physics, Chemistry and Maths
Computer Science Engineering	Physics and Maths
Computer Science Engineering (AIML)	Physics and Maths
Mechanical Engineering	Physics, Chemistry and Maths
OPTIONALSUBJECTS	(1) Chemistry (2) Biology (3) Biotechnology (4) Technical Vocational subject (5) Computer Science (6) Information Technology (7) Informatics Practices (8) Agriculture (9) Engineering Graphics (10) Business Studies (11) Electronics (12) Entrepreneurship

Table no:1.3

S. No.	Academic Level	Entry Qualifications at different levels	Exiting Qualifications at different levels	NHEQF/ NSQF level	Unified Credit Level (UCF)
1	1st year UG Degree	12th Completed	Under graduate Certificate	Level 5	4.5
2	2nd year UG Degree	A candidate with Diploma inappropriate branch of Engineering / Equivalent Vocational or Technical Program with NHEQF level5 / UCF level4.5completed	Under graduate Diploma	Level 6	5.0
3	3rd year UG Degree	A candidate with 10+4/ 12+2 in appropriate domain with NSQF level 6/UCF level 5completed	Bachelor of Vocational Education	Level 7	5.5
4	Final year UG Degree	A candidate with 3 years bachelor's degree in vocational /B.Sc. in appropriate domain with NHEQF level 7 / UCF level	B.E. / B.Tech.	UG Engineerin g Degree	6.0

		5.5 completed			

8.2 Eligibility for Admission to PG Program in Engineering (Master of Technology in CTM, Environment Engineering, SE, TE, EE, PED, ECE, CSE)

Table No:1.4

1	M.Tech in CTM, Environment Engineering, SE, TE, EE, PED, ECE, CSE)	2 years	B.Tech with 55% marks (relevant stream)

8.3 Eligibility for Admission to Diploma Program in Engineering (CE, EE, ME, CSE)

Table No: 1.5

1	Diploma in (CE, EE, ME, CSE)	3 years	10^{th} Passed
2	Diploma in (CE, EE, ME, CSE) Lateral Entry	2 years	10+2 / ITI Diploma, PCM with 35% marks

9. Curriculum

For the purpose of awarding degrees the curriculum of all M.Tech / B.TECH Engineering programs is structured to have a minimum of credits+ NCC (Non-credit Audit Courses) as specified in the evaluation scheme approved by the university's Board of Studies and spread out across four / eight semesters of study of each program respectively.

Under CBCS, the degree program will consist of the following categories of courses:

1. Basic Science Course-BSC
2. Human Science Course-HSC
3. Skill Enchantment Course–SEC
4. Generic Elective Course–GEC
5. Discipline Specific Elective-DSE
6. Ability Enhancement Compulsory Courses-AECC
7. Professional Core Courses-PCC
8. Professional Elective Courses-PEC
9. Research Project-RP(Minor & Major)
10. Internship (Industrial / Research)
11. MOCCS
12. Minor Certification Integrated with UG Degree

10. Medium of Instruction

The medium of instruction is ENGLISH for all courses, examinations, seminar presentations and project reports. Exception of dual medium for Diploma Engineering courses, if needed Hindi can be used for communication.

11. **Choice Based Credit System (CBCS)/ LOCF/OBE**
The university follows a flexible Choice based Credit System. Accordingly, the students shall be given the option for selecting their courses, credits, teachers, slots and create their timetable. The student is given the option of selecting the number of credits to undergo in a semester, subject to the curriculum requirements of minimum and maximum. The student shall make the choice of course in consultation with the Class Coordinator and as stipulated from time to time.

12. **Registration for Course in a Semester**
A student will be eligible for registration of courses only if he/she satisfies the regulation of University norms and has cleared all dues to the University, Hostel and Library up to the end of the previous semester if student is not debarred from enrolment on disciplinary grounds. Except for the first-year courses, registration for a semester will be done during a specified week before the start of the semester as per the Academic Calendar.Late registration /enrolment will be permitted by the Dean of the School for genuine cases, on recommendation by the Head of the respective department, with a late fee as decided from time to time.

13. **Attendance**
The faculty handling a course must finalize the attendance, 3 calendar days before the lastinstructionaldayofthecourseandsubmittotheHoDthroughtheclassteacher.

i. A student with less than 75% attendance (Total Contact Hours -"TCH") in aggregate of all courses will not be permitted to appear for the end-semester examination of that semester, irrespective of the reason for the short fall of the attendance. The student is however permitted to avail Academic Leave up to 10% for attending academic related activities like, Industrial Visits, Seminars, Conferences, Competitions etc., with the prior approval of the HoD. After the event, the student should submit the relevant documents for proof to the HoD. for approval of the Academic Leave.

ii. The remaining 25% allowance in attendance is given to account for activities under NCC / NSS / Cultural / Sports / Minor Medical exigencies etc.

13.1 **Condonation of Medical Cases**
For medical cases, submission of complete medical history and records with prior information from the parent / guardian to Dean / HOD is mandatory. The assessment of such cases will be done by the attendance sub – committee on the merit of the case and put-up recommendations to the Vice–Chancellor. Such condo nation is permitted only twice for a student in then tire duration of the program.
The Vice-Chancellor, based on the recommendation of the attendance sub - committee may then give condonation of attendance, only if the Vice-Chancellor deems it fit and deserving. But in any case, the condonation cannot exceed 10%.

13.2 **Additional Condonation**
Additional condonation may be considered in rare and genuine cases which includes, approved leave for attending select NCC / Sports Camps, cases requiring prolonged medical treatment and critical illness involving hospitalization. For such select NCC / Sports Camps prior permission for leave shall be obtained by the respective faculty coordinator / Director of sports from the designated authority, before deputing the students.

14. **Assessment Procedure**
Engineering courses shall have two component so assessment namely,

i. "IA" for Internal Assessment: This assessment will be carried out throughout the semester as per the Academic Schedule.

ii. "EA" for External Assessment: This assessment will be carried out at the end of the Semester as per the Academic Schedule.

Table No: 1.6 : Weightage of the I A and E A for various categories of the courses.

S. No.	Category of Courses	IA Weightage	IA Minimum	ESE	ESE Minimum	Passing minimum (IA+ESE)
1	Theory Course	30%	---	70%	30%	40%
2	Practical Course	40%	---	60%	---	50%
3	Theory Course with Practical Components	30%	---	70%	30%	40%
4	Design/Semester Project	30%	---	70%	50%	50%
5	Student Discipline	100%	---	---	---	50%
6	Research Project (Major &Minor) and Viva Voce	30%	---	70%	50%	50%

14.1 Theory Assessment (IA & EA).

The general guidelines for the assessment of Theory Courses shall be done on a continuous basis is given as below

Table 1.7: Weightage for theory Assessment

No.		Assessment Theory courses	Weightage Percentage wise of marks	Duration
1	IA	Sessional Exams	40%	Based on Credit
3		Assignments	20%	--
4		Attendance	20%	--
5		Seminar / Project / Surprise Test / Quiz etc.,	20%	--
6	EA	End Semester Exam / ESE	100%	Based on Credit

Total Assessment will be equal to IA+EA for theory

14.2 Practical Assessment (IA & EA)

The general guidelines for the assessment of Practical course shall be done on a continuous basis is given as below

Table 1.8 : Weightage for Practical course Assessment

S. No.		AssessmentPractical Courses	Weightage Percentage wise of Marks	Duration
1	IA	Internal Assessment/ Practical Sessional Exam (Inc : Viva-voice)	50%	Based on Credit
2		Attendance in Lab during Semester& Lab Record/Practical Files/ Presentation / Case Study / Seminar/Project.	50%	--

3	EA	EndSemesterExam/ESE	100%	Based on Credit

15. Research Project/ Semester Project Assessment Criteria

The general guidelines for assessment of Project are given in Table 1.9

Table No 1.9: Assessment pattern for Research Project / Semester Project

No.	Review / Examination scheme	Broad Guidelines	Weightage
1	First Review	Concept	10%
2	Second Review	Design	10%
3	Third Review	Experiment/Analysis	20%
4	Final Review/ESM	Project report and Viva – Voce, Results and Conclusion	60%

***Note–Novel Ideas shall be protected by IP Filling (Patent/Design/Copyright).**

16. Internship

A student has to compulsorily attend Summer / Winter internship during semester breaks. In lieu of Summer / Winter internship, the student is permitted to register for under taking case study / project work under a faculty of the University and carry out the project. In both the cases, the internship report in the prescribed format dulycertifiedbythefacultyin-chargeshallbesubmittedtotheHoD.Theevaluationwillbedonethroughpresentation and viva. The course will have a Weightage as defined in the respective curriculum.

Table No 1.10: Assessment pattern for Internship

S.No.	Category	Weightage
1	Demo graphic Information	5%
2	Internship details/job description	25%
3	Future goals/career plans	5%
4	Learning outcomes	5%
5	Time line and responsibilities	10%
6	Leadership development plan	15%
7	Assessment & presentation	20%
8	Writing style	15%

17. For Non Credit Courses/ Audit Courses

The assessment will be graded “Satisfactory/Not Satisfactory” and grades as Pass/Fail will be awarded. The Assessment will be done based on the respective assessment rubrics issued by the Head of the Department.

18. Credit Weightage

Credits are the weightages, assigned to the courses based on the following general pattern:

One Hour 1 credits.

Two Hour Practical 0.5 credits.

19. Maximum Duration of Program

A student may complete the program at a slower pace than the regular pace, but in any case, in not more than N+2 years. A student completing the degree programs in the extended period will not be eligible for university ranking.

20. Maximum Gaps between semester/year

A student may be permitted by the Vice-Chancellor to withdraw from the entire programme for a maximum of two semesters for reasons of ill health, start – up venture or other valid reasons as recommended by a committee consisting of Head of Department, Dean of School, and Dean (Student Welfare).

21. Credit System & Grading CGPA/SGPA

IIMT-University implemented the choice-based credit system with a view to offer students choice of courses within a program with a flexibility to complete the program by earning credits at a pace decided by the students themselves. The system allowed students to choose inter-disciplinary, intra-disciplinary courses according to their learning needs, interest and aptitude. It was considered as a cafeteria approach and was expected to provide mobility to students.

As per the Current credit system practiced in institutions needs comprehensive reforms as they offer very little flexibility, choice and are less learner centric. Degrees offered today are more self-contained focusing on a specialization area and depend a lot on knowledge available with the faculty from the department only. Though the most requisite credit system does exist, wherein students are given a wide choice and flexibility, these exist as small islands in the vast ocean of thousands of educational institutes in India. In such institutions, the curriculum is frequently designed which is learner centric and offering a wide specialization area for students to pick and choose courses from.

The institutions shall make attempts wherein the design of the credit system and the teaching and evaluation modes shall be the responsibility of individual course teachers. The students should have the freedom to opt for courses from other specializations and not just from their core specialization. For this there has to be stronger collaborations between departments of the University and outside.

Most institutions follow the absolute grading system which is a simple procedure wherein the marks obtained by students correspond to a specific grade and grade point. It reflects the individual performance in a particular subject without any reference to the group/class. The absolute grading system has limitations and may be susceptible to some inconsistencies.

The relative grading system on the other hand provides relative performance of a student to a group/class wherein the student is ranked in a group/class on basis of relative level of achievement. In this system decisions are made in advance by the faculty members as to what proportion of students would be awarded a particular grade on the basis of their relative performance and which is done by assigning grades on basis of a normal curve. This facilitates comparative performance and eliminates negative effect of pass or fail.

Relative grading system may be used if the number of students registered for the course is at least 30. For a class of smaller size, an absolute grading scheme may be used. The statistical method may be used with adjustments to calculate the mean (M), median (Md) and standard deviation (SD) of the total marks (TM) obtained by the students registered for the course. If the mean and median coincide, the mean may be used for further computations, otherwise the median may be used. If suppose the mean is used, then the letter grades may be awarded based on the ranges specified in table below:*Table No: 1.11*

Table No:1.11

Letter Grade	Range
A+	TM>M+1.75SD
A	M+1.25 SD ≤TM<M+1.75SD
B+	M+0.75 SD ≤TM<M+1.25SD
B	M+0.25 SD ≤ TM < M+0.75 SD
C+	M-0.25 SD ≤ TM < M-0.25 SD
C	M-0.75 SD ≤ TM < M-0.25 SD
D+	M-1.25 SD ≤ TM < M-0.75 SD
D	M-1.75 SD ≤ TM < M-1.25 SD
E+	M-2.0 SD ≤ TM < M-1.75 SD
E	M-2.25 SD ≤ TM < M-2.0 SD
F	M-2.25 SD > TM
CO	Carry Over (Summer / Winter) due to Attendance deficiency (between 40% and 75%) and/or I. Lack of minimum IA marks as specified in clause 10.0 Table 3.
RA	Repeat the course due to (i) Lack of minimum attendance (below 40%) in regular course.
--	DETAINED "RC" or "RA" or both in all registered theory courses of a semester. The student is detained and has to repeat the entire semester. Clause 12.3

Letter grades may be improved based on the following scheme: Use the table above to determine grade boundaries. Look for natural gaps in the neighborhood of grade boundaries. Choose the largest gap in the neighborhood and make this as the grade boundary.

An 'E', 'E+' and 'F' grade may not be a purely relative grade. These may be assigned on the following basis:

- A minimum, say 30/100, may be set as pass marks for the course. A fail grade may then be awarded only if the Total Marks for the course are less than 30. Otherwise, the students may be awarded the Just Pass Grade D.
- A fail grade may be awarded to students whose marks are below the prescribed minimum even if the table above leads to a pass grade.

Similarly, a lower limit may be set for the A grade also, for instance greater than or equal to 86. Students not achieving the prescribed minimum may be awarded a lower letter grade even if the table above indicates otherwise. A pass grade may be made mandatory for both internal as well as external examinations in the case of a separate internal and external assessment,

a) Internal and External marks may be summed up with appropriate weightages to compute a total out of 100 marks. The letter grade may be assigned on this computed total.

b) Internal and external marks may be graded separately and then the assigned grade points may be used, with appropriate weightages, to compute a final grade point and letter grade.

Grading in the case of Re-evaluations, Retests and Remedial Examinations may be based on the following guidelines:

a) The ranges of marks once computed for awarding letter grades the first time, called the First Distribution (FD), will not be modified.

b) If a re-evaluation leads to a change in marks, then FD will be used to award an appropriate letter grade.

c) A retest may be permitted if

i. A student gets a letter grade of E+ or E. In this case, irrespective of the marks obtained, at most D grade may be awarded.

ii. A student is unable to complete course requirements because of certified illness or tragedy. In this case FD will be used to award an appropriate letter grade.

The use of relative grading system may be recommended in autonomous institutions, institutes of national importance and institutions with high ranking. The results of the relative grading system may be shared by such institutions later with other interested institutions to implement the same.

GPA and CGPA

GPA is the ratio of the sum of the product of the number of credits Ci of course "i "and the grade points Pi earned for that course taken over all courses "i" registered and successfully completed by the student to the sum of Ci for all "i". That is,

$$GPA = \frac{\sum_i C_i P_i}{\sum_i C_i}$$

CGPA will be calculated in a similar manner, in any semester, considering all the courses enrolled from the first semester onwards.

The Grade card will not include the computation of GPA and CGPA for courses with letter grade CO, RC and U until those grades are converted to the regular grades.

A course successfully completed cannot be repeated.

Grade Sheet

Based on the performance, each student is awarded a final letter grade at the end of the semester in each course. The letter grades and corresponding grade points are given in Table 1.11.

A student is considered to have completed a course successfully and earned credits if he/she secures a letter grade other than F, CO, RA in that course.

After results are declared, grade sheet will be issued to each student which will contain the following details:

a) Program and discipline for which the student has enrolled.
b) Semester of registration.
c) The course code, name of the course, category of course and the credits for each course registered in that semester
d) The letter grade obtained in each course
e) Semester Grade Point Average (GPA)
f) The total number of credits earned by the student up to the end of that semester in each of the course categories.
g) The Cumulative Grade Point Average (CGPA) of all the courses taken from the first semester.
h) Credits earned under Non CGPA courses.
i) Medium of Instruction is English.
j) Grade Equivalency.

22. Class/ Division

CGPA ≥ 8.0: First Class with distinction

6.5 ≤ CGPA <8.0: First Class

5.0 ≤ CGPA <6.5: Second Class.

23. Transfer of Credit / Academic Credit Bank

Within the broad framework of these regulations, the Academic Council, based on there commendation of the Credit Transfer Committee so constituted may permit students to transfer part of the credit earned in other approved Universities of repute & status in the India or abroad.

The Academic Council may also approve admission of students who have completed a portion of course work in another approved Institute of repute under Multiple entry & Exit system, based on the recommendation of the credit transfer committee on a case-to-case basis.

Students who have completed coursework, at least first year, at some university other than the university to which transfer is sought (may request for transfer of admission to this university. A student may be granted admission only through an admission process that will follow the same policy as for fresh admissions. However, a uniform credit system must be followed by all universities to effect transfer of credits.

Credit Transfer request can be submitted only after the student has been admitted in the concerned program and the following conditions are met:

The course work has been completed at a UGC approved and accredited University through fulltime formal learning mode.

a) The university accreditation grade/ ranking are not lower than that of the university to which the transfer is sought.
b) The courses prescribe to the common minimum syllabus under UGC CBCS system.
c) The letter grade obtained in the courses is “B” or better.
d) The number of credits to be transferred does not exceed the prescribed limit.
e) The program in question must have a similar credit system, in particular, modular or semester and the same numeric and letter grading system along with common meaning of the term “credit” in numerical terms.

The aspect of shelf life of courses needs to be considered while accepting credits as obsolescence of knowledge of certain field in terms of its current relevance needs to be investigated. The time lapsed between successful completion of certain courses of the program and the admission to which program transfer is sought needs to be considered. The maximum number of credit points that may be considered under a credit transfer needs to be specified. Contextual variables such as teaching-learning approach adopted, learning facilities offered, use of evaluation modes may also be considered while preparing the credit transfer policy.

24. Change of Discipline

i. If the number of students in any discipline of Engineering program as on the last instructional day of the First Semester is less than the sanctioned strength, then the vacancies in the said disciplines can be filled by transferring students from other disciplines subject to eligibility.
ii. If any Student of Engineering program wants to change from Engineering to any program/ any discipline as per their eligibility they are permitted to change on or before 30 calendar days from the first day of commencement of program as per academic calendar.
iii. All students who have successfully completed the first semester of the course will be eligible for consideration for change of discipline subject to the availability of vacancies and as per norms.
iv. All such transfers will be allowed based on merit of the students. The decision of the Vice-Chancellor shall be final while considering such requests.

25. Use of Technological Intervention

With the proliferation of different types of access devices, especially mobile access devices, technology has the potential to augment traditional classroom practices and revolutionize learning and evaluation methods. Technology, in fact can be an important driver to enable lifelong learning. Learning and engagement of students is facilitated by use of technology through several modes such as synchronous learning, semi-synchronous learning, blended learning, collaborative learning, flipped classroom etc. MOOC's, especially provided through SWAYAM, are a window of opportunity for lifelong learning and are offered through technology-based platforms. Learning management systems (LMS) may be used by institutions to integrate the entire teaching, learning and evaluation process. The Learning Management System may be used by institutions to deliver academic content in blended form and to assess learning through thesis, assignments etc. Open-source learning management systems such as Moodle, Edmodo may be used for posting content in the form of videos, audios, e-learning modules, live class sessions etc. Use of plagiarism detection software will be highly recommended to check originality of content.

In the conduct of examinations, universities face tremendous challenges such as need for trained manpower, distribution of question paper without delays and errors, delays in evaluation of answer scripts, lack of infrastructure to conduct examinations at a large scale, non-availability of faculty members for assessment, security issues faced during paper setting and paper distribution, tampering of certificates and answer scripts etc.

For a typical examination department of an institution will be an autonomous body right from registration of student to convocation through an integrated system. In fact, steps must be taken to implement a complete examination management system that considers the complete life cycle of examination process. The use of technology will reduce dependency on human intervention and be error free.

The following functions will be automated:

i. registration of students and generating unique PRN,
ii. filling up of examination form,
iii. generation of seat numbers and admit cards/hall tickets,
iv. preparation of list of paper setter,
v. use of question bank system to draw question sets,
vi. question paper generation,
vii. online distribution of question papers on the day of examination with system of encryption,
viii. Barcode system for answer books (this will eliminate issues related to errors, avoid malpractices etc.),
ix. digitization of answer scripts and onscreen evaluation of answer sheets,
x. tracking of student's performance,
xi. Marks submission through online software,
xii. viewing of result through online system,
xiii. online verification and revaluation system,
xiv. digitization of certificates and marksheets (to avoid tampering and easy retrieval),
xv. certificate authentication system,
xvi. Submission of various other applications through online system.

The above will lead to conduct of functions of the examination system in an efficient and transparent manner and timely availability of information to students.

26. Student Discipline

Every student is required to observe utmost discipline and decorum both inside and outside the campus and not to indulge in any activity which may affect adversely the prestige reputation of the University.

27. Student Welfare

Any act of indiscipline of a student reported to the Dean (Students Welfare) and Head of the Department will be referred to a Discipline Committee constituted for the purpose. The Committee will enquire into the charges and decide on a suitable punishment if the charges are substantiated. The committee will also authorize the Dean (Students Welfare) to recommend to the Vice-Chancellor for the implementation of the decision. The student concerned may appeal to the Vice-Chancellor, whose decision will be the final.

28. Ragging

Ragging in any form is a criminal and non-bailable offence in our country. The current State and Central legislations provide stringent punishments including imprisonment. Once the involvement of a student(s) is established in ragging, offending fellow students/staff, harassment of any nature to the fellow students/staff etc. the student(s) will be liable to be dismissed from the University, as per the laid down procedures of the UGC / Govt. /Institute. Every senior student at the University, along with their parent, shall give an undertaking every year in this regard and the same should be submitted at the time of Registration.

29. Power of Modify

Not with standing all that has been stated above, the Academic Council is vested with powers to modify any or all the above regulations from time to time, if required, subject to the approval by the Board of Studies and Final approval by Vice-Chancellor.

30. Exit Point

Refer to point 8

31. NC/Credit Course

Please refer to point 17 for NC (Non Credit Courses). Refer to Evaluation schemes for Credit Courses.

32. Any other heading as per your Program

NA

EVALUATION SCHEME

(B.Tech.) Mechanical Engineering
FIRST YEAR, SEMESTER-I

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-111	Engineering Mathematics-I	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAS-113 / SEAS-112	Engineering Chemistry / Engineering Physics	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-111 / SEME-111	Learning Computers with Thinking & Programming in C / Concepts of Mechanical Engineering & Mechatronics	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEE-111 / SEEC-111	Basic Electrical Engineering / Fundamentals of Electronics Engineering	3	1	0	30	20	0	100	0	**150**	**4**
5	PCE-111/ SEHU-112	Professional Communication/ Environmental Studies	3	0	0	10	5	0	35	0	**50**	**2**
6	SEAS-113P / SEAS-112P	Engineering Chemistry (Lab)/ Engineering Physics (Lab)	0	0	3	0	0	20	0	30	**50**	**2**
7	SECS-111 P/ SEME-111P	Learning Computers with Thinking & Programming in ‘C’ / Engineering Graphics & Design Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEE-111P / SEEC-111P	Basic Electrical Engineering Lab/ Fundamentals of Electronics Engineering Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	PCE-111P/ SEME-112P	Professional Communication Lab / Engineering Workshop Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC -112*	University Social Responsibility - Community Outreach	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-111*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**15**	**130**	**85**	**80**	**435**	**120**	**850**	**26**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-112 & SPT-111 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Applied Science Courses(Core)	Engineering Mathematics-I, Engineering Chemistry / Engineering Physics
Common Engineering Courses (Core)	Learning Computers with Thinking & Programming in C/ Concepts of Mechanical Engineering & Mechatronics, Basic Electrical Engineering / Fundamentals of Electronics Engineering,
Skill Enhancement Courses	University Social Responsibility, SPORTS
Ability Enhancement Courses	Professional Communication/ Environmental Studies

(B.Tech.) Mechanical Engineering
FIRST YEAR, SEMESTER-II

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-121	Engineering Mathematics-II	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAS-122 / SEAS-123	Engineering Physics / Engineering Chemistry	3	1	0	30	20	0	100	0	**150**	**4**
3	SEME-121 / SECS-121	Concepts of Mechanical Engineering & Mechatronics / Learning Computers with Thinking & Programming in ‘C’	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEC-121 / SEEE-121	Fundamentals of Electronics Engineering / Basic Electrical Engineering	3	1	0	30	20	0	100	0	**150**	**4**
5	SEHU-122/ PCE-121	Environmental Studies / Professional Communication	3	0	0	10	5	0	35	0	**50**	**2**
6	SEAS-122P / SEAS-123P	Engineering Physics Lab / Engineering Chemistry lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SEME-121P / SECS-121 P	Engineering Graphics & Design Lab / Learning Computers with Thinking & Programming in ‘C’ Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEC-121P / SEEE-121P	Fundamentals of Electronics Engineering Lab / Basic Electrical Engineering Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEME-122P/ PCE-121P	Engineering Workshop Lab/ Professional Communication Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC -125	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
11	NECC-121*	Industrial Visit/Seminar on the report of visit	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
12	NECC -122*	University Social Responsibility - Community Outreach	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
13	SPT-121*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**14**	**130**	**85**	**130**	**435**	**120**	**900**	**28**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher’s Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- External Practical, NC- Non Credit Course

***Note:** NECC-121, NECC-122 & SPT-121 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits , social visits /awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Applied Science Courses(Core)	Engineering Mathematics-II, Engineering Physics/ Engineering Chemistry
Common Engineering Courses (Core)	Concepts of Mechanical Engineering & Mechatronics / Learning Computers with Thinking & Programming in C, Fundamentals of Electronics Engineering / Basic Electrical Engineering
Skill Enhancement Courses	Industrial Visit/Seminar on the report of visit, University Social Responsibility, MOOCS (SWAYAM/NPTEL), SPORTS
Ability Enhancement Courses	Environmental Studies / Professional Communication

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 3rd Semester.

(B.Tech.) Mechanical Engineering
STUDY & EVALUATION SCHEME

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-231/ SESB-231-SESB-249	Mathematics-III/ Engineering Science Electives**	3	1	0	30	20	0	100	0	**150**	**4**
2	SEME-231	Material science	3	1	0	30	20	0	100	0	**150**	**4**
3	SEME-232	Engineering Thermodynamics	3	1	0	30	20	0	100	0	**150**	**4**
4	SEME-233	Strength of Material	3	1	0	30	20	0	100	0	**150**	**4**
5	STCS-239	Python Programming	3	0	0	10	5	0	35	0	**50**	**2**
6	SEME-231P	Material Science Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEME-232P	Engineering Thermodynamics Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEME-233P	Python Programming Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	*NECC-232	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	*SPT-231	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**09**	**130**	**85**	**60**	**435**	**90**	**800**	**24**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-232 & SPT-231 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Applied Science Courses(Core)	Mathematics-III
Engineering Courses (Core)	Material science, Engineering Thermodynamics, Strength of Material, Material Science Lab, Engineering Thermodynamics Lab, Python Programming Lab
Skill Enhancement Courses	University Social Responsibility, SPORTS, Python Programming

(B.Tech.) Mechanical Engineering
SECOND YEAR, SEMESTER-IV

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-231-SESB-249 / SEAS-241	Engineering Science Electives**/ Mathematics-III	3	1	0	30	20	0	100	0	**150**	**4**
2	SEME-241	Fluid Mechanics	3	1	0	30	20	0	100	0	**150**	**4**
3	SEME-242	Manufacturing Processes	3	1	0	30	20	0	100	0	**150**	**4**
4	SDME-241/ SDME-244	DSE-I	3	1	0	30	20	0	100	0	**150**	**4**
5		Generic Elective-I	4	0	0	30	20	0	100	0	**150**	**4**
6	SEME-241P	Fluid Mechanics Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEME-242P	Manufacturing Processes Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEME-243P	Machine Drawing Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC-245	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
11	NECC-241	Industrial Visit/ Seminar/Presentation on the report of visits	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
12	NECC-242	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
13	*SPT-241	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**16**	**04**	**11**	**150**	**100**	**110**	**500**	**90**	**950**	**28**
14		**#Minor Certification Paper-I**	3	1	0	30	20	0	100	0	150	4

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-241, NECC-242 & SPT-241 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of Industrial visits, social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Fluid Mechanics, Manufacturing Processes, Fluid Mechanics Lab, Manufacturing Processes Lab, Machine Drawing Lab
Discipline Specific Elective-I	1. SDME-241 Applied Thermodynamics 2. SDME-242 Advance Welding Technology 3. SDME-243 Engineering Optimization 4. SDME-244 Programming, Data Structures and Algorithms Using Python
Generic Elective-I	This subject will be opted by student from other department of the IIMT University
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship / Mini Project Assessment, Python Programming, MOOCS (SWAYAM/NPTEL)

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 5th Semester.

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

(B.Tech.) Mechanical Engineering
THIRD YEAR, SEMESTER-V

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEME-351	Fluid Machinery	3	1	0	30	20	0	100	0	**150**	**4**
2	SEME-352	Heat & Mass Transfer	3	1	0	30	20	0	100	0	**150**	**4**
3	SEME-353	Production Technology	3	1	0	30	20	0	100	0	**150**	**4**
4	SDME-351-SDME-354	DSE-II	3	1	0	30	20	0	100	0	**150**	**4**
5	SEME-351P	Fluid Machinery Lab	0	0	3	0	0	20	0	30	**50**	**2**
6	SEME-352P	Heat & Mass Transfer Lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SEME-353P	Production Technology Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEME-354P	Internship	0	0	2	0	0	50	0	0	**50**	**2**
9	SEME-359P	Research Project-I	0	0	2	0	0	**50***	0	0	**50***	*NC**
10	NECC-352*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-351*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**12**	**04**	**11**	**120**	**80**	**110**	**400**	**90**	**800**	**24**
		#Minor Certification Paper-II	3	1	0	30	20	0	100	0	150	4

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-352 & SPT-351 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Fluid Machinery, Heat & Mass Transfer, Production Technology, Fluid Machinery Lab, Heat & Mass Transfer Lab, Production Technology Lab
Discipline Specific Elective-II	1. SDME-351 I.C. Engines & Compressors 2. SDME-352 Finite Element Methods 3. SDME-353 Industrial Engineering 4. SDME-354 Gas Dynamics and Jet Propulsion
Research Project	Research Project-I
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

(B.Tech.) Mechanical Engineering
THIRD YEAR, SEMESTER-VI

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEME-361	Theory of Machines	3	1	0	30	20	0	100	0	**150**	**4**
2	SEME-362	Refrigeration & Air Conditioning	3	1	0	30	20	0	100	0	**150**	**4**
3	SDME-361- SDME-364	DSE-III	3	1	0	30	20	0	100	0	**150**	**4**
4	UVE-601	Universal Human Values & Professional Ethics	3	0	0	10	05	0	35	0	**50**	**3**
5	SEME-361P	Theory of Machines Lab	0	0	3	0	0	20	0	30	**50**	**2**
6	SEME-362P	Refrigeration & Air Conditioning- Lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SEME-363P	Mini Project	0	0	3	0	0	50	0	0	**50**	**2**
8	NECC-365	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
9	SEME-369P	Research Project-II	0	0	2	0	0	**50***	0	0	**50***	*NC**
10	NECC-361*	Industrial Visit/ Seminar/Presentation on the report of visits	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	NECC-362*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
12	*SPT-361*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**12**	**03**	**11**	**100**	**65**	**140**	**335**	**60**	**700**	**23**
13		**#Minor Certification Paper-III**	2	0	0	30	20	0	100	0	150	2

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-361, NECC-362 & SPT-361 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of Industrial visits, social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Theory of Machines, Refrigeration & Air Conditioning, Theory of Machines Lab Refrigeration & Air Conditioning- Lab
Discipline Specific Elective-III	1. SDME-361 Mechanical Vibrations 2. SDME-362 Unconventional Machining Processes 3. SDME-363 Machine Design 4. SDME-364 Artificial Intelligence
Ability Enhancement Courses	Universal Human Values & Professional Ethics
Research Project	Research Project-II
Skill Enhancement Courses	University Social Responsibility, SPORTS, Mini Project Lab, Python Programming, MOOCS (SWAYAM/NPTEL)

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 7th Semester.

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

(B.Tech.) Mechanical Engineering
FOURTH YEAR, SEMESTER-VII

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEME-471	CAD/ CAM	3	1	0	30	20	0	100	0	**150**	**4**
2	GE-II	Generic Elective-II	3	1	0	30	20	0	100	0	**150**	**4**
3	SEME-471P	CAD/ CAM Lab	0	0	3	0	0	20	0	30	**50**	**2**
4	SEME-472P	Minor Project	0	0	8	0	0	40	0	60	**100**	**4**
5	SEME-474P	Internship	0	0	2	0	0	100	0	0	**100**	**2**
6	NECC-475	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
7	NECC-472*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
8	SPT-471*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**6**	**02**	**15**	**60**	**40**	**210**	**200**	**90**	**600**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-352 & SPT-351 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Engineering Courses (Core)	CAD / CAM, CAD/ CAM Lab
Generic Elective-II	This subject will be opted by student from other department of the IIMT University
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship, Minor Project

(B.Tech.) Mechanical Engineering
FOURTH YEAR, SEMESTER-VIII

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	GE-III	Generic Elective-III	3	1	0	30	20	0	100	0	**150**	**4**
2	SDME-481/ SDME-484	DSE-IV	3	1	0	30	20	0	100	0	**150**	**4**
3	SEME-481P	Major Project	0	0	20	0	0	100	0	150	**250**	**10**
		Grand Total	**06**	**02**	**20**	**60**	**40**	**100**	**200**	**150**	**550**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-352 & SPT-351 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Generic Elective-III	This subject will be opted by student from other department of the IIMT University
Discipline Specific Elective-IV	1. SDME-481 Non-destructive Testing 2. SDME-482 Flexible Manufacturing System 3. SDME-483 Power Plant Engineering 4. SDME-484 Automobile Engineering
Research Project	Major Project

****ENGINEERING SCIENCE ELECTIVES**
(Effective from session 2022-23)

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-231/ SESB-241	Engineering Mechanics	3	1	0	30	20	0	100	0	150	4
2	SESB-232/ SESB-242	Material Science	3	1	0	30	20	0	100	0	150	4
3	SESB-233/ SESB-243	Energy Science & Engineering	3	1	0	30	20	0	100	0	150	4
4	SESB-234/ SESB-244	Sensor & Instrumentation	3	1	0	30	20	0	100	0	150	4
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	3	1	0	30	20	0	100	0	150	4
6	SESB-236/ SESB-246	Introduction to Soft Computing	3	1	0	30	20	0	100	0	150	4
7	SESB-237/ SESB-247	Analog Electronics Circuits	3	1	0	30	20	0	100	0	150	4
8	SESB-238/ SESB-248	Electronics Engineering	3	1	0	30	20	0	100	0	150	4
9	SESB-239/ SESB-249	Digital Electronics	3	1	0	30	20	0	100	0	150	4

S. No	Subject Code	Subject Name	Remark
1	SESB-231/ SESB-241	Engineering Mechanics	Subject can be offered to any branch except ME/ CE/ AG and allied branches
2	SESB-232/ SESB-242	Material Science	
3	SESB-233/ SESB-243	Energy Science & Engineering	Subject can be offered to any branch except EE and allied branches
4	SESB-234/ SESB-244	Sensor & Instrumentation	
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	Subject can be offered to any branch except CSE and allied branches
6	SESB-236/ SESB-246	Introduction to Soft Computing	
7	SESB-237/ SESB-247	Analog Electronics Circuits	Subject can be offered to any branch except EC and allied branches
8	SESB-238/ SESB-248	Electronics Engineering	
9	SESB-239/ SESB-249	Digital Electronics	Subject can be offered to any branch except EC/ EE and allied branches

FORMAT-1

Format-1

CBCS: Statement of Credit distribution

College/School:School of Engineering & Technology Programme:B.Tech Duration: 8 Semester Annual/Semester: Semester	Credit range: 160-190 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr)	Ability Enhancement Compulsory Course (AECC)	Skill Enhancment Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	26	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit)+P-2(2Credit) C-3 (4 Credit)+P-3(2Credit) C-4 (4 Credit)+P-4(2Credit)	AECC-1(2)				
II	28	C-5 (4 Credit) C-6 P-1(2Credit) C-7 (4 Credit)+P-2(2Credit) C-8 (4 Credit)+P-3(2Credit) C-9 (4 Credit)+P-4(2Credit)	AECC-2(2)	SEC-1(2)			
Provision to change the stream							
III	24	C-10 (4 Credit)+P-1(2Credit) C-11 (4 Credit)+P-2(2Credit) C-12 (4 Credit)+P-3(2Credit) C-13 (4Credit)		SEC-2(2)			
Provision to change the core papers							
IV	28	C-14 (4 Credit) C-15 P-1(2Credit) C-16 (4 Credit)+P-2(2Credit) C-17 (4 Credit)+P-3(2Credit)		SEC-3(2)	DSE-1(4)	GE-1(4)	
V	24	C-18 (4 Credit)+P-1(2Credit) C-19 (4 Credit)+P-2(2Credit) C-20 (4 Credit)+P-3(2Credit)		SEC-4(2)	DSE-2(4)		RP-1(NC*)
VI	23	C-21 (4 Credit)+P-1(2Credit) C-22 (4 Credit)+P-2(2Credit)	AECC-3(3)	SEC-5(2) SEC-6(2)	DSE-3(4)		RP-2(NC*)
VII	28	C-23 (4 Credit)+P-1(2Credit)		SEC-7(2) SEC-8(2)		GE-2(4)	Minor Project-1 (4)

VIII	18				DSE-4(4)	GE-3(4)	Major Project -1 (10)
Total Credits	**189**	21(Th)*4(Cr) = 84 20 (Pr)*2(Cr) = 40 **Total = 124**	2*2 = 04 1*3 = 03 **= 07**	8*2 = 16 **= 16**	4*4 = 16 **=16**	3*4 = 12 **= 12**	4+10 **= 14**

***MOOCs certification Elective #Entreprenuership & Innovation core paper**

Format-2

IIMTU-NEP Implementation: **Format-2**
(B.Tech Mechanical Engineering)

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES B.Tech. ME	**FIRST YEAR**	**SEMESTER -I**	i) C1 (Th.4 Cr.) ii) AECC-1 (Th.2 Cr + P 2 Cr.)	4 2 2	4 3 3	48 36 36	Engineering Mathematics –I Professional Communication Professional Communication Lab	5 5		
			i) C2(Th.4 Cr.+ P 2 Cr).	4 2	4 3	48 36	Engineering Chemistry Engineering Chemistry (Lab)	5		
			i) C3 (Th.4 Cr.+ P 2 Cr.)	4 2	4 3	48 36	Learning Computers with Thinking and Programming in C Learning Computers with Thinking and Programming in C lab	5		
			i) C4 (Th.4 Cr.+ P 2 Cr.)	4 2	4 3	48 36	Basic Electrical Engineering Basic Electrical Engineering Lab	5		
		SEMESTER - II	i) C5 (Th.4 Cr.+ P 2Cr.) iii) AECC-2 iv) SEC-1	4 2 2 2	4 3 3 2	48 36 36 24	Engineering Mathematics –II Engineering Workshop Lab Environmental Studies MOOCS (Swayam/ NPTEL)	5 5		
			i) C6(Th.4Cr.+ P 2Cr.)	4 2	4 3	48 36	Engineering Physics Engineering Physics (Lab)	5		
			i) C7 (Th.4Cr.+ P 2Cr.)	4 2	4 3	48 36	Concepts of Mechanical Engineering & Mechatronics Engineering Graphics & Design Lab	5		
			i) C8 (Th.4Cr.+ P 2Cr.)	4 2	4 3	48 36	Fundamentals of Electronics Engineering Fundamentals of Electronics Engineering (Lab)	5		

Programme Outcomes:
$PO_1 - PO_{12}$ **[ANNEXTURE-1]**

Programme Specific Outcomes:
$PSO_1 - PSO_4$ **[ANNEXTURE-2]**

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR	SEMESTER -III	i) C9 (Th. 4 Cr. + P 2Cr.)	4 2	4 3	48 36	Material science Material Science Lab	5		
			i) C10 (Th. 4 Cr. + P 2Cr.)	4 2	4 3	48 36	Engineering Thermodynamics Engineering Thermodynamics Lab	5		
			i) C11 (Th. 4 Cr)	4	4	48	Engineering Mathematics-III	5		
			i) C12 (Th. 3 Cr + P 2Cr.)	4 2	4 3	48 36	Strength of Material Python Programming Lab	5		
			i) SEC-2 (Th. 2 Cr)	2	3	36	Python Programming	5		
		SEMESTER -IV	i) C13 (Th. 4 Cr.) ii) SEC-3 iii) DSE-1 iv) GE-1	4 2 4 4	4 2 4 4	48 24 48 48	Engineering Science Electives** (List is attached separately) MOOCS (SWAYAM/ NPTEL) Applied Thermodynamics Advance Welding Technology Engineering Optimization Programming, Data Structures and Algorithms Using Python ***#To be opted from other department***	5 5		
			i) C14 (Th. 4 Cr. + P 2Cr.)	4 2	4 3	48 36	Fluid Mechanics Fluid Mechanics Lab	5		
			i) C15 (Th. 4 Cr+ P 2Cr.) ii) P 2 Cr.	4 2 2	4 3 3	48 36 36	Manufacturing Processes Manufacturing Processes Lab Machine Drawing Lab	5		

Programme Outcomes:
PO_1 – PO_{12} **[ANNEXTURE-1]**

Programme Specific Outcomes:
PSO_1 – PSO_4 **[ANNEXTURE-2]**

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	THIRD YEAR	SEMESTER -V	i) C16 (Th. 4 Cr. + P 2 Cr.) ii) SEC-4 iii) DSE-2	4 2 2 4	4 3 2 4	48 36 24 48	Fluid Machinery Fluid Machinery Lab Internship* I.C. Engines & Compressors Finite Element Methods Industrial Engineering Gas Dynamics and Jet Propulsion	5 5		
			i) C17 (Th. 4 Cr. + P 2 Cr.)	4 2	4 3	48 36	Heat & Mass Transfer Heat & Mass Transfer Lab	5		
			i) C18 (Th. 4 Cr. + P 2 Cr.)	4 2	4 3	48 36	Production Technology Production Technology Lab	5		
		SEMESTER - VI	i) C19 (Th. 4 Cr. + P 2Cr.) ii) SEC-5 iii) DSE-3	4 2 2 4	4 3 2 4	48 36 24 48	Theory of Machines Theory of Machines Lab MOOCS (SWAYAM/ NPTEL) Mechanical Vibrations Unconventional Machining Processes Machine Design Artificial Intelligence	5 5		
			i) C20 (Th. 4 Cr. + P 2Cr.)	4 2	4 3	48 36	Refrigeration & Air Conditioning Refrigeration & Air Conditioning Lab	5		
			i) AECC (Th. 3Cr) ii) SEC-6	3 2	3 3	36 36	Universal Human Values & Professional Ethics Mini Project	5		

*** Industrial Training of 4 Weeks / 5 Weeks to be completed between the semester break**

Programme Outcomes:
$PO_1 - PO_{12}$ **[ANNEXTURE-1]**

Programme Specific Outcomes:
$PSO_1 - PSO_4$ **[ANNEXTURE-2]**

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	FOURTH YEAR	SEMESTER - VII	i) C21 (Th. 4 Cr. + P 2Cr.) ii) SEC-7 iii) Project Lab (Minor)	4 2 2 4	4 3 2 8	48 36 24 96	CAD/ CAM CAD/ CAM Lab MOOCS (SWAYAM/NPTEL) Minor Project *	5		
			i) SEC-8	2	2	24	Internship*			
			i) GE-2	4	4	48	***#To be opted from other department***			
		SEMESTER - VIII	i) GE-3	4	4	48	***#To be opted from other department***			
			ii) DSE-4	4	4	48	Non-destructive Testing Flexible Manufacturing System Power Plant Engineering Automobile Engineering			
			iii) Major Project	10	20	240	Major Project *			

***Minor and Major Project report will be evaluated by external & internal examiners.**
*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

Programme Outcomes:
PO_1 – PO_{12} **[ANNEXTURE-1]**

Programme Specific Outcomes:
PSO_1 – PSO_4 **[ANNEXTURE-2]**

ANNEXTURE-1

Program Outcomes:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and
Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

ANNEXTURE-2

Program Specific Outcomes:

PSO1: Ability to recognize and examine the mechanical parts, machine apparatuses and systems and to get to know platforms, apparatuses, innovative work in the area of Mechanical Engineering.

PSO2: Apply the concepts of Mechanical Engineering and use AUTO CAD, Solid Works, and Ansys software for the design and development of industrial problems.

PSO3: Apply the knowledge of Mechanical Engineering in the various fields such as automobile industries, manufacturing units and power plants etc.

PSO4: Apply the principles and knowledge of Mechanical Engineering to analyze the most advanced system.

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I

Programme:UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year:I Semester:I
Credits Theory: 4 Practical: 0	**Subject:**Engineering Mathematics-I
Course Code: SEAS-111	**Title: :** Engineering Mathematics-I

Course Objectives:
1. To apply the knowledge of differential calculus in the field of engineering.
2. To deal with functions of several variables that is essential in optimizing the results of real life problems.
3. To understand the essential tools of matrices and linear algebra, Eigen values and diagonalization in a Comprehensive manner are required.
4. To understand Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc.
5. To deal with vector calculus that is required in different branches of Engineering to graduate engineers.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T:1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**DIFFERENTIAL CALCULUS-I:** Successive Differentiation (nth order derivatives), Leibnitz theorem and its application. Curve tracing: Cartesian and Polar co-ordinates. Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions.	**8L**
II	**DIFFERENTIAL CALCULUS-II:** Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians.	**8L**
III	**MATRICES:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, System of linear equations, Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem and its application Diagonalisation of a Matrix	**8L**
IV	**INTEGRAL CALCULUS:** Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Application: Areas and volumes.	**8L**
V	**Vector Calculus:** Vector differentiation: Gradient, Curl and	

	Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem (without proof) and their applications	**8L**

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3)Assignments	20
4)Research Project ReportSeminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of differentiability and apply in the study of Successive differentiation, Leibnitz theorems and Partial differentiation.

CO2 Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.

CO3 Remember the concept of matrices and apply for solving linear simultaneous equations

CO4 Illustrate the working methods of multiple integral and apply for finding area, volume.

CO5 Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

CO6 Apply the concept of calculus in solving engineering problems

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:**Engineering Mathematics-II
Course Code:SEAS-121	**Title: :** Engineering Mathematics-II

Course Objectives:

1. To understand the effective mathematical tools for the solutions of differential equations that model physical processes
2. To get the idea of types of partial differential equations and their solutions.
3. To deal with applications of partial differential equations e.g. wave and heat equations.
4. To understand the concept of Laplace Transform and its application to solve differential and integral equations.
5. To be familiar with the concept and expansion of Fourier series.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**ORDINARY DIFFERENTIAL EQUATIONS:** Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation.	**8L**
II	**PARTIAL DIFFERENTIAL EQUATIONS:** Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.	**8L**
III	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**: Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension.	**8L**
IV	**LAPLACE TRANSFORM:** Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform,	**8L**

	Convolution theorem, Application to solve simple linear and simultaneous differential equations.	
V	**FOURIER SERIES:** Euler's Formulae, Functions having arbitrary periods,πPeriodic functions, Fourier series of period 2 Change of interval, Even and odd functions, Half range sine and cosine series.	**8L**

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1 Understand the concept of differentiation and apply for solving differential equations

CO2 Remember the concept of partial differential equation and to solve partial differential equations.

CO3 Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations

CO4 Understand the concept of Laplace Transform and apply for solving differential equations.

CO5 Remember &Understand the concept of Fourier Series.

CO6 Apply the concept of calculus in solving engineering problems

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:**Engineering Physics
Course Code:SEAS-112/122	**Title:** Engineering Physics

Course Objectives:

1. To Understand the concept of Relativistic Mechanics
2. To know the significance of Maxwell's equations in the Engineering applications of electromagnetic waves.
3. Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore.
4. To know the concept of Interference and Diffraction.
5. To Understand the Phenomenon of Polarization and Laser.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Relativistic Mechanics:** Inertial and Non- Inertial Frames; Michelson-Morley Experiment; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Mass Energy Equivalence and Variation of Mass with Velocity.	**8L**
II	**Electromagnetic:** Gauss law Ampere's law and displacement current; Equation of continuity; Maxwell's equations in Integral and Differential Forms; Electromagnetic Wave Propagation in Free Space and Conducting Media; Poynting Theorem	**8L**
III	**Quantum Mechanics:** Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box.	**8L**
IV	**Wave Optics: Interference:** Basics of interference of light; Principle of superposition, coherent Sources, Conditions of Interference; Interference by division of wave front and amplitude (Fresnel's bi-prism, Interference due to thin film, Newton's Rings). **Diffraction:** Fraunhoffer Diffraction Due Single and N-slit; Diffraction Grating; Rayleigh's criterion of resolution; absent spectra, dispersive Power of grating, Resolving power of Grating.	**8L**
V	**Polarization:** Phenomenon of double refraction; Ordinary and extra-	

	ordinary rays; Nicol Prism; quarter wave plate and half wave plate; Production and analysis of Plane, Circularly and Elliptically Polarized Light; Optical Activity; Specific Rotation, Laurent half's half shade Polari meter.	**8L**

Reference / Text Books:

Text Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

Reference Books:

1. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
2. Engineering Physics-Malik HK and Singh AK (McGrawHill)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments	30
4)Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 To describe the classical relativity and wave mechanics problems.
CO2 To demonstrate the electromagnetic waves and their application in various processes
CO3 To calculate and solve the engineering problems of quantum mechanics.
CO4 To evaluate and grade the engineering problems of wave optics.
CO5 To prepare the classical physics & to prepare the ideas in solving the problems in their parent streams.
CO6 To prepare the Production and analysis of Plane

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Physics Lab
Course Code:SEAS-112P/ SEAS-122 P	**Title:** Engineering PhysicsLab

Course Objectives: The objectives of studying this course are,
1. To understand the concept of wave length by the interference
2. To understand the concept of wave length by the diffraction.
3. To understand the concept of viscosity of liquid and flow of liquid.
4. To understand the energy band gap in the semiconductors.
5. To understand the concept of polarization.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To determine the wavelength of Sodium light by Newton's rings
Practical-2	To determine the wavelength of prominent lines of mercury by plane diffraction grating
Practical-3	To determine the focus length combination of two lenses separated by distance and verify the formula for the focal length of combination of lenses
Practical-4	To determine the wave length of sodium light with the help of Fresnel's bi-prism
Practical-5	To determine the coefficient of viscosity of a given liquid
Practical-6	To verify Stefan's law
Practical-7	Calibration of a volt meter with potentiometer
Practical-8	To determine the resistance per unit length and specific resistance of a given resistance using Carey Foster 's Bridge
Practical-9	To determine the energy bend gap of a given semiconductor material
Practical-10	To determine the Specific Rotation of the Cane sugar solution with the help of Polarimeter.

Reference / Text Books:

1. Practical Physics- K. K. Dey& B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics- Practical- Katiyar&Pandey (Wiley India)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. To determine the wavelength of sodium light by Newton's ring experiment.

CO2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.

CO3. Understand measurement technology, usage of new instruments and real time applications in engineering studies.

CO4. To determine the viscosity of liquid.

CO5. To determine the emission of energy with respect the temperature and verify Stefan's law.

CO6. To determine the calibration of potential and draw the curve.

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:**Engineering Chemistry
Course Code:SEAS-113/123	**Title:** Engineering Chemistry

Course Objectives:
1. Student will be able to apply fundamental concepts of chemistry in different fields of Engineering.
2. Student will be able to identify compounds using different spectroscopic techniques
3. Student will be able to understand the basic principles of electrochemistry for different engineering applications
4. Student will be able to illustrate different types of impurities in water and its softening techniques
5. Student will be able to apply the concepts of determination of calorific values and analyze the coal
6. Student will be able to recall the basic knowledge of polymerization & and applications

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Atomic and Molecular Structure:** Molecular orbitals of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application	**8L**
II	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	**8L**
III	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system.	**8L**
IV	**Water Analysis:** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulon'smethos).	**8L**
V	**Polymers:** Basic concepts of Polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of	**8L**

	synthesis of organometallic compounds (Grignard reagent) and their applications.	

Reference / Text Books:

Text Books:

1. University Chemistry ByB.H.Mahan
2. University Chemistry ByC.N.R.Rao
3. Organic Chemistry By I.L.Finar
4. Physical Chemistry By S.Glasstone
5. Engineering Chemistry By S.S.Dara
6. Polymer Chemistry By FreW.Billmeyer

Reference Books:

1. Elementary Organic Spectroscopy ByY.R.Sharma
2. Principles of Physical Chemistry By Puri, Sharma,Pathania
3. Principles of Inorganic Chemistry By Puri, Sharma,Kalia
4. Concise Inorganic Chemistry ByJ.D.Lee

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Apply fundamental concepts of chemistry in different fields of Engineering
CO2 Identify compounds using different spectroscopic techniques.
CO3 Understand the basic principles of electrochemistry for different engineering applications
CO4 Illustrate different types of impurities in water and its softening techniques
CO5 Apply the concepts of determination of calorific values and analyze the coal
CO6 Recall the basic knowledge of polymerization and its applications

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:**Engineering Chemistry Lab
Course Code: SEAS-113P/SEAS-123P	**Title: :**Engineering Chemistry Lab

Course Objectives: The objectives of studying this course are,

1. Student will be able to Estimate different impurities present in water sample.
2. Student will be able to Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution
3. Student will be able to Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/ 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To determine total alkalinity in the given water sample.
Practical-2	To determine the temporary and permanent hardness in water sample using EDTA as standard solution.
Practical-3	To determine the available chlorine in bleaching powder solution.
Practical-4	To determine the chloride content in the given water sample by Mohr's method.
Practical-5	To determine the pH of the given solution using pH meter and pH-metric titration.
Practical-6	To determine the Equivalent weight of Iron by the chemical displacement method.
Practical-7	To determine the Viscosity of an addition polymer like polyester by Viscometer.
Practical-8	To find chemical oxygen demand of waste water sample by potassium dichromate
Practical-9	To determine the iron content in the given sample using external indicator
Practical-10	To determine the strength of given HCL solution by titrating against N/10 Standard Sodium hydroxide solution

Reference / Text Books:

1. Practical Chemistry B.Tech. Text Book, Dr. UshaNakra and Laxmi Kant Sharma Dr. Vivek Pandey, Dr. T. L. Rajawat, Dr. Sama Jain, Dr. Monika Sharma, Dr. Virendra Singh (Neelkanth Publishers(P) Ltd.)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Analyze the need, design and perform a set of experiments.

CO2. Identify the structure of unknown/new compounds with the help of spectroscopy

CO3. Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.

CO4. Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution

CO5. Equipped with basic knowledge of polymer reinforced composites, applications of semiconductor photochemistry in energy harnessing and optical sensors.

CO6. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG (R) **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:**Learning Computers with Thinking and Programming in C
Course Code:SECS-111/121	**Title: :**Learning Computers with Thinking and Programming in C

Course Objectives:

1. After studying this course students will be able to develop simple algorithms for arithmetic and logical problems.
2. After studying this course students will be able to translate the algorithms to programs & finally execution in C language.
3. After studying this course students will be able to implement conditional branching, iteration and recursion in C language.
4. After studying this course student will be able to decompose a problem into functions and synthesize a complete program using divide and conquer approach using C language.
5. After studying this course students will be able to use arrays, pointers and structures to develop algorithms and programs for implementation in C language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Programming basics.** Conceptual Introduction to components of a computer system i.e. Memory, processor, I/O Devices, storage, operating system. Understanding assembler, compiler, interpreter, loader and linker. Understanding Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics of C language**. Core Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.	**8L**
II	**Arithmetic expressions & Conditional Branching in C language**: Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively. Conditional Branching: Applying if and switch statements, nesting of if and else, use of break and default with switch	**8L**

III	**Loops & Functions in C language:** Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.	**8L**
IV	**Arrays & Basic Algorithms in C language**: Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.	**8L**
V	**Pointer& File Handling in C language**: Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.	**8L**

Reference / Text Books:

Text Books:

1. Let Us C By Yashwant P. Kanetkar.
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.

Reference Books:

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Programming in C by Kochan Stephen G. Pearson Education – 2015.
3. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
4. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 To understand the basic computer concepts and programming principles of C language.
CO2 To develop simple algorithms for arithmetic and logical problems.
CO3 To translate the algorithms to programs & execution (in C language).
CO4 To implement conditional branching, iteration and recursion.
CO5 To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO6 To use arrays, pointers and structures to develop algorithms and programs

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:**Learning Computers with Thinking and Programming in C Lab
Course Code:SECS-111 P/SECS-121P	**Title: :**Learning Computers with Thinking and Programming in C Lab

Course Objectives: The objectives of studying this course are,

1. After studying the above course the student will be able to implement algorithms and draw flowcharts for solving easy and complex Mathematical as well as engineering problems..
2. After studying the above course the student will be able to, understand and demonstrate programming language concepts by implementing programs in C language.
3. After studying the above course the student will be able to, design and develop programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage in computer language C.
4. After studying the above course the student will be able to, able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures in C language which will be latter helpful in understanding the concept of object oriented programming in C++.
5. After studying the above course the student will be able to, develop confidence for self-learning and ability for life-long learning needed for learning any computer language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	**Contents**
Practical-1	Write a program to calculate the area of train gleusing formula Area $=\sqrt{s(s-a)(s-b)(s-c)}$ where s=(a+b+c)/2.
Practical-2	We input the basicsalaryofanemployeethroughthekeyboard. The Dearness allowance (DA) is25% of the basic salary while the house rent allowance (HRA) is 15% of the basic salary. While the provident fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA). Write a program in CtocalculatetheNetSalary.
Practical-3	Writeaprogram in Ctodeterminetherootsofquadraticequation.
Practical-4	Writeaprogram in Ctofindthelargestofthreenumbersusingthenestedifelse construct.
Practical-5	Writeaprogram in Ctoreceivemarksofhistory, geography & civics from user & check its eligibility for course if a) Marksofhistory>40 b) Marksofgeography>50 c) Marksofcivics>60

	d) Totalofhistory&civicsmarks>150 orTotalofthreesubjectsmarks>200
Practical-6	Writeaprogram in Ctofindthevalueofyforaparticularvalueofn. Thea, x, b, n is input by user if n=1 y=ax%b if n=2 y=ax2+b2 if n=3 y=a-bx ifn=4 y=a+x/b
Practical-7	Writeaprogramin C to constructaFibonacciseriesuptonterms.
Practical-8	Writeaprogram in CtofindwhetherthenumberisArmstrongnumber or not.
Practical-9	Write aprogramin C togeneratesumofseries1!+2!+3!+ n!
Practical-10	Writea program in Ctofind the sumoffollowingseries1-X1/1!+X2/2!-……Xn/n!.
Practical-11	Writeaprogram in Ctoprinttheentireprimenobetween1and 500.
Practical-12	Writeaprogramin C toprintoutalltheArmstrongnumberbetween 50and 600.
Practical-13	Writeaprogramin C todrawthefollowing figure: 4 3 2 1 321 2 1 1
Practical-14	Writeaprogram in Ctoreceiveafive-digit no anddisplayas like12345: 1 2 3 4 5
Practical-15	Writea function in Cthatreturnsumofalltheevendigitsofagivenpositiveno entered through keyboard.
Practical-16	Writeaprogram in C toprintareaofa trapezium using function&returnitsvalue to main function.
Practical-17	Writeaprogram in Ctocalculatethefactorialforgivennumberusingfunction.
Practical-18	Writea program in CtofindsumofFibonacciseriesusingfunction.
Practical-19	Writeaprogramin C to findthefactorialofgivennumberusingrecursion.
Practical-20	Writeaprogram in Ctofindthesumofdigitsofa5digit number using recursion.
Practical-21	Writeaprogramin C tocalculatetheGCDofgivennumbersusingrecursion.
Practical-22	Writeaprogram in Ctoconvertdecimalnumberintobinarynumber.
Practical-23	Writeaprogramin C toconvertbinarynumberintodecimalnumber.
Practical-24	Writeaprogramin C todeleteduplicateelementina listof20elements& display it on screen.
Practical-25	Writeaprogram in Ctomergetwosortedarray&no element isrepeatedduringmerging.
Practical-26	Writeaprogram in C to evaluatetheadditionofdiagonalelementsoftwo square matrixes.
Practical-27	Writeaprogram in Ctofindthetransposeofagivenmatrix&checkwhether it is symmetric or not.
Practical-28	Writeaprogram in Cto print themultiplicationoftwoN*N (Square) matrix.
Practical-29	WriteaprograminCtocheckwhetherthegivenstringisapalindromeor not.

Practical-30	Writeprogram in Ctosortthearrayofcharacter (String) inalphabeticalorder like STRING in GNIRTS.
Practical-31	Writeaprogram in Ctoremovealltheblankspacefromthestring&print it, also count the no of characters.
Practical-32	Writeaprogram in Ctostorethefollowingstring“zero”,“one” ---------“five”. Printthenoinwords,giveninfigureas3205.
Practical-33	Write a program in C to compare two given dates. To store a date use a structurethatcontainsthreemembersnamelyday, monthandyear.Ifthe dates are equal then display message equal otherwise unequal.
Practical-34	WriteaCprogramtocopy&countthecharactercontentofonefilesays c.txt to another file d.txt.
Practical-35	Writeaprogram in Ctoprint alltheprimenumber,between2to 200ina file nameprime.txt.
Practical-36	WritethefollowingCprogramusingpointer: a) Tosortthelistofnumbersthroughpointer b) Toreversethestringthroughpointer.
Practical-37	Writeaprogram in Ctofindthe largest no among30 integersarrayusing dynamic memory allocation.
Practical-38	UsingDynamicMemoryAllocation, Writeaprogramin C to findthetranspose of given matrix.
Practical-39	Writeaprogram in Ctofindthefactorialofgivennumberusingcommand line argument.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Implementation of algorithms and drawing flowcharts for solving easy and complex Mathematical as well as Engineering problems.

CO2. Computer programming language concepts understanding and demonstration.

CO3. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

CO4. Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures.

CO5. Development of confidence for self-education and ability for life-long learning needed for Computer language.

CO6. Understand the basics of file handling mechanisms

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UGC Approved Section 2f & 12B

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Concepts of Mechanical Engineering & Mechatronics
Course Code:SEME-111/121	**Title:** Concepts of Mechanical Engineering & Mechatronics

Course Objectives:

1. Acquire knowledge of various types of force system , free body diagram and equilibrium of body under various types of forces
2. Acquire knowledge of basic concepts of strength of materials, and statically determinate and indeterminate structures, simple beams subjected to various types of loading and plot shear force and bending moment diagrams
3. Acquire knowledge of the fundamentals of thermodynamics, temperature scales and various modes of heat transfer so that student will now begin to utilize these concepts in real-world applications
4. Acquire knowledge of various types of engines and its components, mechatronics with their advantages,
5. The learner will have a good understanding of the all-important basic technologies that are useful in daily activities

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	**Contents**	**No. of Lectures Allotted**
I	**Force Systems**: Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Classification of forces & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces **Coplanar Concurrent Force system and Coplanar:** Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem.	**8L**
II	**Introduction to mechanics of solid:** Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety. Basic Numerical problems. Types of beams under various loads, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment. Basic Numerical problems	**8L**
III	**Basic concepts of thermodynamics**: Basic concepts, Concept of continuum, Microscopic and Macroscopic approach, Thermodynamic equilibrium, State and process, Reversible and Quasi-static process, Work,	

	Zeroth law, Concept of temperature and heat. First law of thermodynamics and its importance, **Second law of thermodynamics**: Kelvin Planck and Clausius statements, Heat engine, Refrigerator and Heat pump, Efficiency and COP, Thermodynamic temperature scale. **Heat transfer and its various modes**: Conduction, Convection and Radiation.	**8L**
IV	**Introduction to IC engines**: IC Engine: Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to electric, and hybrid electric vehicles	**8L**
V	**Introduction to mechatronics**: Evolution, Scope, Advantages and disadvantages of Mechatronics, Industrial applications of Mechatronics, Introduction to autotronics, bionics, and avionics and their applications. Sensors and Transducers: Types of sensors, types of transducers and their characteristics. **Overview of mechanical actuation system**: Kinematic Chains, Cam, Train Ratchet Mechanism, Gears and its type, Belt, Bearing. **Hydraulic and pneumatic actuation systems**: Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems	**8L**

Reference / Text Books:

Text Books:

1. Engineering Mechanics: Statics” , J.L Meriam , Wiley.
2. “Engineering Mechanics ” , Thimoshenko& Young , 4ed, Tata McGraw Hill.
3. “Engineering Mechanics : Statics and Dynamics”, Shames and Rao, Pearson.

Reference Books:

1. Engineering Mechanics ” , Dr Sadhu Singh , Umesh Publications.
2. “Engineering Mechanics ” , Bhavikatti , New Age.
3. “Engineering Mechanics”, V. Jayakumar and M. Kumar, PHI.
4. Mechatronics : Principles, Concepts and Applications, NitaigourMahalik, McGraw Hill.
5. Mechatronics, As per AICTE: Integrated Mechanical Electronic Systems, K.P.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the basics of mechanics, construct free body diagrams and appropriate equilibrium equations.

CO2 Understand and draw shear force and bending moment diagram for a beam under different loading conditions

CO3 Understand the basic concepts of thermodynamics and their applications

CO4 Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump

CO5 Understand the concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation, hydraulic and pneumatic

CO6 Understand the analysis of different machine parts and working principal and future prospects of mechatronics fields.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:**Fundamentals of Electronics Engineering
Course Code:SEEC-111/121	**Title:** Fundamentals of Electronics Engineering
Course Objectives: 1. To develop a strong foundation of concept of PN Junction and solid state devices 2. To present the Operational amplifier and its applications 3. To familiarize with digital electronics & the design of various digital circuits using logic gates 4. To introduce the various communication systems	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Overview of Semiconductors**, PN junction Diode, Zener Diodes, Diode Application: Half and Full Wave rectification, Clippers, Clampers Special Purpose two terminal Devices: Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**8L**
II	**BJT**: Transistor Construction, Operation, Amplification action (Common Base, Common Emitter, Common Collector) **Field Effect Transistor:** Construction, Operation and Characteristic of JFET and MOSFET (Depletion and Enhancement) Type	**8L**
III	**OP AMP:** Introduction, Op-amp symbol, terminals, packages, Block diagram Representation of op-amp- Ideal opamp& practical op-amp – Open loop & closed loop configurations, characteristics of op-amp, Op-Amp Circuits: Inverting Amplifier, Non-inverting Amplifier, Voltage Follower, Summing Amplifier, scaling & averaging amplifiers, Integrator, Differentiator.	**8L**
IV	**Digital Electronics:** Number systems, Binary codes – Binary Arithmetic, Logic gates, Boolean algebra, laws and theorems, Simplification of Boolean expressions, Implementation of Boolean expressions using logic gates Standard forms of Boolean expression, K Map Minimization upto 4 Variables.	**8L**
V	**Fundamentals of Communication Engineering**: Block diagram of a basic communication system, Frequency spectrum, Need for modulation, Methods of modulation, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	**8L**

Reference / Text Books:

Text Books:

1. Robert L. Boylestand / Louis Nashelsky “Electronic Devices and Circuit Theory”, Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, “Basic Electrical and Electronics Engineering”, Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, “Electronic Communication Systems”, McGraw Publication

Reference Books:

1. David A. Bell, “Electronic Devices and Circuits”, Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, “Electronic Devices and Circuits”, McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford Uni Press India

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of PN Junction and devices.
CO2 Understand the concept of BJT, FET and MOFET
CO3 Understand the concept of Operational amplifier
CO4 Understand the Principles of digital electronics
CO5 Principles of various communication systems
CO6 Design rectifier & measure the waveform parameters

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Fundamentals of Electronics Engineering Lab
Course Code:SEEC-111P/ SEEC-121P	**Title: :**: Fundamentals of Electronics Engineering Lab
Course Objectives: The objectives of studying this course are, 1. To introduce the concepts of electronic circuits and its components 2. To introduce the concepts of diodes & transistors 3. To impart the knowledge of various configurations, characteristics and applications.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks/ 2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	**Contents**
Practical-1	Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
Practical-2	To verify the PN diode characteristics
Practical-3	To verify the Zener diode characteristics
Practical-4	To verify the BJT characteristics (either of the configurations)
Practical-5	Study of Logic Gate
Practical-6	Design and implementation of Adder and Subtractor using logic gates.
Practical-7	To determine the external characteristics of DC Shunt generator
Practical-8	Implement an Adder and Subtractor Circuit using Operational Amplifier
Practical-9	To study Full Wave Rectifier Circuit
Practical-10	Study of AM modulator and Demodulator

Reference / Text Books:

Text Books:

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication

Reference Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India

If the course is available as Generic Elective then the students of following departments may opt it.

BOS

NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.**Conduct experiments illustrating the application of Fundamentals of semiconductor, electronic components/devices. **CO2**. Demonstrate the behavior of Principles of digital electronics. **CO3.**Apply the operation and discuss the performance of several fundamentally important op-amp circuits that have certain features or characteristics oriented to special applications. **CO4.** Analyze the concept with the working principles of forward and reverse bias characteristics. **CO5.** Demonstrate the basic skills in design and analysis of filter circuits, biasing circuits. **CO6.** Discriminate the principle, construction and operation of BJTs, FETs and MOSFETs.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:**Basic Electrical Engineering
Course Code:SEEE-111/121	**Title:** Basic Electrical Engineering

Course Objectives:
1. The objective of this course is to teach the students Introduction to Electrical Engineering
2. To understand the fundamental concept of Electrical Engineering like DC Network, AC Network,
3. Measuring Instruments, Energy Conversion Devices

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Circuit theory Concepts**-Mesh and nodal analysis; Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem; Star Delta transformation..	**8L**
II	Sinusoidal and phasor representation of voltage and current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel; Apparent, active & reactive powers, Power factor; Series and parallel resonance; Bandwidth and quality factor.	**8L**
III	**Measuring Instruments:** Construction and principles of operation of voltage and current measuring instruments; introduction to power and energy meters. **Three Phase A.C. Circuits:** Star-Delta connections; Line and phase voltage/current relations; Three phase power and its measurement.	**8L**
IV	**Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and voltage regulation of single phase transformer. **D.C. Machines:** Principles of electromechanical energy conversion; Types of D.C. machines; E.M.F. equation; Losses and efficiency; applications of DC machines.	**8L**
V	**Three phase induction Motor:** Principle of operation; Types, slip-torque characteristics; Applications. **Synchronous Machines:** Principle of Operation of Alternator and synchronous motor. **Single phase Motors:** Principle of operation of induction motor.	**8L**

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons.
4. BL Theraja , A Textbook of Electrical Technology - Volume I, S. Chand Publishing

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.
4. Cotton H., Advanced Electrical Technology, Wheeler Publishing.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Apply the concepts of KVL/KCL and network theorems in solving DC circuits.

CO2 Analyze the steady state behavior of single phase and three phase AC electrical circuits.

CO3 Identify the application areas of a single phase two winding transformer and calculate their efficiency.

CO4 Illustrate the working principles of induction motor, synchronous machine and employ them in different area of applications.

CO5 To make students capable of analyzing and solving the varieties of problems and issues coming up in the vast field of electrical measurements.

CO6 Illustrate the working principles of DC machine and employ them in different area of applications.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Basic Electrical Engineering Lab
Course Code:SEEE-111P/SEEE-121P	**Title: :**Basic Electrical Engineering Lab

Course Objectives: The objectives of studying this course are,
1. Understand and gain knowledge about circuit laws and theorems.
2. Gain knowledge about time domain analysis of circuit transients.
3. Understand the concept of resonance in series and parallel circuits.

Nature of Paper: Core/DSE/SEC/GE/AECC

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To verify the Kirchhoff's current and voltage laws
Practical-2	To verify the Superposition theorem
Practical-3	To verify the Thevenin's theorem
Practical-4	To verify the Norton's theorem
Practical-5	To determine the external characteristics of DC Shunt generator
Practical-6	To measure current and speed for speed control of D.C. Shunt Motor
Practical-7	To measure the power in a 3-phase system by two-wattmeter method
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.

CO2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase.

CO3. Calculate efficiency of a single phase transformer and DC machine.

CO4. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

CO5. Understand 3 phase balanced and unbalanced, star and delta connected supply andload and to measure power in 3 phase circuits

CO6. Determination of efficiency of a single-phase transformer by direct load test.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 2 Practical: 0	**Subject:**Professional Communication
Course Code:PCE-111/121	**Title:** Professional Communication

Course Objectives:
1. To enhance one's ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2. Toincreaseone'sknowledgeandawarenessofemotionalcompetencyandemotionalintelligenceatplaceo fstudy/work.
3. To provide opportunity for realizing one's potential through practical experience.

Nature of Paper: AECC

Minimum Passing Marks/Credits: 40% Marks/2

L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Listening** • Techniques of effective listening • Listening and comprehension • Probing questions • Barriers to listening **Speaking** • Pronunciation • Enunciation • Vocabulary • Fluency • Common Errors ***Reading*** • Techniques of effective reading • Gathering ideas and information from a given text i. Identify the main claim of the text ii. Identifythepurposeofthetext iii. Identifythecontextofthetext iv. Identify the concepts mentioned • Evaluating these ideas and information i. Identify the arguments employed in the text ii. Identify the theories employed or assumed in the text • Interpretthetext	**8L**

	i. To understand what a text says ii. To understand what a text does iii. To understand what a text means	
II	***Writing and different modes of writing*** • Clearly state the claims • Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues • Provide background information • Effectively argue the claim • Provide evidence for the claims • Use examples to explain concepts • Follow convention • Be properly sequenced • Use proper signposting techniques	**8L**
III	• Be well structured i. Well-knit logical sequence ii. Narrative sequence iii. Category groupings • Different modes of Writing- i. E-mails ii. Proposal writing for Higher Studies iii. Recording the proceedings of meetings iv. Any other mode of writing relevant for learners ***Effective use of Social Media*** • Introduction to social media websites • Advantages of social media • Ethics and etiquettes of social media • How to use Google search better • Effective ways of using Social Media • Introduction to Digital Marketing ***Non-verbal communication*** • Meaning of non-verbal communication • Introduction to modes of non-verbal communication • Breaking the misbeliefs • Open and Closed Body language • Eye Contact and Facial Expression • Hand Gestures • Do's and Don'ts • Learning from experts • Activities-Based Learning	**8L**
IV	***Resume Skills*** • Resume Skills : Preparation and Presentation i. Introduction of resume and its importance ii. Difference between a CV, Resume and Bio data iii. Essential components of a good resume • Resume skills : common errors i. Common errors people generally make in preparing	**8L**

	their resume ii. Prepare a good resume of her/his considering all essential components ***Interview Skills*** • Interview Skills : Preparation and Presentation i. Meaning and types of interview (F2F, telephonic, video, etc.) ii. Dress Code, Background Research, Do's and Don'ts iii. Situation, Task, Approach and Response (STAR Approach) for facing an iv. interview v. Interview procedure (opening, listening skills, closure, etc.) vi. Important questions generally asked in a job interview (open and closed vii. ended questions) • Interview Skills : Simulation i. Observation of exemplary interviews ii. Comment critically on simulated interviews	
V	• Interview Skills : Common Errors i. Discuss the common errors generally candidates make in interview ii. Demonstrate an ideal interview	**8L**

Reference / Text Books:

1. Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.
2. Brown, Michele & GylesBrandreth. How to Interview and be Interviewed. London: Sheldon Press1994.
3. Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977.
4. Collins, Patrick. Speak with Power and Confidence. New York: Sterling, 2009.
5. Hughes, Shirley. Professional Presentations: A Practical Guide to the Preparation and Performance ofSuccessful Business Presentations. Sydney: McGraw-Hill, 1990.
6. Kratz, Abby Robinson. Effective Listening Skills. Toronto: ON: Irwin Professional Publishing, 1995.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	10 05 35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1 The students will Gain Self Competency and Confidence.

CO2 They will be fluent speaker and proficient writer and enhance their LSRW Skills.

CO3 The students will demonstrate a fuller and deeper understanding of all the facets of Professional communication.

CO4 They will be able to enrich their vocabulary and their correct usage.

CO5 They will develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation.

CO6 The students will Gain Knowledge about the world of work**.**

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Professional Communication Lab
Course Code: PCE-111P/121P	**Title:** Professional Communication Lab

Course Objectives: The objectives of studying this course are,
1. Improve the dynamics of professional presentations.
2. Develop the ability to compeer professional occasions.
3. Enable to read newspaper for their communicative competence.
4. Equip with effective business correspondence.
5. Develop in them communication and social graces necessary for functioning.

Nature of Paper: Core/DSE/SEC/GE/AECC

Minimum Passing Marks/Credits: 50% Marks/ 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical 1	Group Discussion: Practice Based on Accurate and Current Grammatical Patterns
Practical 2	Intonation Pattern Practice: Rising, Falling, and Level Tones.
Practical 3	Communication Skills /Conversational Skills for Interviews/ Seminars/ Workshops with Emphasis on Kinesics/Para linguistics along with Promotion of Phonetic Script Skills.
Practical 4	Presentation Skills for Technical Paper / Project Reports / Professional Report based on Proper Stress and Intonation Mechanics.
Practical 5	Theme Presentation Practices Based on Linguistic Patterns
Practical6	***Digital Literacy*** • Role of Digital literacy in professional life • Trends and opportunities in using digital technology in workplace • Internet Basics • Introduction to MS Office tools i. Paint ii. Office iii. Excel iv. Powerpoint

Reference / Text Books:

Text Books:
1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons.

Reference Books:
1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.

3. A Grabel, Basic Electrical Engineering, McGraw Hill.	
If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** Develop all-round personalities with a mature outlook to function effectively in different circumstances. **CO2**. Develop effective communication and presentation skills **CO3.** Learn corporate etiquette - organizing and managing professional events and will understand how reading enhances their communicative competency **CO4.** Conduct effective correspondence and prepare reports which produce results. **CO5.** Write logical sentences and paragraphs, use appropriate diction, grammar and punctuation. **CO6.** Produce business documents for mailing to external recipients or intra-organizational circulation	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td>Programme: UG
Class:B.TECH(CSE,AIML,ME,CE,EE)</td><td colspan="2">Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 2
Practical: 0</td><td colspan="2">Subject:Environment Studies</td></tr>
<tr><td>Course Code:SEHU-111/122</td><td colspan="2">Title: Environment Studies</td></tr>
<tr><td colspan="3">Course Objectives:
1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
3. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
6. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.</td></tr>
<tr><td colspan="3">Nature of Paper: AECC</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/2</td></tr>
<tr><td colspan="3">L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction to environmental studies
• Multidisciplinary nature of environmental studies;
• Scope and importance; Concept of sustainability and sustainable development.</td><td>4L</td></tr>
<tr><td>II</td><td>Ecosystems
• What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:
a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)</td><td>4L</td></tr>
<tr><td>III</td><td>Natural Resources: Renewable and Non-renewable Resources
• Land resources and land use change; Land degradation, soil erosion and desertification.</td><td></td></tr>
</table>

	• Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & interstate). • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	**4L**
IV	**Biodiversity and Conservation** • Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots • India as a mega--biodiversity nation; Endangered and endemic species of India • Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	**4L**
V	**Environmental Pollution** • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies.	**4L**
VI	**Environmental Policies & Practices** • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.	**4L**
VII	**Human Communities and the Environment** • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. • Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. • Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	**4L**
VIII	**Field work** visit to an area to document environmental assets: river/ forest/	**4L**

	flora/fauna, etc. Visit to a local polluted site---Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems---pond, river, Delhi Ridge, etc.	

Reference / Text Books:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., &Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	10
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	05
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1. Gain in-depth knowledge on natural processes that sustain life, and govern economy.

CO2. Estimate and predict the consequences of human actions on the web of life, global economy and quality of human life.

CO3. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.

CO4. Acquire values and attitudes towards understanding complex environmental economic social challenges, and participate actively in solving current environmental problems and preventing the future ones.

CO5. Adopt sustainability as a practice in life, society and industry.

CO6. Develop real field experience.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Engineering Workshop Lab
Course Code: SEME-112P/ SEME-122P	**Title:** Engineering Workshop Lab
Course Objectives: The objectives of studying this course are, 1. To understand the importance of tools used in workshop. 2. To prepare various joints used in workshop. 3. To identify & apply the most appropriate tools for various applications. 4. To perform the various types of black smithy and sheet metal shop operations. 5. To prepare core and mould in foundry shop.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks/ 2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	**Contents**
Module -1	Carpentry Shop: Practical-1: To prepare half-lap corner joint. Practical-2: To prepare mortise &Tenon joint. Practical-3: To prepare a cylindrical pattern on woodworking lathe
Module -2	Fitting Bench Working Shop: Practical-1: To prepare a V-joint fitting Practical-2: To prepare a U-joint fitting Practical-3: To make a perfect square job
Module -3	Black Smithy Shop: Practical-1: To prepare a square rod from given circular rod Practical-2: To prepare a square S- shape from given circular rod Practical-3: To prepare a nail from given circular rod.
Module -4	Welding Shop: Practical-1: To prepare a butt welded joints using arc welding machine. Practical-2: To prepare a Lap welded joints using arc welding machine. Practical-3: To prepare a Lap welded joint using spot welding machine.
Module -5	Sheet-metal Shop: Practical-1: To make round duct of GI sheet using 'soldering' process. Practical-2: To prepare a tray of GI by fabrication
Module -6	Machine Shop: Practical-1: To prepare a bolt on the lathe machine as per given. Diagram. Practical-2: To prepare a job on the lathe machine as per given diagram.
Module -7	Foundry Shop:

	Practical-1: To prepare core as per given size. Practical-2: To prepare a mould for given casting.
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

Reference Books:

1. Business Communication, II Ed, OUP, by Meenakshi Raman & Prakash Singh, 2012.
2. Speak well----- orient black swan.
3. Everyday dialogues in English----- Robert J.Dixon.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Understand the tools used in workshop & their applications.

CO2. Prepare various joints used in carpentry, fitting and welding shop.

CO3. Identify & apply the most appropriate tools for various manufacturing operations like turning, facing and threading.

CO4. Perform the various types of black smithy and sheet metal shop operations.

CO5. Prepare core and mould in foundry shop.

CO6. Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:**Engineering Graphics & Design Lab
Course Code:SEME-111P/ SEME-121P	**Title: :**Engineering Graphics & Design Lab

Course Objectives: The objectives of studying this course are,
1. To study the standard and rules to be trailed by engineers for making precise drawings.
2. To understand the fundamental dimensioning practices that must be continued in the arrangement of drawings.
3. To draw the various types of projection of lines, planes and solids.
4. To apply the CAD for design.
5. To create the engineering models.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/ 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Module-1	Introduction to Engineering Drawing, Orthographic Projections: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Module -2	Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.
Module -3	Projections and Sections of Regular Solids: Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans they include: windows, doors. Prism, Cylinder, Pyramid, Cone – Auxiliary Views.
Module -4	Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.
Module -5	Computer Graphics: Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids].

Reference / Text Books:
Text Books:

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Charotar Publishing House
2. Engineering Drawing, Narayana, K.L. & P Kannaiah (2008), Scitech Publishers.

3. Engineering Drawing Paperback, P.S. Gill (Author) , S.K. Kataria& Sons.

Reference Books:

1. Engineering Drawing and Computer Graphics, Shah, M.B. &Rana B.C. (2008), Pearson Education.
2. Engineering Graphics, Agrawal B. &Agrawal C.M. (2012), TMH Publication.
3. Engineering Graphics & Design, A.P. Gautametc, Khanna Publishing House.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Understand the basic concepts and principles of engineering graphics and their significance.

CO2. Understand the theory of projections and regular solids.

CO3. Draw the various types of projection of lines, planes and solids.

CO4. Apply the CAD for design.

CO5. Creating the engineering models using solid modeling.

CO6. Gain knowledge about orthographic and isometric projections

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III/IV

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: III/IV**
Credits Theory: 04 Practical: NA	**Subject: Engineering Mathematics-III**
Course Code: SEAS-231/241	**Title : Engineering Mathematics-III**
Course Objectives: 1. To make the students familiar with complex functions and its calculus. 2. To deal with applications, residues and conformal mapping. 3. To understand the concept and applications of integral transforms. 4. To deal with numerical solutions of algebraic equations and differential equations. 5. To understand the statistical aspect of functions.	
Nature of Paper: Applied	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
Unit-I	**Functions of a Complex Variable I**: Analytic functions; C-R equations and harmonic functions; Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.	**8**
Unit-II	**Functions of a Complex Variable II**: Representation of a function by power series; Taylor's and Laurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilinear transformations.	**8**
Unit-III	**Integral Transforms:** Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations.	**8**
Unit-IV	**Numerical Techniques:** Solution of polynomial and transcendental equations Bisection method, Regula – Falsi method, Newton - Raphson method. **Interpolation:** Finite difference, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals; **Numerical Differentiation**, **Numerical Integration**; Trapezoidal, Simpson's 1/3 and 3/8 rules. **Numerical solutions of first order differential equations** by Euler's method and 4th order Runge-Kutta method.	**8**
Unit-V	**Statistical Techniques:** Moments, Moment generating functions,	**8**

	Skewness, Kurtosis, Curve Fitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	

Reference / Text Books:

1. *B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.*
2. *B. V. Ramana, Higher Engineering Mathematics, Mc Graw-Hill Publishing Company Ltd., 2008.*
3. *Dass H.K., Engineering Mathematics Vol-I, S. Chand.*
4. *E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.*
5. *Veerarajan T., Engineering Mathematics for first year, Mc Graw-Hill, New Delhi, 2008.*

If the course is available as Generic Elective then the students of following departments may opt it. NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	**30**
2) Assignments	**20**
3) ESE	**100**
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

1. Understand and check the Analyticity of a complex function.
2. To apply the concept of Analytic functions in residue and conformal mappings.
3. To solve and apply the concepts of transforms in the area of engineering.
4. To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.
5. To understand and use the concept of statistical tools to analyze the different data.
6. To apply the knowledge of mathematics in solving various engineering problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-III

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 2**	**Subject: Material Science**
Course Code: **SESB-232/ SESB-242**	**Title: Material Science**

Course Objectives: The objectives of studying this course are,

1. To analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF ,Co-ordination Number etc.
2. To understand concept of mechanical behavior of materials and calculations of same using appropriate equations.
3. To explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions.
4. To understand and suggest the heat treatment process & types. Significance of properties Vs microstructure, Surface hardening & its types.
5. To explain features, classification, applications of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Importance of materials; Review of atomic concepts in Physics and Chemistry; Atomic models; Periodic table; Chemical bonds. **Crystallography and Imperfections**: Concept of unit cell, space lattice, Bravais lattices, common crystal structures; Atomic packing factor and density; X-ray crystallography techniques; Imperfections, Defects & Dislocations in solids.	8
II	**Mechanical properties and Testing**: Stress-strain diagram; Ductile & brittle materials; Stress vs. Strength; Toughness, Hardness, Fracture, Fatigue and Creep; Testing: Strength testing, Hardness testing, Impact testing, Fatigue testing, Creep testing, Non-destructive testing (NDT). **Micro-structural Examination**: Microscope principle and methods; Preparation of samples and Microstructure examination and grain size determination; Comparative study of microstructure of various metals & alloys such as Mild Steel, GI, Brass.	9
III	**Phase Diagrams** Introduction, plotting of binary diagram, equilibrium cooling of an alloy, solid solutions, eutectic, eutectoid and peritectic systems, Iron-Iron carbide	9

	(Iron Carbon)equilibrium diagram- various phases present, various reactions involved, critical points, explanation of Iron Carbon diagram; phase rule.	
IV	**Magnetic Properties**: Concept of magnetism; Dia-para, ferro- magnetism; Soft and hard magnetic materials; Magnetic storages. **Electric Properties**: Energy band concept of conductor, insulator and semi-conductor; Intrinsic &extrinsic semi-conductors; P-n junction and transistors; Basic devices and their applications; Super-conductivity and its applications;	8
V	**Heat Treatment & Ceramics** TTT diagram, pearlite transformation and bainite transformation, continuous cooling and TTT diagram- transformation of austenite, factors affecting critical cooling rate, heat treatment processes- annealing, normalizing, spheroidizing, hardening and tempering, austempering, martempering, precipitation hardening, case hardening- carburizing, nitriding, cyaniding, flame hardening, induction hardening, Classification of ceramic materials, ceramic and non- ceramic materials, mechanical and magnetic properties of ceramics.	9

Text Books:

1. Material Science, R. K. Rajput, S.K. Kataria & Sons
2. Materials Science And Engineering, I.P. Singh, Subash Chander, & Rajesh Kumar Prasad, 13th edition, John brothers.
3. Material Science Material Science In Engineering, DR. K.M. GUPTA, Umesh

Reference Books:

1. Material Science and Engineering, V. Raghavan, Prentice Hall
2. Materials Science and Engineering An Introduction, W.D. Callister, John Wiley
3. Mechanical Behaviour of Materials, Courtney, McGraw-Hill

If the course is available as Generic Elective then the students of following departments may opt it.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:	After studying the above course the student will be able to,	**Level**
CO-1	Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF ,Co-ordination Number etc.	**K2**
CO-2	Understand concept of mechanical behavior of materials and calculations of same using appropriate equations.	**K2**
CO-3	Explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions.	**K2**
CO-4	Understand and suggest the heat treatment process & types. Significance	**K4**

	of properties Vs microstructure, Surface hardening & its types.	
CO-5	Explain features, classification, applications of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc	**K3**
CO6	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	**K3**

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-III

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical:0**	**Subject: Engineering Thermodynamics**
Course Code: SEME-232	**Title : Engineering Thermodynamics**

Course Objectives: The objectives of studying this course are,

1. To understand about energy interactions and its balance between system and surroundings.
2. To know about the laws of thermodynamics and their applications to various problems of thermodynamics.
3. To understand the application of I law of thermodynamics to various devices which work upon the law of energy conservation.
4. To examine the changes in the properties of a substance undergoing a process.
5. To be able to differentiate between high grade and low-grade energies and to learn the limitations of laws of thermodynamics

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /04

L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Basic Concepts of Thermodynamics**: Definitions, system, control volume, surrounding, boundaries, universe; Types of systems; Macroscopic and microscopic viewpoints; Thermodynamic equilibrium; State, property, process; Cycle - Reversibility - Quasi - static process; Irreversible process; Causes of irreversibility; Types of work and heat. **Zeroth law of thermodynamics:** concept of temperature and its measurement.	10
II	**First Law of Thermodynamics**: Definition of work, displacement work and flow work. Joule experiment, First law of thermodynamics for closed system, Limitations of the first law. PMM-I. First law applied to a Process, applied to a flow system; Steady flow energy equation; Application of first law of thermodynamics, Steady flow energy equation.	10
III	**Second law of thermodynamics:** Kelvin-Plank and Clausius statements and Equivalence of the two statements, PMM-II, Thermal reservoir; Heat engine; Heat pump; Parameters of performance; Reversible and irreversible processes and their corollaries; Carnot's Principle / Theorem; Carnot cycle and its specialties;	10
IV	**Application of second law of thermodynamics and concept of Entropy:** Thermodynamic scale of temperature; Clausius Inequality; Entropy; Principle of entropy increase, entropy change of pure substance in different thermodynamics processes, T-ds equation. Statement of third law of	10

	thermodynamics. Energy equation; Availability and irreversibility; Thermodynamic potentials, Gibbs and Helmholtz Function.	
V	**Introduction to IC Engine:** introduction to IC engine and classification to IC engine, engine component. 2 stroke and 4 stroke engine, introduction to Otto cycle and diesel engine. SI engine and CI engine and difference between SI and CI engine. Performance of parameters of IC engine, Heat balance sheet.	10

Text Books:

1. Singh onkar, Applied Thermodynamics, New Age International (p) Publishers Ltd.
2. Ballaney P.L., Thermal Engineering , Khanna Publisher
3. Kearton W.J., Theory of Stream Turbine,I. Pitman.

Reference Books:

1. Rajput R.K. Thermal Engineering, Laxmi Publication
2. Nag PK. Engineering Thermodynamics, TMH
3. Yadav R. Heat Engines, CPH Allahabad

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After studying the above course the student will be able,	**Level**
CO-1	To understand the various laws of thermodynamics and their limitations	**K2**
CO-2	To understand the energy interactions between the system and its surroundings	**K2**
CO-3	To understand the application of laws of thermodynamics to various devices.	**K2**
CO-4	To differentiate between high grade and low-grade energies.	**K2**
CO-5	To analyze the changes in the properties of a substance undergoing a process.	**K4**
CO-6	Students must have understanding of thermodynamic fundamentals before studying their application in applied thermodynamics.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-III

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 2**	**Subject: Strength of Material**
Course Code: SEME-233	**Title : Strength of Material**

Course Objectives: The objectives of studying this course are,

1. To develop the theoretical concept of stress and strain of solids.
2. To understand the mechanical behavior of the materials.
3. To enable students to find the bending moment and shear force at different cross section with different loading condition
4. To develop the ability in students to solve the numerical problems related to deflection, twisting moment and bending.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks /04

L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Unit-I	**Stresses & Strains:** Rigid bodies and deformable solids, Tension, Compression and Shear Stresses, Deformation of simple and compound bars, Thermal stresses, Elastic constants, Volumetric strains, Stresses on inclined planes, principal stresses and principal planes, Mohr's circle of stress.	**12L**
Unit-II	**Shear Force & Bending Moment, Bending Stress:** Beams, transverse loading on beams, Shear force and bending moment in beams, In Cantilevers, Simply supported beams and over – hanging beams, Theory of simple bending, bending stress distribution, Shear stress in beams and distribution in different cross section,	**10L**
Unit-III	**Torsion:** Pure torsion, Power transmission by shaft, Comparison between solid and hollow shaft, Torsion formulation stresses and deformation in circular solid and hollow shafts, Stepped shafts, Deflection in shafts fixed at the both ends	**08L**
Unit-IV	**Deflection of Beams:** Slope and deflection of simple supported and cantilever beams, Double integration method, Area moment method, Macaulay's method, castigliano's and Maxwell theorem	**10L**
Unit-V	**Columns and Struts:** Classification, Euler's column theory, Slenderness ratio, Rankine Gordon Formula. Theory of failure, Thin cylinders & Spheres	**08L**

Text Books:

1. Rajput R.K, *Strength of Materials*, S Chand & Company Ltd.
2. Bear Jhonson, *Mechanics of Materials,* Tata McGraw-Hill.

Reference Books:

1. Timoshenko, S.P., Gere, M.J., Mechanics of Materials, C.B.S., Publishers, 1980.
2. Ramamurtham, S., Strength of Materials,, Dhanpat Rai Publications, 2005.
3. Popov, E.P., Engineering Mechanics of Solids, Prentice-Hall, 1999.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	**150**
Prerequisites for the course:	

Course Learning Outcomes:	After studying the above course the student will be able to,	**Level**
CO-1	Understand the concepts of various types of stress and strain induced in the specimen/bodies.	**K2**
CO-2	Apply shear force and bending moment diagrams to analyze the resistance offered by the beam and able to solve practical problems.	**K4**
CO-3	Acquire the basic knowledge of pure torsion and power transmission through shaft (Solid & Hollow).	**K2**
CO-4	Design a component as per the requirement of safety standard.	**K2**
CO-5	Analyze slender, long columns subjected to axial loads.	**K3**
CO-6	Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.	**K4**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject: Applied Thermodynamics**
Course Code: SDME-241	**Title : Applied Thermodynamics**

Course Objectives: The objectives of studying this course are,
1. To learn about of I law for reacting systems and heating value of fuels
2. To learn about gas and vapor cycles and their first law and second law efficiencies.
3. To understand about the power plant components and steam turbines analysis
4. To learn about gas dynamics of air flow and steam through nozzles
5. To learn the about jet propulsion

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks/4

L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Unit-I	Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy table, Introduction and Otto, Diesel and Dual cycles	**10L**
Unit-II	**Boilers:** Classifications, working of boilers, boiler mountings, accessories, Draught, and its calculations, air pre-heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance. **Condenser:** Classification of condenser, air leakage, condenser performance parameters.	**10L**
Unit-III	**Vapour Power cycles:** Vapor power cycles Rankine cycle with superheat, reheat and regeneration. Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Binary vapour cycle, Combined cycles, Co-generation.	**10L**
Unit-IV	**Steam and Gas Nozzles:** Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, choked flow, throat area, Nozzle efficiency, Effect of friction on nozzle, Super saturated flow. **Steam Turbines:** Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, Losses in steam turbines, Governing of turbines.	**10L**
Unit-V	**Gas Turbine:** Gas turbine classification, Brayton cycle, Principles of gas	**10L**

	turbine, Gas turbine cycles with inter-cooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles. **Jet Propulsion:** Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.	

Text Books:

1. Basic and Applied Thermodynamics by P.K. Nag, mcgraw hill india.
2. Applied thermodynamics by Onkar Singh, New Age International.
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
4. Applied Thermodynamics by Venkanna And Swati, PHI

Reference Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Theory of Stream Turbine by WJ Kearton.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After completing this course	**Level**
CO-1	The students will get a good understanding of various power cycles of gas and vapor cycles.	**K2**
CO-2	To understand different power producing machinaries.	**K2**
CO-3	To understand about the power plant components and steam turbines analysis.	**K2**
CO-4	They will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors.	**K4**
CO-5	They will be able to understand phenomena occurring in high-speed compressible flows.	**K2**
CO-6	Compare and contrast experimental results with theoretical trends, and to attribute observed discrepancies to either measurement error or modeling limitations.	**K4**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 2**	**Subject: Fluid Mechanics**
Course Code: SEME-241	**Title : Fluid Mechanics**

Course Objectives: The objectives of studying this course are,

1. To make the students aware about the fundamental principles of fluid mechanics.
2. To enable the students to understand the problems of fluid mechanics and resolve those problems using the various laws of conservation.
3. To make the students such that they can analyze the energy losses and able to determine pressure drop in pipe flow problems
4. To develop the skill set so as to understand the functionality of various devices which work upon the principles of fluid mechanics
5. To enable the students to analyze the performance of various devices which work upon the principles of fluid mechanics

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Unit-I	**Introduction**: Fluid and continuum; Physical properties of fluids: Viscosity, Compressibility, Surface Tension, Capillarity, Vapour pressure; Cavitation; Classification of fluids including rheological classification. **Fluid Statics**: Pascal's Law; Pressure-density-height relationship; Pressure on plane surfaces; The Hydrostatic law; Total Pressure and centre of pressure; Buoyancy; Measurement of pressure by manometers ; Stability of immersed and floating bodies.	**10L**
Unit-II	**Laminar Flow**: Types of fluid flows, Steady and unsteady, Uniform and non-uniform, Laminar and Turbulent flows, 1-D,2-D,and 3-D flows, Steam lines, Path lines and Steak lines, Steam tube; Equation of motion for laminar flow through pipes, Stokes law, Turbulent Flow, Equation for turbulent flow, Eddy viscosity, Mixing concept and velocity distribution in turbulent flow, Acceleration of a fluid particle along a straight and curved path, Differential and Integral form of continuity equation, Rotation, Vortices and circulation, Elementary explanation of Stream function and velocity potential, Flow net characteristics.	**10L**
Unit-III	**Fluid Dynamics-I**: Introduction to Naiver-Stokes equations; Euler's equation of motion along a streamline and its integration; Bernoulli's	**10L**

	equation and its applications; Pitot tube; Flow through: Orifices, Mouthpieces, Nozzles, Notches, Wires; Free and forced vortex motion.	
Unit-IV	**Fluid Dynamics-II**: Pipe bend problems related to combined application of energy and momentum equations; Determination of coefficients of discharge; Velocity and contraction and energy loss; Equation for velocity distribution over smooth and rough surfaces; Concept of equivalent length; Branched pipes; Pipes in series and parallel; Flow in sudden expansion, contraction; Water hammer.	**10L**
Unit-V	**Boundary Layer Analysis**: Boundary layer thickness; Boundary layer over a flat plate; Laminar layer; Application of Von-Karman integral momentum equation; Turbulent boundary layer; Laminar sub-layer; Hydro-dynamically smooth and rough boundaries; Local and average friction coefficient; Total drag; Boundary layer separation and its control.	**10L**

Text Books:
1. Fox I R J., Introduction to Fluid Mechanics, Wiley and sons.
2. Hunter Rouse John, Elementary Mechanics of Fluids, Wiley and sons.
3. Bansal R K, Fluid Mechanics and Hydraulic Machines, Laxmi Publications

Reference Books:
1. Munson Bruce R, Donald F Young and Okishi T H Fundamentals of Fluid Mechanics Wiley Eastern
2. Grade.R J and Mirajgaonkar A G, Engineering Fluid Mechanics (Including Hydrualic Machines) Nemchand and Bros, Roorkee, 1983
3. Som and Biswas, Introduction to Fluid Mechanics and Machines TMH

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After studying the above course the student will be able,	**Level**
CO-1	To acquire the basic knowledge of principles of fluid mechanics.	**K2**
CO-2	To understand the functionality of various devices which work upon the principles of fluid mechanics	**K2**
CO-3	To learn the energy losses and pressure drop in pipe flow problems	**K2**
CO-4	To solve the problems of fluid mechanics using the various laws of conservation.	**K3**
CO-5	To analyze the performance of various devices which work upon the principles of fluid mechanics	**K4**
CO6	To use of different fluid flow measuring devices.	**K3**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

<table>
<tr><td colspan="2">Programme: UG
Class: B-Tech (ME)</td><td colspan="2">Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td colspan="2">Subject: Manufacturing Processes</td></tr>
<tr><td colspan="2">Course Code: SEME-242</td><td colspan="2">Title : Manufacturing Processes</td></tr>
<tr><td colspan="4">Course Objectives: The objectives of studying this course are,</td></tr>
<tr><td colspan="4">1. To motivate and challenge students to understand and develop an appreciation of the processes in correlation with material properties which change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods.
2. To make learners understand metal cutting Trends, Applications, Opportunities &Additive manufacturing used for this breakthrough technology.
3. Learn about metal joining and understanding the importance of metal joining technique in manufacturing industry.
4. The program covers Unconventional Machining Processes, principles, operations and process parameters.
5. By the end of the course, the learner will have a good understanding of the all-important manufacturing processes.</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="4">L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>Unit-I</td><td colspan="2">Conventional Manufacturing processes: Introduction of Manufacturing processes, Evolution in Manufacturing Processes, Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses.</td><td>10L</td></tr>
<tr><td>Unit-II</td><td colspan="2">Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, cutting tool materials, cutting fluids, Coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining.</td><td>10L</td></tr>
<tr><td>Unit-III</td><td colspan="2">Grinding & Super finishing: Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attrition wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding. Centre-less grinding. Super finishing: Honing, lapping and polishing.</td><td>10L</td></tr>
</table>

Unit-IV	**Metal Joining (Welding):** Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electro-slag, friction welding. Soldering & Brazing. Adhesive bonding. Weld decay in HAZ.	**10L**
Unit-V	**Unconventional Machining Processes:** Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters. Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant &maskant, process parameters, MRR and surface finish. Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining.	**10L**

Text Books:

1. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems.
2. Materials and Manufacturing by Paul Degarmo. 5. Manufacturing Processes by Kaushish, PHI.
3. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA 7. Production Technology by RK Jain.

Reference Books:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014.
2. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA.
3. Degarmo, Black &Kohser, Materials and Processes in Manufacturing.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
5) Seminar On Research Project Report	
6) ESE	100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After studying the above course, the student will be able to,	**Level**
CO-1	Students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products.	**K2**
CO-2	Understanding the fundamentals of casting and rolling, traditional processes and process used in aerospace Industries.	**K2**
CO-3	Understanding fundamentals of welding and riveting, traditional processes and process used in aerospace Industries.	**K2**
CO-4	Understanding unconventional machining process, rapid prototyping and	**K2**

	surface modification process.	
CO-5	Illustrate basic principles of working of machine tools viz. Lathe, Milling, Grinding, Drilling machines etc.	**K2**
CO-6	Make use of process capability information to select and/or synthesize manufacturing processes and systems.	**K4**

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III/IV

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: III/IV**
Credits **Theory: 04** **Practical:0**	**Subject: Engineering Mathematics-III**
Course Code: SEAS-231/241	**Title : Engineering Mathematics-III**
Course Objectives: 1. To make the students familiar with complex functions and its calculus. 2. To deal with applications, residues and conformal mapping. 3. To understand the concept and applications of integral transforms 4. To deal with numerical solutions of algebraic equations and differential equations 5. To understand the statistical aspect of functions	
Nature of Paper: Applied	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
Unit-I	**Functions of a Complex Variable I**: Analytic functions; C-R equations and harmonic functions; Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.	**8**
Unit-II	**Functions of a Complex Variable II**: Representation of a function by power series; Taylor's and Laurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilinear transformations.	**8**
Unit-III	**Integral Transforms:** Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations.	**8**
Unit-IV	**Numerical Techniques:** Solution of polynomial and transcendental equationsBisection method, Regula – Falsi method, Newton - Raphson method. **Interpolation:** Finite difference, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals; **Numerical Differentiation**, **Numerical Integration**; Trapezoidal, Simpson's 1/3 and 3/8 rules. **Numerical solutions of first order differential equations** by Euler's method and 4th order Runge-Kutta method.	**8**
Unit-V	**Statistical Techniques:** Moments, Moment generating functions,	**8**

	Skewness, Kurtosis, Curve Fitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	

Reference / Text Books:

1. *B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.*
2. *B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.*
3. *Dass H.K., Engineering Mathematics Vol-I, S. Chand.*
4. *E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.*
5. *Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.*

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	**30**
2) Assignments	**20**
3) ESE	**100**
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes:

1. Understand and check the Analyticity of a complex function.
2. To apply the concept of Analytic functions in residue and conformal mappings.
2. To solve and apply the concepts of transforms in the area of engineering.
3. To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.
4. To understand and use the concept of statistical tools to analyze the different data.
5. To apply the knowledge of mathematics in solving various engineering problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-V

Programme: UG **Class: B-Tech (ME)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 2**	**Subject: Fluid Machinery**
Course Code: SEME-351	**Title : Fluid Machinery**

Course Objectives: The objectives of studying this course are,
1. To learn about the application of mass and momentum conservation laws for fluid flows
2. To understand the importance of hydraulic machineries
3. To obtain the velocity and pressure variations in various types of simple flows
4. To analyze the flow in water pumps and turbines

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 1 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Impulse of Jet and Impulse Turbines: Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler's fundamental equation. Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat &curve), Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel	10
II	**Reaction Turbines:** Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.	10
III	**Centrifugal Pumps:** Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics. Positive Displacement and other Pumps: Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.	10
IV	Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram, hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.	10

Text Books:

1. Introduction to fluid mechanics and Fluid machines by S.K Som, Gautam Biswas, S Chakraborty
2. Fluid mechanics and machines by R.K Bansal
3. F. M. White, Fluid Mechanics, 6th Ed., Tata McGraw-Hill, 2008

Reference Books:

1. Fluid Mechanics and Its Applications by V.K. Gupta et.al
2. Fluid Mechanics by Yunus Cengel.

If the course is available as Generic Elective then the students of following departments may opt it.
1. NA

Evaluation/Assessment Methodology	
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Outcomes:	After completing this course, student will be able to	**Level**
CO-1	Understand the basics concepts of mass and momentum conservation laws for fluid flows	**K2**
CO-2	Explain the construction and working of various components of fluid machinery systems	**K2**
CO-3	Understand the different types of fluid machinery systems with their respective applications	**K2**
CO-4	Analyze the velocity and pressure variations in various types of simple flows.	**K4**
CO-5	Account for the consequence of heat transfer in thermal analyses of engineering systems	**K2**
CO-6	Explain the interaction of fluid with machines.	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-V

Programme: UG **Class: B-Tech (ME)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical:2**	**Subject: Heat & mass transfer**
Course Code: SEME-352	**Title : Heat & mass transfer**

Course Objectives: The objectives of studying this course are,

1. To understand the fundamental laws of heat transfer and apply the concepts of steady state one dimensional heat conduction.
2. To understand and apply the concept of thermal behavior of fins and transient heat conduction.
3. To understand and apply the the concepts of thermal analysis of heat exchangers.
4. To understand and apply the the concepts of thermal radiation in various engineering problems.
5. To understand and apply the the concepts forced and free convection in practical problems.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Heat Transfer:** Thermodynamics and Heat Transfer, Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials. **Conduction:** General differential heat conduction equation in the rectangular coordinates using boundary conditions. **Steady State one-dimensional Heat conduction :** Simple and Composite Systems in rectangular coordinates with and without energy generation, Concept of thermal resistance and Critical radius of insulation.	10
II	**Fins:** Heat transfer from extended surfaces, Fins of uniform cross-sectional area. **Transient Conduction:** Transient heat conduction, Lumped capacitance method, Time constant, Unsteady state heat conduction in one dimension only.	10
III	Types of heat exchangers, Fouling factors, Overall heat transfer coefficient, Logarithmic Mean Temperature Difference (LMTD) method, Effectiveness-NTU method.	10

IV	**Thermal Radiation:** Basic radiation concepts; Radiation properties of surfaces; Black body radiation, Wein's Kirchhoff's law, displacement law, Stefan Boltzmann law, Gray body, Shape factor, Radiation exchange between diffuse non-black bodies in an enclosure, Radiation shields.	10
V	**Forced Convection:** Basic concepts; Hydrodynamic boundary layer, Thermal boundary layer, Analogy between momentum and heat transfer in turbulent flow over a flat surface, Flow over a flat plate, Flow across a single cylinder and a sphere. **Natural Convection:** Physical mechanism of natural convection, Buoyant force, Empirical heat transfer relation for natural convection over planes and cylinders.	10

Text Books:

1. Heat and Mass Transfer by Cengel, McGraw-Hill.
2. A text book on Heat Transfer, by Sukhatme, University Press.
3. Heat and Mass Transfer by R Yadav, Central Publishing House.

Reference Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& De Witt, John Wiley and Sons.
2. Heat Transfer by J.P. Holman, Mc Graw-Hill.
3. Heat Transfer by Ghoshdastidar, Oxford University Press.

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes:

Course Outcomes:	After studying the above course the student will be able,	**Level**
CO-1	Understand the fundamental laws of heat transfer and apply the concepts of steady state one dimensional heat conduction.	**K2 &K3**
CO-2	Understand and apply the concept of thermal behaviour of fins and transient heat conduction.	**K2 &K3**
CO-3	Understand and apply the concepts of thermal analysis of heat exchangers.	**K2 &K3**
CO-4	Understand and apply the concepts of thermal radiation in various engineering problems.	**K2 &K3**
CO-5	Understand and apply the concepts forced and free convection in practical problems.	**K2 &K3**
CO-6	Understand and apply the basic concepts of heat transfer	**K2 &K3**

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-V

Programme: UG **Class: B-Tech (ME)**	**Year: III** **Semester: V**
Credits **Theory: 3** **Practical: 2**	**Subject: Production Technology**
Course Code: SEME-353	**Title : Production Technology**
Course Objectives:	The objectives of studying this course are,

1.	To understand the concepts of tool geometry, tool nomenclature and various types of cutting force.
2.	To analyze the cutting parameters effects on tool life and tool wear.
3.	To acquire the basic knowledge of cutting fluids and machining economics and optimization.
4.	To Identify the gear manufacturing and gear finishing process.
5.	To understand the specifications of the grinding wheel and explain the super finishing process.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Metal Cutting** Basic tool geometry, single point tool nomenclature, Chips- various type and their characteristics, mechanism of chip formation, Theoretical and experimental determination of shear angle. Orthogonal and oblique metal cutting. Metal cutting theories, relationship of velocities, forces and power consumption.	10
II	**Tool Life and Wear** Effect of operating parameters like tool geometry, cutting speed, feed depth of cut, coolant, materials etc. on force, temp, tool life, surface finish etc. Tool life relationship, Taylor's equation of tool life. Tool materials, flank wear, crater wear, mechanism of tool wear.	10
III	**Thermal aspects of machining:** Cutting temperature and factors affecting it, measurement, cutting fluids and its types, selection of cutting fluids. **Economics of metal machining** Elements of machining cost, tooling economics, machining economics and optimization	10
IV	**Gear Manufacturing** Classification of gear production methods, gear generation – gear hobbing, gear shaping, gear finishing methods – shaving, burnishing, grinding, lapping, honing. **Hole Making Operations** Introduction, Drilling, reaming, boring, tapping, other hole making operations	10

V	**Grinding & Super finishing** Grinding wheels, Abrasive & bonds, Cutting action, Grinding wheel specification, Grinding wheel wear-attritions wear, fracture wear, Dressing & Turning, Max. Chip thickness & Guest criteria, Surface & Cylindrical grinding, Centre less grinding, Honing, Lapping and Polishing.	10

Text Books:

1. Production Technology (Manufacturing Processes): Manufacturing Processes, P C Sharma, S. Chand. Publishing, 2007.
2. Production Technology, R.K. Jain, Khanna Publication.
3. Manufacturing Science, Ghosh and Mallik, E.W. Press.

Reference Books:

1. Principles of Metal cutting, Sen and Bhattacharya, New central book.
2. Metal Cutting Principles, Shaw, MIT Press, Cambridge.
3. Manufacturing Technology, P.N. Rao (Vol. 2), Tata McGraw-Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After studying the above course the student will be able to,	**Level**
CO-1	Understand the concepts of tool geometry, tool nomenclature and various types of cutting force.	**K2**
CO-2	Analyze the cutting parameters effects on tool life and tool wear.	**K4**
CO-3	Acquire the basic knowledge of cutting fluids and machining economics and optimization.	**K2**
CO-4	Identify the gear manufacturing and gear finishing process.	**K2**
CO-5	Understand the specifications of the grinding wheel and explain the super finishing process.	**K2**
CO-6	understand the importance of process variables controlling these processes	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-V

<table>
<tr><td colspan="2">Programme: UG
Class: B-Tech (ME)</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical:0</td><td colspan="2">Subject: I.C. Engine & Compressors</td></tr>
<tr><td colspan="2">Course Code: SDME-351</td><td colspan="2">Title : I.C. Engine & Compressors</td></tr>
<tr><td colspan="2">Course Objectives:</td><td colspan="2">The objectives of studying this course are,</td></tr>
<tr><td>1.</td><td colspan="3">To understand fundamentals of IC engine and working principles</td></tr>
<tr><td>2.</td><td colspan="3">To make the students understand about the combustion phenomenon of SI and CI engines, engine pollutants</td></tr>
<tr><td>3.</td><td colspan="3">To teach the students on production and utilization of alternative solid, liquid and gaseous fuels</td></tr>
<tr><td>4.</td><td colspan="3">To teach modern trends in IC engines</td></tr>
<tr><td>5.</td><td colspan="3">To understand the different types of compressors and its working</td></tr>
<tr><td colspan="4">Nature of Paper: DSE</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks /04</td></tr>
<tr><td colspan="4">L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram, Valve mechanism- Push rod type, Overhead type (SOHC, DOHC). Thermodynamic analysis of Air standard cycles: Otto cycle, Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles Fuel air cycle, factors affecting the fuel air cycle, Actual cycle. Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines</td><td>10</td></tr>
<tr><td>II</td><td colspan="2">Combustion: Stages of Combustion in SI & CI engine, Factors affecting combustion, Flame speed, Ignition Delay, Abnormal combustion and its control. Combustion chamber: Squish, Swirl & tumble, Combustion chamber design for SI & CI engine & factors affecting it. Knocking and Detonations in I C engines</td><td>10</td></tr>
<tr><td>III</td><td colspan="2">Carburetion: Mixture requirements, Carburetors and fuel injection system in SI Engine, MPFI, Scavenging in 2 Stroke engines. Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings. Turbocharging & its types- Variable Geometry Turbocharger, Waste Gate Turbocharger, Effect of turbocharging on power & emission.
Fuels: Fuels for SI and CI engine, Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.</td><td>10</td></tr>
</table>

IV	Ignition System in SI Engine: Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, electronic ignition. Recent trends in IC engine: Lean burn engine, Stratified charge spark ignition engine, Homogeneous charge spark ignition engine, GDI. Engine Emission : Pollutant - Sources and types–Effect on environment and human health-formation of NOx-Hydrocarbon Emission Mechanism-Carbon Monoxide Formation-Particulate emissions - Methods of controlling Emissions	10
V	**Compressors:** classification, reciprocating compressors, single and multi-stage compressors, intercooling, volumetric efficiency. Rotary compressor, its classification, centrifugal compressor, Axial compressors, surging and stalling, Roots blower and Vaned blower	10

Text Books:

1. A Course in International Combustion Engines, by Mathur& Sharma, Dhanpat Rai & Sons
2. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers

Reference Books:

1. I.C Engine Analysis & Practice by E.F Obert.
2. Internal Combustion Engine Fundamentals, by John B. Heywood, Tata Mcgraw Hill Publishers
3. Engine Emission, by B. B. Pundir, Narosa Publication.
4. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek, Pearson Education
5. Fundamentals of Internal Combustion Engine by Gill, Smith, Ziurs, Oxford & IBH Publishing CO.
6. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India.

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes:

Course Outcomes:	After completing this course	**Level**
CO-1	Understand the basic component and working cycle of the I.C. engine.	**K2**
CO-2	Understand the parameters that effect engine performance, combustion and knock.	**K2**
CO-3	Understand the types of fuels and injection system for SI and CI engine	**K2**
CO-4	Understand the effect of engine emissions on environment and human health and methods of reducing it.	**K4**
CO-5	Understand the working principle and types of compressors.	**K4**
CO-6	Understand the working and performance parameters of an I.C. engine.	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-VI

Programme: UG **Class: B-Tech (ME)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 2**	**Subject: Theory of Machines**
Course Code: SEME-361	**Title : Theory of Machines**

Course Objectives:
The objectives of studying this course are,
1. To understand the principles of kinematics and dynamics of machines.
2. To calculate the velocity and acceleration for 4-bar and slider crank mechanism
3. To develop cam profile for followers executing various types of motions
4. To apply the concept of gear, gear train and flywheel for power transmission
5. To apply dynamic force analysis for slider crank mechanism and balance rotating & reciprocating masses in machines

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/04

L: 4
T: 1
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain. **Velocity analysis:** Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, instantaneous center. **Acceleration analysis:** Introduction, acceleration of a point on a link, acceleration diagram, Corioli's component of acceleration, crank and slotted lever mechanism,.	10
II	**Cams:** Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration **Gears and gear trains:** Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.	10
III	**Force analysis:** Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of	10

	speed, Flywheel	
IV	**Balancing:** Introduction, static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of reciprocating masses, balancing of single cylinder engine. **Governors:** Introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor	10
V	**Brakes and dynamometers:** Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer **Gyroscope:** Space motion of rigid bodies, angular momentum, gyroscopic couples, gyroscopic stabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.	10

Text Books:

1. Theory of Machines: S.S. Rattan, McGraw Hill
2. Theory of Mechanisms and Machines: Amitabh Ghosh and Ashok Kumar Mallik, Third Edition Affiliated East-West Press.
3. Kinematics and dynamics of machinery: R L Norton, McGraw Hill.

Reference Books:

1. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press
2. Theory of Machines: Thomas Bevan, CBS Publishers.
3. Kinematics and dynamics of machinery: Wilson and Sadler, Third edition

If the course is available as Generic Elective then the students of following departments may opt it.
1. NA

Evaluation/Assessment Methodology	
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After studying the above course the student will be able,	Level
CO-1	Understand the principles of kinematics and dynamics of machines.	**K2**
CO-2	Calculate the velocity and acceleration for 4-bar and slider crank mechanism	**K3**
CO-3	Develop cam profile for followers executing various types of motions	**K3**
CO-4	Apply the concept of gear, gear train and flywheel for power transmission	**K3**
CO-5	Apply dynamic force analysis for slider crank mechanism and balance rotating &reciprocating masses in machines	**K3**
CO-6	Apply the concepts of gyroscope, governors in fluctuation of load and brake & dynamometer in power transmission	**K3**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-VI

Programme: UG **Class: B-Tech (ME)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 2**	**Subject: Refrigeration & Air conditioning**
Course Code: SEME-362	**Title : Refrigeration & Air conditioning**
Course Objectives:	The objectives of studying this course are,

1.	Learning the fundamental principles and different methods of refrigeration and air conditioning.
2.	Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables.
3.	Comparative study of different refrigerants with respect to properties, applications and environmental issues.
4.	Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
5.	Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems

Nature of Paper: Core
Minimum Passing Marks/Credits: 40% Marks/4
L: 4 T: 1 P: 0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Refrigeration:** Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of Refrigeration, Refrigeration effect & C.O.P. **Air Refrigeration cycle:** Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system.	10
II	**Vapour Compression System:** Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Intercooling, Cascade system.	10
III	**Vapour Absorption system;** Working Principal of vapour absorption refrigeration system, Comparison between absorption & Compression systems, Ammonia – Water vapour absorption system. **Refrigerants:** Classification of refrigerants, Desirable properties of refrigerants, Common	10

	refrigerants, Secondary refrigerants, Ozone layer depletion and global warming considerations of refrigerants. Classification of refrigerants, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants, Ozone layer depletion and global warming considerations of refrigerants.	
IV	**Air Conditioning:** Introduction to air conditioning, Psychometric properties and their definitions, Different Psychometric processes, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP).	10
V	**Refrigeration Equipment & Application:** Elementary knowledge of refrigeration & air conditioning equipments e.g. compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers .	10

Text Books:

1. Refrigeration and Air conditioning by C.P Arora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd. Pub.
3. Refrigeration and Air conditioning by R.C. Arora, PHI
4. Refrigeration and Air conditioning by Stoecker & Jones. McGraw-Hill
5. Refrigeration and Air conditioning by Arora & Domkundwar. Dhanpat Rai

Reference Books:

1. Principles of Refrigeration by Roy J. Dossat. Pearson Education
2. Thermal Environment Engineering. By Kuhen, Ramsey &Thelked

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Outcomes:	After completing this course	**Level**
CO-1	Understand the basics concepts of Refrigeration & Air-Conditioning and its working principles	**K2**
CO-2	Explain the construction and working of various components in Refrigeration & Air-Conditioning systems	**K2**
CO-3	Understand the different types of RAC systems with their respective applications	**K2**
CO-4	Apply the basic laws to the thermodynamic analysis of different processes involved in Refrigeration and Air-Conditioning	**K3**
CO-5	Apply the basic concepts to calculate the COP and other performance parameters for different RAC systems	**K3**
CO-6	Use P-h, T-S to solve refrigeration and Air conditioning design problems.	**K3**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-VI

Programme: UG **Class: B-Tech (ME)**		**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**		**Subject: Machine Design**
Course Code: SDME-363		**Title : Machine Design**
Course Objectives:		The objectives of studying this course are,
1.	Describe the fundamental terms, properties, and design concepts.	
2.	Prepare small elements' designs and drawings for small-scale industrial units.	
3.	Design the riveted joints for the boiler shell.	
4.	Analyze the static and dynamic loads on moving elements.	
5.	Explain the stress developed in IC engine parts and decide the dimensions accordingly	
Nature of Paper: DSE		
Minimum Passing Marks/Credits: 40% Marks/4		
L: 4 T: 1 P: 0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)		

Unit	Contents	No. of Lectures Allotted
I	**Engineering Materials and Concepts of Design:** Introduction, Type of design, Necessity of design, Mechanical properties of materials, Steps in machine design, Characteristics of good designer, Factor of safety, Factors affecting factor of safety, Aesthetic consideration in design, Ergonomic consideration in design, Selection of materials, Design for Static Loads- Modes of failure, Factor of safety, Theory of failure. Design for Fluctuating Loads- Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Soderberg, Goodman & Gerber criteria.	10
II	**Design of Shaft, Key & Coupling** Shaft, Type of Shaft, Shaft Materials, Standard Size, Determination of shaft diameter (Hollow and Solid) using strength (shaft subjected to twisting moment and shaft subjected to bending moment) criterion, Types of keys, Selection of square & flat keys, Types of shaft couplings, Design of sleeve or muff coupling, flange coupling.	10
III	**Design of Riveted & Welded Joints** Rivet materials, Rivet heads, Types of riveted joints, Possible failure of riveted joints, Strength Equations and efficiency of riveted joint, Caulking & fullering, Design of lap and butt joints. Riveted joints for boiler shell according to I.B.R., Welding, Common type of welded joints, Strength of butt weld, Strength of parallel fillet weld, Strength of transverse fillet weld.	10

IV	**Design of Spring & Hydrodynamic Bearings** Introduction, Types of spring, Material of helical springs, Terms used in compression spring, Styles of end, application of spring, Close-coiled helical spring, Maximum shear stress induced for given axial load, Expression for axial deflection, Calculation for number of coils, Mean coil diameter, Spring wire diameter, Spring index, Solid length, Free length, Pitch of the coil, Design of leaf springs, Design of various hydro-dynamically lubricated bearings.	10
V	**Design of Gears (Spur & Helical) & IC Engine Parts (Cylinder & Piston):** Introduction, Advantages & disadvantages of gear drive, Terms used in gears, Selection of material, Design analyzing, Lewis equation, Dynamic tooth load, Static tooth load, Wear tooth load, Design procedure for Spur gear and Helical gear, Cylinder and cylinder liner, Bore and length of cylinder, Thickness of cylinder wall, Cylinder head, Piston, Thickness of piston head, Piston ribs & Cup, Piston rings, Piston Barrel, Piston skirt.	10

Text Books:

1. Machine Design, R.S. Khurami and J.K. Gupta, S. Chand.
2. Machine Design (SI Units), Dr. P.C. Sharma and Dr. D. K. Aggarwal, S. K Kataria & Sons.
3. Machine Design, Dr. Rajendra Karwa, Laxmi Publications, 2002

Reference Books:

1. Design of Machine Elements - Bhandari, Tata McGraw-Hill.
2. Machine Design- Maleev and Hartmann, CBS Public.
3. Machine Design – An Integrated Approach - Robert L. Norton, Prentice-Hall Inc.

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After studying the above course the student will be able to,	**Level**
CO-1	Acquire the basic knowledge of material properties & concepts of machine design.	**K2**
CO-2	Understand the design process of shaft, key coupling for various kinds of loadings and their applications.	**K2**
CO-3	Understand the material and design process of springs and bearing their utility.	**K2**
CO-4	Design and examine the gear strength on the basis of various static and dynamic conditions.	**K4**
CO-5	Understand the design process of a cylinder and piston and their application for an IC engine.	**K2**
CO-6	Explain the parts of IC engine and design of gears and springs	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B-Tech (ME)**	**Year: III** **Semester: VI**
Credits **Theory: 3** **Practical: 0**	**Subject: Universal Human Values and Professional Ethics**
Course Code: UVE-601	**Title : Universal Human Values and Professional Ethics**

Course Objectives: The objectives of studying this course are,

1. To reinstate the rich cultural legacy and human values of which we are the custodians.
2. To focus on professional ethics which are broader indicators of desirable actions vis-à-vis undesirable actions?
3. To lay down broader guidelines of values and ethics for internal and external stakeholders.
4. To suggest operational guidelines for value-based and ethical practices in the higher educational institutions leading to implementation and monitoring.
5. To indicate the outcomes of creating a value-based and ethical culture in HEIs.
6. To suggest indicative reinforcement programme for nurturing human values and ethics in HEIs.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /3

L: 3
T: 0
P: 0 (In Hours/Week)
Theory - 0
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	**Introduction - Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation-as the mechanism for self-exploration, Continuous Happiness and Prosperity-A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	09
II	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.	09

III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva*as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!.	09
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	09
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human for Conduct, Basis Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	0
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	35
Total:	**50**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to: 1. The learning process for holistic development 2. Impeccable governance 3. Effective institutional management 4. Well laid system of rewards and chastisement 5. Institutional climate where 'rights' enjoy and 'wrongs' are discouraged. 6. Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester: VII

Programme: UG **Class: B-Tech (ME)**	**Year: IV** **Semester: VII**
Credits **Theory: 3** **Practical: 0**	**Subject: CAD/ CAM**
Course Code: SEME-471	**Title : CAD/ CAM**

Course Objectives: The objectives of studying this course are,
1. To understand the importance of CAD/CAM for industrial purpose.
2. To acquire the basic knowledge to perform transformation of 2D and 3D objects
3. To Identify and generate the Bezier's and B-Spline curve.
4. To understand the G codes and M codes for programming on lathe and milling machine.
5. To understand the concepts of group technology and flexible manufacturing system.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 0
P: 0 (In Hours/Week)
Theory - 0
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	**Introduction** Introduction to CAD/CAM, Historical developments, Industrial look at CAD/CAM, CAD Engineering applications, their importance & necessity; Introduction to CIM, Basics of geometric and solid modeling, explicit, implicit, intrinsic Polar envelope and parametric equations coordinate systems.	09
II	**Transformations** Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations orthographic, Axonometric, Oblique and perspective projections.	09
III	**Curves** Algebraic and geometric forms, Analytical & Synthetic Curves, tangents and normal, blending functions, re-parametrization, straight lines, conics, cubic splines, bezier curves and B-spline curves; Rational curves, Non-uniform Rational curves, NURBS; Curve manipulation.	09
IV	**FUNDAMENTAL OF CNC AND PART PROGRAMING** Introduction to NC systems and CNC — Machine axis and Co-ordinate system- CNC machine tools-Principle of operation CNC- Construction features including structure and Drives and Introduction of Part Programming, types — Detailed Manual part programming on Lathe & Milling machines using G codes and M codes- Cutting Cycles, Loops, Sub program and Macros- Introduction of CAM package.	09

V	**CELLULAR MANUFACTURING AND FLEXIBLE MANUFACTURING SYSTEM (FMS)** Group Technology(GT),Part Families–Parts Classification and coding, Production flow Analysis–Cellular Manufacturing–Composite part concept–Types of Flexibility — FMS — FMS Components — FMS Application & Benefits — FMS Planning and Control — Quantitative analysis in FMS	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
1. Understand the importance of CAD/CAM for industrial purpose.
2. Acquire the basic knowledge to perform transformation of 2D and 3D objects.
3. Identify and generate the Bezier and Spline curve.
4. Understand the G codes and M codes for programming on lathe and milling machine.
5. Understand the concepts of group technology and flexible manufacturing system.

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester: VIII

<table>
<tr><td colspan="2">Programme: UG
Class: B-Tech (ME)</td><td>Year: IV
Semester: VII</td></tr>
<tr><td colspan="2">Credits
Theory: 3
Practical: 0</td><td>Subject: Non-destructive Testing</td></tr>
<tr><td colspan="2">Course Code: SDME-481</td><td>Title : Non-destructive Testing</td></tr>
<tr><td colspan="3">Course Objectives: The objectives of studying this course are,
1. To study and understand the various Non-Destructive Evaluation and Testing methods, theory and their industrial applications.
2. Explain Principles of selection of non-destructive Evaluation method (NDE).
3. Describe various inspection methods like Magnetic particle, Radiographic Inspection their principle, general procedure, advantages and limitations.
4. Explain Special NDT Techniques with their application in different fields.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="3">L: 3
T: 0
P: 0 (In Hours/Week)
Theory - 0
Practical- NIL</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction: Introduction to NDT, DT, advantages & limitations of NDT, classification of NDT methods, Comparison with DT, Terminology, Flaws and Defects. Scope of NDT. Codes, Standards and Certifications in NDT. Visual Inspection– Equipment used for visual inspection, Borescopes, Application of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection, Visual Inspection in Welding.</td><td>09</td></tr>
<tr><td>II</td><td>Liquid Penetrant Testing – Principle, Scope, Testing equipment, Advantages, Limitations, types of penetrants and developers, standard testing procedure, Zyglo test, Illustrative examples and interpretation of defects.
Magnetic Particle Inspection – Principle, Scope, Testing equipment, Advantages, Limitations, Application of MPI & standard testing procedure, DC & AC magnetization, Skin Effect, different methods to generate magnetic fields, Illustrative examples and interpretation of defects.</td><td>09</td></tr>
<tr><td>III</td><td>Radiographic Testing – Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photoelectric effect, coherent scattering and Incoherent scattering, Beam geometry. X-ray Radiography – Principle, equipment & methodology, applications, source, types of radiations and limitations;
γ-ray Radiography – Principle, equipment, γ-ray source & technique; Radiography Image Quality Indicators, Film Processing, advantages of γ-ray radiography over X-ray radiography. Precautions against radiation hazards.</td><td>09</td></tr>
</table>

IV	**Ultrasonic Testing** – Introduction, Principle, Piezoelectricity and Piezoelectric Transducers, Wave propagation, Ultrasonic probes, selection of angle probes, Acoustic Impedance, Reflection and transmission coefficient, Snell's law, standard testing procedure & calibration, advantages & limitations. Data representation - A-scan, B-scan, C-scan. Applications in inspection of welded joints, castings, forgings and dimensional measurements. Introduction to TOFD & Phased Array Ultrasonic Testing.	09
V	**Special NDT Techniques: Eddy Current Inspection**– Introduction, Principle, Methods, scope, Equipment, types of probes, Sensitivity, standard testing procedure, advanced ECT methods, advantages and limitations. **Acoustic Emission Technique**– Introduction, Types of AE signal, Principle, Advantages & Limitations, Interpretation of Results, Applications. **Holography, Thermography**– Introduction, Principle, advantages, limitations and applications.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
1. Understand the concept of destructive and Non-destructive testing methods.
2. Explain the working principle and application of die penetrant test and magnetic particle inspection.
3. Understand the working principle of eddy current inspection.
4. Apply radiographic techniques for testing.
5. Apply the principle of Ultrasonic testing and applications in medical and engineering areas.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III
ENGINEERING SCIENCE ELECTIVES

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: III**	
Credits **Theory: 3** **Practical: 0**	**Subject: Material Science**	
Course Code: SEME-231	**Title : Material Science**	
Course Objectives: The objectives of studying this course are, 1. To reinstate the Solid solutions – Hume Rothery's rules – the phase rule – single component system 2. To focus on iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels 3. To lay down Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip 4. To suggest Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials 5. To indicate Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics 6. To suggest shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy		
Nature of Paper: Engineering Science Elective		
Minimum Passing Marks/Credits: 40% Marks/4		
L: 3 T: 0 P: 0 (In Hours/Week) Theory - 0 Practical- NIL		
Unit	**Contents**	**No. of Lectures Allotted**
I	Phase Diagrams: Solid solutions – Hume Rothery's rules – the phase rule – single component system – one-component system of iron – binary phase diagrams – isomorphous systems – the tie-line rule – the lever rule – application to isomorphous system – eutectic phase diagram – peritectic phase diagram – other invariant reactions – free energy composition curves for binary systems – microstructural change during cooling.	09
II	Ferrous Alloys: The iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels – eutectoid steel, hypo and hypereutectoid steels – effect of alloying elements on the Fe-C system – diffusion in solids – Fick's laws – phase transformations – T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations – tempering of martensite – steels – stainless steels – cast irons.	09
III	Mechanical Properties: Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip – strengthening methods – strain hardening – refinement of the grain size – solid solution strengthening –	09

	precipitation hardening – creep resistance – creep curves – mechanisms of creep – creep-resistant materials – fracture – the Griffith criterion – critical stress intensity factor and its determination – fatigue failure – fatigue tests – methods of increasing fatigue life – hardness – Rockwell and Brinell hardness – Knoop and Vickers microhardness.	
IV	Magnetic, Dielectric & Superconducting Materials: Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites – dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization – dielectric breakdown – insulating materials – Ferroelectric materials – superconducting materials and their properties.	09
V	New Materials: Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications – shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where ‘rights’ enjoy and ‘wrongs’ are discouraged.
6. Understand Harmony in the Nature and Existence

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: III**
Credits **Theory: 3** **Practical: 0**	**Subject: Engineering Mechanics**
Course Code: SESB-231-SESB-249	**Title : Engineering Mechanics**

Course Objectives: The objectives of studying this course are,
1. To reinstate Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel positionthe Solid solutions – Hume Rothery's rules – the phase rule – single component system
2. To focus on shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.
3. To lay down Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem.
4. To suggest plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.
5. To indicate normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants.

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 0
P: 0(In Hours/Week)
Theory - 0
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium. Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.	09
II	Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams. Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.	09
III	Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.	09
IV	Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.	09

	Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.	
V	Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy. Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections. Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where 'rights' enjoy and 'wrongs' are discouraged.
6. Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (ME)**	Year: II Semester: IV
Credits Theory: 4 Practical:2	**Subject:** Basic Data Structure & Algorithm
Course Code: SESB-235/245	**Title:** Basic Data Structure & Algorithm

Course Objectives:
- Acquire some basic mathematical tools and techniques of algorithm analysis.
- To familiarise with basic data structures and to develop the ability to choose the appropriate data structure for designing efficient algorithms.
- Learn some basic algorithms with their rigorous proofs of correctness and efficiency analysis of implementation using appropriate data structures

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3
T:1
P:3 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction to data structure and Algorithms: Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and Multi dimensional arrays, spare matrices, Character storing in C, String operations.	**8**
II	Stack And Queue and Link List: Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue , Priority Queue , D-Queue , Singly and circularly linked list, List operations Lists implementations	**8**
III	Trees : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree.	**8**
IV	Graphs: Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths.	**8**

V	Searching and Sorting: Linear search, binary Search, Internal and External sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices : Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting.	**8**

Reference / Text Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Weiss, "Data Structure & Algorithm Analysis in C", Addision Wesley.
4. Basse, "computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
5. Lipschutz, "Data structure, "Schaum series.
6. Aho, hopcropt, Ullman, “Data Structure & Algorithm", Addision Wesley.
7. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
- Understand and analyze the time and space complexity of an algorithm
- Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)
- Discuss various algorithm design techniques for developing Algorithms
- Discuss various searching, sorting and graph traversal Algorithms
- Understand operation on Queue, Priority Queue, D-Queue.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (ME)**	Year: II Semester: IV
Credits Theory: 4 Practical:2	**Subject:** Introduction to Soft Computing
Course Code: SESB-236/246	**Title: :** Introduction to Soft Computing
Course Objectives:	
Nature of Paper: Engineering Science Elective	
Minimum Passing Marks/Credits: 40% Marks/4	
L:3 T:1 P:3(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Introduction to Soft Computing, ARTIFICIAL NEURAL NETWORKS Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network.	**8**
II	FUZZY SYSTEMS Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	**8**
III	NEURO - FUZZY MODELING Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation	**8**
IV	GENETIC ALGORITHMS Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method	**8**
V	APPLICATION OF SOFT COMPUTING Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques	**8**

Reference / Text Books:

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)
5. Sivanandam, Deepa, “ Principles of Soft Computing”, Wiley

6. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
7. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
8. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
9. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley Wang, “Fuzzy Logic”, Springer

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning,fuzzy inference systems, and fuzzy logic
- Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self learning situations.
- Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.
- Develop some familiarity with current research problems and research methods in Soft Computing Techniques

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B.TECH (ME)**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject:** Energy Science and Engineering
Course Code:SESB-233	**Title: :** Energy Science and Engineering

Course Objectives:
1. To develop a strong foundation of concept of Energy and its units
2. To familiarize with Conventional & non-conventional energy source.
3. To introduce the various Systems and Synthesis.

Nature of Paper: ESE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Energy and its Usage: Units and scales of energy use, Mechanical energy and transport, Heat energy: Conversion between heat and mechanical energy, Electromagnetic energy: Storage, conversion, transmission and radiation, Introduction to the quantum, energy quantization, Energy in chemical systems and processes, flow of CO_2, Entropy and temperature, carnot and Stirling heat engines, Phase change energy conversion, refrigeration and heat pumps, Internal combustion engines, Steam and gas power cycles, the physics of power plants. Solid-state phenomena including photo, thermal and electrical aspects	**8L**
II	**Nuclear Energy:** Fundamental forces in the universe, Quantum mechanics relevant for nuclear physics, Nuclear forces, energy scales and structure, Nuclear binding energy systematics, reactions and decays, Nuclear fusion, Nuclear fission and fission reactor physics, Nuclear fission reactor design, safety, operation and fuel cycles.	**8L**
III	**Solar Energy:** Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, Basic physics of semiconductors, Carrier transport, generation and recombination in semiconductors, Semiconductor junctions: metal-semiconductor junction & p-n junction, Essential characteristics of solar photovoltaic devices, First Generation Solar Cells, Second Generation Solar Cells, Third Generation Solar Cells	**8L**
IV	**Conventional & non-conventional energy source:** Biological energy sources and fossil fuels, Fluid dynamics and power in the wind, available resources, fluids, viscosity, types of fluid flow, lift, Wind turbine dynamics and design, wind farms, Geothermal power and ocean thermal energy conversion, Tidal/wave/hydro power.	**8L**

V	**Systems and Synthesis:** Overview of World Energy Scenario, Nuclear radiation, fuel cycles, waste and proliferation, Climate change, Energy storage, Energy conservation. Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts, LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption	**8L**

Reference/Text Books

1. Energy and the Challenge of Sustainability, World Energy Assessment, UNDP, New York, (2000).
2. Perspective of Modern Physics, A. Beiser, McGraw-Hill International Editions (1968).
3. Introduction to Modern Physics, H.S. Mani and G.K.Mehta, East-West Press (1988).
4. Introduction to Electrodynamics, D. J. Griffiths, Fourth Edition, Prentice Hall (2013).
5. Introductory Nuclear Physics, R. K. Puri and V.K. Babbar, Narosa Publishing House (1996).
6. Physics of Solar Cells: From Basic Principles to Advanced Concepts by Peter Wurfel, John Wiley & Sons, 2016
7. Principles of Solar Engineering, D.Y. Goswami, F.Kreith and J.F. Kreider, Taylor and Francis, Philadelphia, 2000.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of Energy and its Usage
CO2 Understand the concept of Nuclear Energy.
CO3 Understand the concept of solar Energy
CO4 Understand the Principles of Conventional & non-conventional energy source
CO5 Principles of various Systems and Synthesis

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (ME)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject: Sensor and Instrumentation**
Course Code:	**SESB-234**

Course Objectives: The objectives of studying this course are,

1. Apply the use of sensors for measurement of displacement, force and pressure.
2. Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
3. Demonstrate the use of virtual instrumentation in automation industries.
4. Identify and use data acquisition methods.

Nature of Paper: ESE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, and Measurement of **pressure** using LVDT based diaphragm & piezoelectric sensor.	09
II	Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.	09
III	Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs, Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation.	09
IV	Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R Ladder type, Use of Data Sockets for Networked Communication.	09
V	Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.	09

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: After undergoing this course, the students will be able to:	
1. Apply the use of sensors for measurement of displacement, force and pressure. 2. Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level. 3. Demonstrate the use of virtual instrumentation in automation industries. 4. Identify and use data acquisition methods. 5. Comprehend intelligent instrumentation in industrial automation.	

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (ME)**	**Year:III** **Semester: IV**
Credits **Theory: 4** **Practical:00**	**Subject: Electronics Engineering**
Course Code:SESB-238	**Title: Digital Electronics**

Course Objectives: The students will learn

1. To develop a strong foundation in analysis, design and implementation of electronic circuits
2. To present the electronics applications in diode systems
3. learn Bipolar junction transistors and its applications
4. Understand Operational amplifiers
5. Understand Electronic instrumentation and measurements.

Nature of Paper: ESE

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	PN junction diode: Introduction of semiconductor materials; Semiconductor diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, diode equivalent circuits, transition and diffusion capacitance, Zener diodes breakdown mechanism (Zener and	(L-9)
II	Diode application: Series, parallel and series, parallel diode configuration, half and full wave rectification, clippers, clampers, Zener diode as shunt regulator, voltage-multiplier circuits special purpose two terminal devices :	(L-9)
III	Bipolar junction transistors and field effect transistor: Bipolar junction transistor: Transistor construction, operation, amplification action, common base, common emitter, common collector configuration dc biasing BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration. Collector feedback, emitter-follower configuration. Bias	(L-9)
IV	Operational amplifiers: Introduction and block diagram of Op-Amp, ideal & practical characteristics of Op-Amp, differential amplifier circuits, practical Op-Amp circuits (inverting amplifier, non-inverting amplifier, unity gain amplifier, summing amplifier, integrator, And differentiator), Op- Amp parameters: input offset voltage, output offset voltage, input biased current, input offset current differential and common-mode operation.	(L-9)

V	Electronic instrumentation and measurements: Digital voltmeter: Introduction, RAMP techniques digital multimeters: Introduction Oscilloscope: introduction, basic principle, CRT, block diagram of oscilloscope, simple, measurement of voltage, current phase and frequency using CRO, introduction of digital storage oscilloscope and comparison of DSO with analog oscilloscope.	(L-9)

Reference / Text Books:

1. Robert L. Boylestand / Louis Nashelsky, "Electronic Devices and Circuit Theory," Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.
3. Meetidehran/ A.K. singh "fundamental of electronics Engineering", New age international publisher.

If the course is available as Generic Elective then the students of following departments may opt it.
- NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the concept of PN junction and special purpose diodes.
2. Study the application of conventional diode and semiconductor diode.
3. Analyse the I-V characteristics of BJT and FET.
4. Analyzethe of Op-Amp, amplifiers, integrator, and differentiator.
5. Understand the concept of digital storage oscilloscope and compare of DSO with analog oscilloscope

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (ME)**	**Year:III** **Semester: IV**
Credits **Theory: 4** **Practical:00**	**Subject: Digital Electronics**
Course Code:SESB-239	**Title: Digital Electronics**

Course Objectives: The students will learn

1. To develop a strong foundation in analysis, design and implementation of digital electronic circuits
2. To present the Digital fundamentals, Boolean algebra and its applications in digital systems
3. To familiarize with the design of various combinational digital circuits using logic gates
4. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
5. To introduce the fundamentals of digital logic families.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Digital System and Binary Numbers**: Number System and its arithmetic, Signed binary numbers, Binary codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc Clusky method (Tabular method).	(L-9)
II	Combinational Circuits: Analysis & Design procedure, Binary Adder, Subtractor, n-bit parallel Adder & Subtractor, Magnitude Comparator, Multiplexers, Demultiplexer, Decoders, Encoders.	(L-9)
III	Sequential Logic: Flip-flop and Latch, SR latch, JK flip-flop, T flip-flop, D flip-flop, Master-slave JK flip-flop, Flip Flop Conversion, Registers & Counters: Shift registers (SISO, SIPO, PISO, PIPO), Counters: Asynchronous/Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.	(L-9)
IV	Digital Logic Families: DTL, TTL, ECL & Metal Oxide Semiconductor logic families: N- MOS, P-MOS and CMOS logic circuits, Fan Out, Fan in, Noise Margin.	(L-9)
V	**Memory & Programmable Logic Devices:** RAM, ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Circuit Implementation using ROM, PLA and PAL.	(L-9)

Reference / Text Books:

1. *M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.*
2. *David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.*
3. *RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.*
4. *Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5th Edition, 2010.*

If the course is available as Generic Elective then the students of following departments may opt it.
- NA

Evaluation/Assessment Methodology

Max. Marks

1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

After completing the course, students should be able to:

1. Understand the concept of number system, Logic Gates, Boolean algebra, K-map and Quine Mclusky method
2. Design combinational and sequential logic circuits and their applications
3. Understand concepts of Synchronous & Asynchronous Sequential Circuits
4. Understand the idea of Digital Logic Families, memory and Programmable Logic Devices
5. To develop a strong foundation in analysis, design and implementation of digital electronic circuits.
6. To introduce the fundamentals of digital logic families.

Evaluation Scheme

Bachelor of Technology (B.Tech) Electrical Engineering

Bachelor of Technology (B.Tech) Electrical Engineering
FIRST YEAR, SEMESTER-I

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-111	Engineering Mathematics-I	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAS-113 / SEAS-112	Engineering Chemistry / Engineering Physics	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-111 / SEME-111	Learning Computers with Thinking and Programming in C/ Concepts of Mechanical Engineering & Mechatronics	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEE-111 / SEEC-111	Basic Electrical Engineering / Fundamentals of Electronics Engineering	3	1	0	30	20	0	100	0	**150**	**4**
5	PCE-111/ SEHU-112	Professional Communication/ Environmental Studies	3	0	0	10	5	0	35	0	**50**	**2**
6	SEAS-113P / SEAS-112P	Engineering Chemistry (Lab)/ Engineering Physics (Lab)	0	0	3	0	0	20	0	30	**50**	**2**
7	SECS-111 P/ SEME-111P	Learning Computers with Thinking and Programming in C Lab/ Engineering Graphics & Design Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEE-111P / SEEC-111P	Basic Electrical Engineering Lab/ Fundamentals of Electronics Engineering Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	PCE-111P/ SEME-112P	Professional Communication Lab / Engineering Workshop Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC -112*	University Social Responsibility - Community Outreach	0	0	0	0	0	25*	0	0	25*	NC*
11	SPT-111*	SPORTS	0	0	0	0	0	50*	0	0	50*	NC*
		Grand Total	**15**	**04**	**12**	**130**	**85**	**80**	**435**	**120**	**850**	**26**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-112 & SPT-111 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Applied Science Courses(Core)	Engineering Mathematics-I, Engineering Chemistry / Engineering Physics
Common Engineering Courses (Core)	Computer Basics & 'C' Programming/ Engineering Mechanics, Basic Electrical Engineering / Fundamentals of Electronics Engineering,
Skill Enhancement Courses	University Social Responsibility, SPORTS
Ability Enhancement Courses	Professional Communication/ Environmental Studies

Bachelor of Technology (B.Tech) Electrical Engineering
FIRST YEAR, SEMESTER-II

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-121	Engineering Mathematics-II	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAS-122 / SEAS-123	Engineering Physics / Engineering Chemistry	3	1	0	30	20	0	100	0	**150**	**4**
3	SEME-121 / SECS-121	Concepts of Mechanical Engineering &Mechatronics / Learning Computers with Thinking and Programming in C	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEC-121 / SEEE-121	Fundamentals of Electronics Engineering / Basic Electrical Engineering	3	1	0	30	20	0	100	0	**150**	**4**
5	SEHU-122/ PCE-121	Environmental Studies / Professional Communication	3	0	0	10	5	0	35	0	**50**	**2**
6	SEAS-122P / SEAS-123P	Engineering Physics Lab / Engineering Chemistry lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SEME-121P / SECS-121 P	Engineering Graphics & Design Lab / Learning Computers with Thinking and Programming in C Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEC-121P / SEEE-121P	Fundamentals of Electronics Engineering Lab / Basic Electrical Engineering Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEME-122P/ PCE-121P	Engineering Workshop Lab/ Professional Communication Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC -125	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
11	NECC-121*	Industrial Visit/ Seminar on the report of visit	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
12	NECC -122*	University Social Responsibility - Community Outreach	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
13	SPT-121*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**14**	**130**	**85**	**130**	**435**	**120**	**900**	**28**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- External Practical, NC- Non Credit Course	
***Note:**NECC-121, NECC-122 & SPT-121 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits , social visits /awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Applied Science Courses(Core)	Engineering Mathematics-II, Engineering Physics/ Engineering Chemistry
Common Engineering Courses (Core)	Engineering Mechanics / Computer Basics & 'C' Programming, Fundamentals of Electronics Engineering / Basic Electrical Engineering
Skill Enhancement Courses	Industrial Visit/Seminar on the report of visit, University Social Responsibility, MOOCS (SWAYAM/NPTEL), SPORTS
Ability Enhancement Courses	Environmental Studies / Professional Communication

Most Important regarding Internship: A minimum of 4-5 weeks internship is to completed during summer break & its assessment will be done in 3rd Semester.

Bachelor of Technology (B.Tech) Electrical Engineering
SECOND YEAR, SEMESTER-III

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-231/ SESB-231-9	Engineering Mathematics-III/ Engineering Science Electives**	3	1	0	30	20	0	100	0	**150**	**4**
2	SEEE-231	Network Analysis & Synthesis	3	1	0	30	20	0	100	0	**150**	**4**
3	SEEE-232	Electrical and Electronics Measurements and Instrumentation	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEE-233	Linear Integrated Circuits	3	1	0	30	20	0	100	0	**150**	**4**
5	STCS-239	Python Programming	3	0	0	10	5	0	35	0	**50**	**2**
6	SEEE-231P	Network Analysis Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEE-232P	Electrical and Electronics Measurements and Instrumentation Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEEE-233P	Linear Integrated Circuits Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC-232*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-231*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**09**	**130**	**85**	**60**	**435**	**90**	**800**	**24**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-232 & SPT-231 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Applied Science Courses(Core)	Mathematics-III
Engineering Courses (Core)	Network Analysis & Synthesis, Electrical and Electronics Measurements and Instrumentation, Linear Integrated Circuits, Network Analysis Lab, Electrical and Electronics Measurements and Instrumentation Lab, Linear Integrated Circuits Lab
Skill Enhancement Courses	University Social Responsibility, SPORTS, Python Programming

Bachelor of Technology (B.Tech) Electrical Engineering
SECOND YEAR, SEMESTER-IV

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-241-SESB-249 / SEAS-241	Engineering Science Electives**/ Mathematics-III	3	1	0	30	20	0	100	0	**150**	**4**
2	SEEE-241	Electrical Machines I	3	1	0	30	20	0	100	0	**150**	**4**
3	SEEC-242	Digital Electronics	3	1	0	30	20	0	100	0	**150**	**4**
4	SDEE-241-SDEE-244	DSE-I	3	1	0	30	20	0	100	0	**150**	**4**
5		Generic Elective-I	4	0	0	30	20	0	100	0	**150**	**4**
6	SEEE-241P	Electrical Machines Lab I	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEC-242P	Digital Electronics Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEEE-243P	Sensors Modeling& Simulation Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC-245	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
11	NECC-241*	Industrial Visit/ Seminar/Presentation on the report of visits	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
12	NECC-242*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
13	SPT-241*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**16**	**04**	**11**	**150**	**100**	**110**	**500**	**90**	**950**	**28**
14		**#Minor Certification Paper-I**	3	1	0	30	20	0	100	0	150	4

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher’s Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-241, NECC-242 & SPT-241 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of Industrial visits, social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Electrical Machines I, Digital Electronics, Electrical Machines Lab I, Digital Electronics Lab, Sensors Modeling & Simulation Lab
Discipline Specific Electives I **(Refer Page No.- 85-89)**	1. SDEE-241 - Embedded System Design 2. SDEE-242 - Utilization of Electrical Energy & Electric Traction 3. SDEE-243 - Sensors & Transducers 4. SDEE-244 - Electromagnetic Field Theory
Generic Electives-I	This subject will be opted by student from other department of the IIMT University
Skill Enhancement Courses	University Social Responsibility, SPORTS, MOOCS (SWAYAM/NPTEL), Industrial Visit/Seminar

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 5^{th} Semester.

[#]Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

Bachelor of Technology (B.Tech) Electrical Engineering
THIRD YEAR, SEMESTER-V

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEEE-351	Control Systems	3	1	0	30	20	0	100	0	**150**	**4**
2	SEEE-352	Electrical Machines-II	3	1	0	30	20	0	100	0	**150**	**4**
3	SEEE-353	Elements of Power Systems	3	1	0	30	20	0	100	0	**150**	**4**
4	SDEE-351-SDEE-354	DSE-II	3	1	0	30	20	0	100	0	**150**	**4**
5	SEEE-351P	Control Systems Lab	0	0	3	0	0	20	0	30	**50**	**2**
6	SEEE-352P	Electrical Machines Lab-II	0	0	3	0	0	20	0	30	**50**	**2**
7	SEEE-353P	Power System Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEE-354P	Internship	0	0	2	0	0	50	0	0	**50**	**2**
9	SEEE-359P	Research Project-I	0	0	2	0	0	*50**	0	0	*50**	*NC**
10	NECC-352*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-351*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**12**	**04**	**13**	**120**	**80**	**110**	**400**	**90**	**800**	**24**
		#Minor Certification Paper-II	3	1	0	30	20	0	100	0	150	4

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: SEEE-359P is noncredit course and will be evaluated on the basis of Project prepared by the students during the semester. Student needs to qualify it but the marks will not be added in total marks. NECC-352 & SPT-351 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Control Systems, Electrical Machines-II, Elements of Power Systems, Control Systems Lab, Electrical Machines Lab-II, Power System Lab
Discipline Specific Elective-II (Refer Page No.- 97-101)	1. SDEE-351 - Signals and Systems 2. SDEE-352 - Sustainable Energy 3. SDEE-353 - HVDC & AC Transmission 4. SDEE-354 - Power System Stability
Generic Electives-I	This subject will be opted by student from other department of the IIMT University
Research Project	Research Project I
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

Bachelor of Technology (B.Tech) Electrical Engineering
THIRD YEAR, SEMESTER-VI

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEEE-361	Power electronics	3	1	0	30	20	0	100	0	**150**	**4**
2	SEEE-362	Microprocessor and Microcontroller	3	1	0	30	20	0	100	0	**150**	**4**
3	SDEE-361-SDEE-364	DSE-III	3	1	0	30	20	0	100	0	**150**	**4**
5	UVE-601	Universal Human Values & Professional Ethics	3	0	0	10	05	0	35	0	50	3
6	SEEE-361P	Power Electronics Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEE-362P	Microprocessor and MicrocontrollerLab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEEE-363P	Mini Project Lab	0	0	3	0	0	50	0	0	**50**	**2**
10	NECC-365	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
11	SEEE-369P	Research Project II	0	0	2	0	0	*50**	0	0	*50**	*NC**
12	NECC-361*	Industrial Visit/ Seminar/Presentation on the report of visits	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
13	NECC-362*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
14	SPT-361*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**12**	**03**	**13**	**100**	**65**	**140**	**335**	**60**	**700**	**23**
15		**#Minor Certification Paper-III**	2	0	0	30	20	0	100	0	150	2

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: SEEE-369P is noncredit course and will be evaluated on the basis of Project prepared by the students during the semester. Student needs to qualify it but the marks will not be added in total marks.NECC-361, NECC-362 & SPT-361 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of Industrial visits, social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Power electronics, Microprocessor and Microcontroller, Power electronics Lab, Microprocessor and Microcontroller Lab
Discipline Specific Elective-III (Refer Page No.- 109-113)	1. SDEE-361 - Power System Analysis 2. SDEE-362 - Modern Control Systems 3. SDEE-363 - FACTS Controller 4. SDEE-364 - Electrical Machine Design
Ability Enhancement Courses	Universal Human Values & Professional Ethics is a non-credit course (Audit Course)
Research Project	Research Project II
Skill Enhancement Courses	University Social Responsibility, SPORTS, MOOCS (SWAYAM/NPTEL), Mini Project Lab

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 7th Semester.

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

Bachelor of Technology (B.Tech) Electrical Engineering
FOURTH YEAR, SEMESTER-VII

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEEE-471	Smart Grid	3	1	0	30	20	0	100	0	**150**	**4**
2		Generic Elective-II	3	1	0	30	20	0	100	0	**150**	**4**
3	SEEE-471P	Industrial Electric Drives Lab	0	0	3	0	0	20	0	30	**50**	**2**
4	SEEE-472P	Minor Project	0	0	8	0	0	40	0	60	**100**	**4**
5	SEEE-474P	Internship	0	0	2	0	0	100	0	0	**100**	**2**
6	NECC-475	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
7	NECC-472*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
8	SPT-471*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**06**	**02**	**15**	**60**	**40**	**210**	**200**	**90**	**600**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-472 & SPT-471 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Engineering Courses (Core)	Power System Protection, Industrial Electric Drives Lab
Generic Electives-II	This subject will be opted by student from other department of the IIMT University
Skill Enhancement Courses	University Social Responsibility, SPORTS, , MOOCS (SWAYAM/NPTEL),Internship
Research Project	Minor Project

Bachelor of Technology (B.Tech) Electrical Engineering
FOURTH YEAR, SEMESTER-VIII

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1		Generic Elective-III	3	1	0	30	20	0	100	0	**150**	**4**
2	SDEE-481- SDEE484	DSE-IV	3	1	0	30	20	0	100	0	**150**	**4**
3	SEEE-481P	Major Project	0	0	20	0	0	100	0	150	**250**	**10**
		Grand Total	**06**	**02**	**20**	**60**	**40**	**100**	**200**	**150**	**550**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

Generic Electives-III	This subject will be opted by student from other department of the IIMT University
Discipline Specific Elective-V (Refer Page No.- 128-132)	1.SDEE-481 - Fundamental of Electric Vehicles 2. SDEE-482 - Energy Conservation & Auditing 3. SDEE-483 - Digital Signal Processing 4. SDEE-484 - Biomedical Instrumentation
Research Project	Major Project

**ENGINEERING SCIENCE ELECTIVES
(Effective from session 2022-23)

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-231/ SESB-241	Engineering Mechanics	3	1	0	30	20	0	100	0	150	4
2	SESB-232/ SESB-242	Material Science	3	1	0	30	20	0	100	0	150	4
3	SESB-233/ SESB-243	Energy Science & Engineering	3	1	0	30	20	0	100	0	150	4
4	SESB-234/ SESB-244	Sensor & Instrumentation	3	1	0	30	20	0	100	0	150	4
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	3	1	0	30	20	0	100	0	150	4
6	SESB-236/ SESB-246	Introduction to Soft Computing	3	1	0	30	20	0	100	0	150	4
7	SESB-237/ SESB-247	Analog Electronics Circuits	3	1	0	30	20	0	100	0	150	4
8	SESB-238/ SESB-248	Electronics Engineering	3	1	0	30	20	0	100	0	150	4
9	SESB-239/ SESB-249	Digital Electronics	3	1	0	30	20	0	100	0	150	4

S.No	Course Code	Course Name	Remark
1	SESB-231/ SESB-241	Engineering Mechanics	Course can be offered to any branch except ME/ CE
2	SESB-232/ SESB-242	Material Science	
3	SESB-233/ SESB-243	Energy Science & Engineering	Course can be offered to any branch except EE
4	SESB-234/ SESB-244	Sensor & Instrumentation	
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	Course can be offered to any branch except CSE and allied branches
6	SESB-236/ SESB-246	Introduction to Soft Computing	
7	SESB-237/ SESB-247	Analog Electronics Circuits	Course can be offered to any branch except EC
8	SESB-238/ SESB-248	Electronics Engineering	
9	SESB-239/ SESB-249	Digital Electronics	Course can be offered to any branch except EC/ EE

Format-1

Format-1

CBCS: Statement of Credit distribution

College/School:School of Engineering & Technology Programme:B.Tech Duration: 8 Semester Annual/Semester: Semester						Credit range: 160-190 (suggested by CBCS Committee)	
MOOCs certification Elective	**#Entreprenuership& Innovation core paper**						
Sem.	Cr	Core Course/ Foundation Course Th (6 cr)	Ability Enhancement Compulsory Course (AECC)	Skill Enhancment Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	26	C-1 (4 Credit) C-2 (4 Credit)+P-01(2Credit) C-3 (4 Credit)+P-02(2Credit) C-4 (4 Credit)+P-03(2Credit)	AECC-1(2) AECC-2(2)				
II	28	C-5 (4 Credit)+P-04(2Credit) C-6 (4 Credit)+P-05(2Credit) C-7 (4 Credit)+P-06(2Credit) C-8 (4 Credit)+P-07(2Credit)	AECC-3(2)	SEC-1(2)			
Provision to change the stream							
III	24	C-09(4 Credit) C-10 (4 Credit)+P-08(2 Credit) C-11(4 Credit)+P-09(2 Credit) C-12 (4Credit)+P-10(2 Credit)		SEC-2(2)			
Provision to change the core papers							
IV	28	C-13 (4 Credit)+P-11(2 Credit) C-14 (4 Credit)+P-12(2 Credit) C-15 (4 Credit)+P-13(2 Credit)		SEC-3(2)	DSE-1(4)	**GE-1(4)**	
V	24	C-16 (4 Credit)+P-14(2 Credit) C-17 (4 Credit)+P-15(2 Credit) C-18(4 Credit)+P-16(2 Credit)		SEC-4(2)	DSE-2(4)		RP-I (NC*)
VI	23	C-19 (4 Credit)+P-17(2 Credit) C-20 (4 Credit)+P-18(2 Credit)	AECC-4(3)	SEC-5(2) SEC-6(2)	DSE-3(4)		RP-II(NC*)
VII	18	C-21 (4 Credit)+P-19(2 Credit)		SEC-7(2), SEC-8(2)		**GE-2(4)**	Minor Project (4)
VIII	18				DSE-4(4)	**GE-3(4)**	Major Project (10)
Total Credits	**189**	21(Th)*4(Cr) = 84 19(Pr)*2(Cr) = 38 **Total = 122**	2*2 = 04 1*3 = 03 1*2 = 02 **= 09**	8*2 = 16 **= 16**	4*4 = 16 **=16**	3*4 = 12 **= 12**	4+10 **= 14**

Format-2

Format-2

IIMTU-NEP Implementation: (B.Tech Electrical Engineering)

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES B.Tech EE	**FIRST YEAR**	**SEMESTER -I**	i) C1 (Th.4Cr) ii) AECC-1 (Th.2 Cr+ P 2 Cr)	4 2 2	4 3 3	48 36 36	Engineering Mathematics –I Professional Communication Professional Communication Lab	5 5		
			ii) C2(Th.4 Cr. + P 2Cr)	4 2	4 3	48 36	Engineering Chemistry Engineering Chemistry (Lab)	5		
			iii)C3 (Th.4 Cr. +P 2Cr)	4 2	4 3	48 36	Learning Computers with Thinking and Programming in C Learning Computers with Thinking and Programming in C lab	5		
			iv) C4 (Th.4 Cr +P 2Cr.)	4 2	4 3	48 36	Basic Electrical Engineering Basic Electrical Engineering Lab	5		

		SEMESTER - II	i) C5 (Th.4 Cr + P 2 Cr) ii) AECC-2 (Th.2 Cr) iii) SEC-1(2Cr)	4 2 2 2	4 3 3 2	48 36 36 24	Engineering Mathematics –II Engineering Workshop Lab Environmental Studies MOOCS (Swayam/ NPTEL)	5 5		
			ii) C6(Th.4Cr. +P2Cr)	4 2	4 3	48 36	Engineering Physics Engineering Physics (Lab)	5		
			iii) C7 (Th.4Cr. +P 2Cr)	4 2	4 3	48 36	Concepts of Mechanical Engineering & Mechatronics Engineering Graphics & Design Lab	5		
			iv) C8 (Th.4Cr +P 2Cr)	4 2	4 3	48 36	Fundamentals of Electronics Engineering Fundamentals of Electronics Engineering (Lab)	5		

Programme Outcome:

PO_1 -PO_{12} [ANNEXTURE-1]

Programme Specific Outcome:

PSO_1 –PSO_4 [ANNEXTURE-2]

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR	**SEMESTER -III**	i) C09 (Th. 4 Cr + P 2Cr) ii) SEC-2(2Cr)	4 2 2	4 3 3	48 36 36	Network Analysis & Synthesis Network Analysis Lab Python Programming	5 5		
			ii) C10 (Th. 4 Cr + P 2Cr)	4 2	4 3	48 36	Electrical and Electronics Measurements and Instrumentation Electrical and Electronics Measurements and Instrumentation Lab	5		
			iii) C11 (Th. 4 Cr)	4	4	48	Engineering Mathematics-III	5		
			iv) C12 (Th. 4 Cr+P 2Cr)	4 2	4 3	48 36	Linear Integrated Circuits Linear Integrated Circuits Lab	5		

		SEMESTER -IV	i) C13 (Th.4 Cr + P 2 Cr) ii) SEC-3(2Cr) iii) DSE-1(Th.4Cr) iv) GE-1(Th.4Cr)	4 2 2 4 4	4 3 2 4 4	48 36 24 48 -	Engineering Science Electives**/ Mathematics-III Sensor Modeling & Simulation Lab MOOCS (Swayam/ NPTEL) Embedded System Design Utilization of Electrical Energy & Electric Traction Sensors & Transducers Electromagnetic Field Theory **#To be opted from other department**	5 5		
			ii) C14 (Th. 4 Cr + P 2Cr)	4 2	4 3	48 36	Electrical Machines-I Electrical Machines Lab	5		
			iii) C15 (Th. 4 Cr+ P 2Cr)	4 2	4 3	48 36	Digital Electronics Digital Electronics Lab	5		

Programme Outcome:

PO_1 -PO_{12} [ANNEXTURE-1]

Programme Specific Outcome:

PSO_1 –PSO_4 [ANNEXTURE-2]

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	THIRD YEAR	SEMESTER -V	i)C16 (Th. 4 Cr +P 2 Cr) ii) SEC-4(2 Cr) iii) DSE-2(4Cr)	4 2 2 4	4 3 2 4	48 36 24 48	Control Systems Control Systems Lab Internship Sustainable Energy HVDC & AC Transmission Power System Stability	5 5		
			ii) C17 (Th. 4 Cr +P 2 Cr)	4 2	4 3	48 36	Electrical Machines-II Electrical Machines Lab-II	5		
			iii) C18 (Th. 4 Cr + P 2 Cr)	4 2	4 3	48 36	Elements of Power Systems Power Systems Lab	5		

		SEMESTER - VI	i) C19 (Th. 4 Cr + P 2Cr) ii) SEC-5(2.Cr) iii) SEC-6(2.Cr) iii) DSE-3(Th.4Cr) iv) AECC-3(Th.3Cr)	4 2 2 2 4 3	4 3 2 3 4 3	48 36 24 36 48 36	Power Electronics Power Electronics Lab MOOCS (Swayam/ NPTEL) Mini Project Power System Analysis Modern Control Systems FACTS Controller Electrical Machine Design Universal Human Values & Professional Ethics	5 5 5		
			ii) C20 (Th. 4 Cr + P 2Cr)	4 2	4 3	48 36	Microprocessor & Microcontrollers Microprocessor & Microcontrollers Lab	5		

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

Programme Outcome:

PO_1 -PO_{12} [ANNEXTURE-1]

Programme Specific Outcome:

PSO_1–PSO_4 [ANNEXTURE-2]

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	FOURTH YEAR	**SEMESTER -VII**	i) C21 (Th. 4Cr+ P 2Cr) ii) SEC-7(2.Cr) iii) SEC-8(2.Cr) iii) Project Lab (Minor) v) GE-2(Th.4Cr)	4 2 2 2 4 4	4 3 2 2 8 4	48 36 24 24 96	Smart Grid Industrial Electric Drives Lab Internship MOOCS (SWAYAM/NPTEL) Minor Project Lab **#To be opted from other department**	5 5		
		SEMESTER - VIII	i) GE-3 (Th.4Cr) ii) DSE-4 iii) Major Project	4 4 10	4 4 20	 48 240	**#To be opted from other department** Fundamental of Electric Vehicles Energy Conservation & Auditing Digital Signal Processing Biomedical Instrumentation Major Project Lab	 5 5		

- **Minor &Major Project report will be evaluated by external & internal examiners & Research topic may be selected from the main core paper.**
- **Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

Programme Outcome:
PO_1 -PO_{12} [ANNEXTURE-1]

Programme Specific Outcome:
PSO_1 –PSO_4 [ANNEXTURE-2]

ANNEXTURE-1

Program Outcomes:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and
Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

ANNEXTURE-2

Program Specific Outcomes:

PSO1: Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronics circuits, control systems, electrical machines and Power system.

PSO2: Apply the appropriate techniques and modern engineering hardware and software tools in electrical engineering to engage in life-long learning and to successfully adapt in multi-disciplinary environments.

PSO3: Aware of the impact of professional engineering solutions in societal, environmental context, professional ethics and be able to communicate effectively.

Format-3

B.Tech. EEE Department

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year : I Semester : I
Credits Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-I
Course Code:SEAS-111	**Title:** Engineering Mathematics-I

Course Objectives:

1. To apply the knowledge of differential calculus in the field of engineering.
2. To deal with functions of several variables that is essential in optimizing the results of real life problems.
3. To understand the essential tools of matrices and linear algebra, Eigen values and diagonalization in a Comprehensive manner are required.
4. To understand Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc.
5. To deal with vector calculus that is required in different branches of Engineering to graduate engineers.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T:1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**DIFFERENTIAL CALCULUS-I:** Successive Differentiation (nth order derivatives), Leibnitz theorem and its application. Curve tracing: Cartesian and Polar co-ordinates. Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions.	**8L**
II	**DIFFERENTIAL CALCULUS-II:** Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians.	**8L**
III	**MATRICES:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, System of linear equations, Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem and its application Diagonalisation of a Matrix	**8L**
IV	**INTEGRAL CALCULUS:** Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Application: Areas and volumes.	**8L**
V	**Vector Calculus:** Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's	**8L**

	Divergence theorem, Green's theorem and Stoke's theorem (without proof) and their applications	

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project ReportSeminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of differentiability and apply in the study of Successive differentiation, Leibnitz theorems and Partial differentiation.

CO2 Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.

CO3 Remember the concept of matrices and apply for solving linear simultaneous equations

CO4 Illustrate the working methods of multiple integral and apply for finding area, volume.

CO5 Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

CO6 Apply the concept of calculus in solving engineering problems

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-II
Course Code:SEAS-121	**Title:** Engineering Mathematics-II

Course Objectives:
1. To understand the effective mathematical tools for the solutions of differential equations that model physical processes
2. To get the idea of types of partial differential equations and their solutions.
3. To deal with applications of partial differential equations e.g. wave and heat equations.
4. To understand the concept of Laplace Transform and its application to solve differential and integral equations.
5. To be familiar with the concept and expansion of Fourier series.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**ORDINARY DIFFERENTIAL EQUATIONS:** Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation.	**8L**
II	**PARTIAL DIFFERENTIAL EQUATIONS:** Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.	**8L**
III	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**: Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension.	**8L**
IV	**LAPLACE TRANSFORM:** Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.	**8L**

V	**FOURIER SERIES:** Euler's Formulae, Functions having arbitrary periods,πPeriodic functions, Fourier series of period 2 Change of interval, Even and odd functions, Half range sine and cosine series.	**8L**

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1 Understand the concept of differentiation and apply for solving differential equations

CO2 Remember the concept of partial differential equation and to solve partial differential equations.

CO3 Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations

CO4 Understand the concept of Laplace Transform and apply for solving differential equations.

CO5 Remember &Understand the concept of Fourier Series.

CO6 Apply the concept of calculus in solving engineering problems

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Physics
Course Code:SEAS-112/122	**Title:** Engineering Physics

Course Objectives:
1. To Understand the concept of Relativistic Mechanics
2. To know the significance of Maxwell's equations in the Engineering applications of electromagnetic waves.
3. Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore.
4. To know the concept of Interference and Diffraction.
5. To Understand the Phenomenon of Polarization and Laser.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Relativistic Mechanics:** Inertial and Non- Inertial Frames; Michelson-Morley Experiment; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Mass Energy Equivalence and Variation of Mass with Velocity.	**8L**
II	**Electromagnetic:** Gauss law Ampere's law and displacement current; Equation of continuity; Maxwell's equations in Integral and Differential Forms; Electromagnetic Wave Propagation in Free Space and Conducting Media; Poynting Theorem	**8L**
III	**Quantum Mechanics:** Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box.	**8L**
IV	**Wave Optics:** **Interference:** Basics of interference of light; Principle of superposition, coherent Sources, Conditions of Interference; Interference by division of wave front and amplitude (Fresnel's bi-prism, Interference due to thin film, Newton's Rings). **Diffraction:** Fraunhoffer Diffraction Due Single and N-slit; Diffraction Grating; Rayleigh's criterion of resolution; absent spectra, dispersive Power of grating, Resolving power of Grating.	**8L**

V	**Polarization:** Phenomenon of double refraction; Ordinary and extra-ordinary rays; Nicol Prism; quarter wave plate and half wave plate; Production and analysis of Plane, Circularly and Elliptically Polarized Light; Optical Activity; Specific Rotation, Laurent half's half shade Polari meter.	**8L**

Reference / Text Books:

Text Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

Reference Books:

1. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
2. Engineering Physics-Malik HK and Singh AK (McGrawHill)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 To describe the classical relativity and wave mechanics problems.
CO2 To demonstrate the electromagnetic waves and their application in various processes
CO3 To calculate and solve the engineering problems of quantum mechanics.
CO4 To evaluate and grade the engineering problems of wave optics.
CO5 To prepare the classical physics & to prepare the ideas in solving the problems in their parent streams.
CO6 To prepare the Production and analysis of Plane

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Physics Lab
Course Code:SEAS-112P/ SEAS-122 P	**Title:**Engineering Physic slab
Course Objectives: The objectives of studying this course are, 1. To understand the concept of wave length by the interference 2. To understand the concept of wave length by the diffraction. 3. To understand the concept of viscosity of liquid and flow of liquid. 4. To understand the energy band gap in the semiconductors. 5. To understand the concept of polarization.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks/2	
L: 0 T: 0 P: 2 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Practical-1	To determine the wavelength of Sodium light by Newton's rings
Practical-2	To determine the wavelength of prominent lines of mercury by plane diffraction grating
Practical-3	To determine the focus length combination of two lenses separated by distance and verify the formula for the focal length of combination of lenses
Practical-4	To determine the wave length of sodium light with the help of Fresnel's bi-prism
Practical-5	To determine the coefficient of viscosity of a given liquid
Practical-6	To verify Stefan's law
Practical-7	Calibration of a volt meter with potentiometer
Practical-8	To determine the resistance per unit length and specific resistance of a given resistance using Carey Foster 's Bridge
Practical-9	To determine the energy bend gap of a given semiconductor material
Practical-10	To determine the Specific Rotation of the Cane sugar solution with the help of Polarimeter.

Reference / Text Books:

1. Practical Physics- K. K. Dey& B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics- Practical- Katiyar&Pandey (Wiley India)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** To determine the wavelength of sodium light by Newton's ring experiment. **CO2.** To determine the wavelength of sodium light with the help of Fresnel's bi-prism. **CO3.** Understand measurement technology, usage of new instruments and real time applications in engineering studies. **CO4.** To determine the viscosity of liquid. **CO5.** To determine the emission of energy with respect the temperature and verify Stefan's law. **CO6.** To determine the calibration of potential and draw the curve.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Chemistry
Course Code: SEAS-113/123	**Title:**Engineering Chemistry

Course Objectives:

1. Student will be able to apply fundamental concepts of chemistry in different fields of Engineering.
2. Student will be able to identify compounds using different spectroscopic techniques
3. Student will be able to understand the basic principles of electrochemistry for different engineering applications
4. Student will be able to illustrate different types of impurities in water and its softening techniques
5. Student will be able to apply the concepts of determination of calorific values and analyze the coal
6. Student will be able to recall the basic knowledge of polymerization & and applications

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Atomic and Molecular Structure:** Molecular orbitals of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application	**8L**
II	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	**8L**
III	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system.	**8L**
IV	**Water Analysis:** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulon'smethos).	**8L**
V	**Polymers:** Basic concepts of Polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.	**8L**

Reference / Text Books:
Text Books:
1. University Chemistry ByB.H.Mahan
2. University Chemistry ByC.N.R.Rao
3. Organic Chemistry By I.L.Finar
4. Physical Chemistry By S.Glasstone
5. Engineering Chemistry By S.S.Dara
6. Polymer Chemistry By FreW.Billmeyer

Reference Books:
1. Elementary Organic Spectroscopy ByY.R.Sharma
2. Principles of Physical Chemistry By Puri, Sharma,Pathania
3. Principles of Inorganic Chemistry By Puri, Sharma,Kalia
4. Concise Inorganic Chemistry ByJ.D.Lee

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
CO1 Apply fundamental concepts of chemistry in different fields of Engineering
CO2 Identify compounds using different spectroscopic techniques.
CO3 Understand the basic principles of electrochemistry for different engineering applications
CO4 Illustrate different types of impurities in water and its softening techniques
CO5 Apply the concepts of determination of calorific values and analyze the coal
CO6 Recall the basic knowledge of polymerization and its applications

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Chemistry Lab
Course Code: SEAS-113P/SEAS-123P	**Title:**Engineering Chemistry Lab

Course Objectives: The objectives of studying this course are,
1. Student will be able to Estimate different impurities present in water sample.
2. Student will be able to Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution
3. Student will be able to Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To determine total alkalinity in the given water sample.
Practical-2	To determine the temporary and permanent hardness in water sample using EDTA as standard solution.
Practical-3	To determine the available chlorine in bleaching powder solution.
Practical-4	To determine the chloride content in the given water sample by Mohr’s method.
Practical-5	To determine the pH of the given solution using pH meter and pH-metric titration.
Practical-6	To determine the Equivalent weight of Iron by the chemical displacement method.
Practical-7	To determine the Viscosity of an addition polymer like polyester by Viscometer.
Practical-8	To find chemical oxygen demand of waste water sample by potassium dichromate
Practical-9	To determine the iron content in the given sample using external indicator
Practical-10	To determine the strength of given HCL solution by titrating against N/10 Standard Sodium hydroxide solution

Reference / Text Books:

1. Practical Chemistry B.Tech. Text Book, Dr. UshaNakra and Laxmi Kant Sharma Dr. VivekPandey, Dr. T. L. Rajawat, Dr. Sama Jain, Dr. Monika Sharma, Dr. Virendra Singh (Neelkanth Publishers (P) Ltd.)

If the course is available as Generic Elective then the students of following departments may opt it.

BOS

NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to	

CO1. Analyze the need, design and perform a set of experiments.
CO2. Identify the structure of unknown/new compounds with the help of spectroscopy
CO3. Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.
CO4. Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution
CO5. Equipped with basic knowledge of polymer reinforced composites, applications of semiconductor photochemistry in energy harnessing and optical sensors.
CO6. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Learning Computers with Thinking and Programming in C
Course Code:SECS-111/121	**Title:** Learning Computers with Thinking and Programming in C

Course Objectives:
1. After studying this course students will be able to develop simple algorithms for arithmetic and logical problems.
2. After studying this course students will be able to translate the algorithms to programs &finally execution in C language.
3. After studying this course students will be able to implement conditional branching, iteration and recursion in C language.
4. After studying this course student will be able to decompose a problem into functions and synthesize a complete program using divide and conquer approach using C language.
5. After studying this course students will be able to use arrays, pointers and structures to develop algorithms and programs for implementation in C language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Programming basics.** Conceptual Introduction to components of a computer system i.e. Memory, processor, I/O Devices, storage, operating system. Understanding assembler, compiler, interpreter, loader and linker. Understanding Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics of C language**. Core Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.	**8L**
II	**Arithmetic expressions & Conditional Branching in C language**: Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively. Conditional Branching: Applying if and switch statements, nesting of if and else, use of break and default with switch	**8L**

III	**Loops & Functions in C language:** Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.	**8L**
IV	**Arrays & Basic Algorithms in C language**: Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.	**8L**
V	**Pointer& File Handling in C language**: Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.	**8L**

Reference / Text Books:

Text Books:

1. Let Us C By Yashwant P. Kanetkar.
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.

Reference Books:

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Programming in C by Kochan Stephen G. Pearson Education – 2015.
3. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
4. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1	To understand the basic computer concepts and programming principles of C language.
CO2	To develop simple algorithms for arithmetic and logical problems.
CO3	To translate the algorithms to programs & execution (in C language).
CO4	To implement conditional branching, iteration and recursion.
CO5	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO6	To use arrays, pointers and structures to develop algorithms and programs

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Learning Computers with Thinking and Programming in C Lab
Course Code:SECS-111 P/SECS-121P	**Title:**Learning Computers with Thinking and Programming in C Lab

Course Objectives: The objectives of studying this course are,
1. After studying the above course the student will be able to implement algorithms and draw flowcharts for solving easy and complex Mathematical as well as engineering problems..
2. After studying the above course the student will be able to, understand and demonstrate programming language concepts by implementing programs in C language.
3. After studying the above course the student will be able to, design and develop programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage in computer language C.
4. After studying the above course the student will be able to, able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures in C language which will be latter helpful in understanding the concept of object oriented programming in C++.
5. After studying the above course the student will be able to, develop confidence for self-learning and ability for life-long learning needed for learning any computer language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/ 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Write a program to calculate the area of triangle using formula Area = √s (s- a) (s-b) (s-c) where s = (a+b+c)/2.
Practical-2	We input the basics alary of an employee through the keyboard. The Dearness allowance (DA) is 25% of the basic salary while the house rent allowance (HRA) is 15% of the basic salary. While the provident fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA). Write a program in Ctocalculate the Net Salary.
Practical-3	Write a program in Codetermine the roots of quadratic equation.
Practical-4	Write a program in to find the largest of three numbers using then estedifelse construct.
Practical-5	Write a program in C to receive marks of history, geography & civics from user & check its eligibility for course if a) Marks of history>40 b) Marks of geography>50 c) Marks of civics>60 d) Total of history & civics marks>150 or Toal of three subjects marks>200

Practical-6	Write a program in C to find the value of y for a particular value of n. The a, x, b, n is input by user if n=1 y=ax%b if n=2 y=ax2+b2 if n=3 y=a-bx ifn=4 y=a+x/b
Practical-7	Write a program in C to construct a Fibonacci series upto n terms.
Practical-8	Write a program in C to find whether the number is Arm strong number or not.
Practical-9	Write a program in C to generate sum of series1!+2!+3!+ n!
Practical-10	Writea program in Ctofind the sum of following series1-X1/1!+X2/2!-…………Xn/n!.
Practical-11	Write a program in C to print the entireprime no between1and 500.
Practical-12	Write a program in C to printout all the Arm strong number between 50 and 600.
Practical-13	Write a program in C to draw the following figure: 4 3 2 1 3 2 1 2 1
Practical-14	Write a program in C to receive a five-digit no and display as like12345: 1 2
Practical-15	Write a function in C that return sum of all the evendig its of a given positive no entered through keyboard.
Practical-16	Write a program in C to printarea of a trapezium using function & returnits value to main function.
Practical-17	Write a program in C to calculate the factorial for given number using function.
Practical-18	Write a program in C to find sum of Fibonacci series using function.
Practical-19	Write a program in C to find the factorial of given number using recursion.
Practical-20	Write a program in C to find the sum of digits of a 5 digit number using recursion.
Practical-21	Write a program in C to calculate the GCD of given numbers using recursion.
Practical-22	Write a program in C to convert decimal number into binary number.
Practical-23	Write a program in C to convert binary number into decimal number.
Practical-24	Write a program in C to delete duplicate element in a list of 20 elements & display it on screen.
Practical-25	Write a program in C to merge two sort edarray & no element is repeated during merging.
Practical-26	Write a program in C to evaluate the addition of diagonal elements of two square matrixes.
Practical-27	Write a program in C to find the transpose of a given matrix & check whether it is symmetric or not.
Practical-28	Write a program in C to print the multiplication of two N*N (Square) matrix.
Practical-29	Write a program in C to check whether the given string is a palindrome or not.
Practical-30	Write program in C to sort the array of character (String) in alphabetical order like STRING in GNIRTS.
Practical-31	Write a program in C to remove all the blank space from the string & print it, also

	count the no of characters.
Practical-32	Write a program in C to store the following string "zero", "one"--- "five". Print the no in words, given in figure as 3205.
Practical-33	Write a program in C to compare two given dates. To store a date use a structure that contains three members namely day, month and year. If the dates are equal then display message equal otherwise unequal.
Practical-34	Write a C program to copy & count the character content of one file says c. txt to another file d. txt.
Practical-35	Write a program in C to print all the prime number, between 2 to 200 in a file name prime. txt.
Practical-36	Write the following C program using pointer: a) To sort the list of numbers through pointer. b) To reverse the string through pointer.
Practical-37	Write a program in C to find the largest no among 30 integers array using dynamic memory allocation.
Practical-38	Using Dynamic Memory Allocation, Write a program in C to find the transpose of given matrix.
Practical-39	Write a program in C to find the factorial of given number using command line argument.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Implementation of algorithms and drawing flowcharts for solving easy and complex Mathematical as well as Engineering problems.

CO2. Computer programming language concepts understanding and demonstration.

CO3. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

CO4. Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures.

CO5. Development of confidence for self-education and ability for life-long learning needed for Computer language.

CO6. Understand the basics of file handling mechanisms

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td colspan="2">Programme: UG
Class: B.TECH(CSE,ME,CE,EE)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: Concepts of Mechanical Engineering & Mechatronics</td></tr>
<tr><td colspan="2">Course Code:SEME-111/121</td><td>Title: Concepts of Mechanical Engineering & Mechatronics</td></tr>
<tr><td colspan="3">Course Objectives:
1. Acquire knowledge of various types of force system, free body diagram and equilibrium of body under various types of forces
2. Acquire knowledge of basic concepts of strength of materials, and statically determinate and indeterminate structures, simple beams subjected to various types of loading and plot shear force and bending moment diagrams
3. Acquire knowledge of the fundamentals of thermodynamics, temperature scales and various modes of heat transfer so that student will now begin to utilize these concepts in real-world applications
4. Acquire knowledge of various types of engines and its components, mechatronics with their advantages,
5. The learner will have a good understanding of the all-important basic technologies that are useful in daily activities.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="3">L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Force Systems: Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Classification of forces & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces
Coplanar Concurrent Force system and Coplanar: Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem.</td><td>8L</td></tr>
<tr><td>II</td><td>Introduction to mechanics of solid: Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety. Basic Numerical problems. Types of beams under various loads, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment. Basic Numerical problems</td><td>8L</td></tr>
</table>

III	**Basic concepts of thermodynamics**: Basic concepts, Concept of continuum, Microscopic and Macroscopic approach, Thermodynamic equilibrium, State and process, Reversible and Quasi-static process, Work, Zeroth law, Concept of temperature and heat. First law of thermodynamics and its importance, **Second law of thermodynamics**: Kelvin Planck and Clausius statements, Heat engine, Refrigerator and Heat pump, Efficiency and COP, Thermodynamic temperature scale. **Heat transfer and its various modes**: Conduction, Convection and Radiation.	**8L**
IV	**Introduction to IC engines**: IC Engine: Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to electric, and hybrid electric vehicles	**8L**
V	**Introduction to mechatronics**: Evolution, Scope, Advantages and disadvantages of Mechatronics, Industrial applications of Mechatronics, Introduction to autotronics, bionics, and avionics and their applications. Sensors and Transducers: Types of sensors, types of transducers and their characteristics. **Overview of mechanical actuation system**: Kinematic Chains, Cam, Train Ratchet Mechanism, Gears and its type, Belt, Bearing. **Hydraulic and pneumatic actuation systems**: Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems	**8L**

Reference / Text Books:

Text Books:

1. Engineering Mechanics: Statics", J.L Meriam, Wiley.
2. "Engineering Mechanics", Thimoshenko & Young, 4ed, Tata McGraw Hill.
3. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson.

Reference Books:

1. Engineering Mechanics", Dr Sadhu Singh, Umesh Publications.
2. "Engineering Mechanics", Bhavikatti, New Age.
3. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI.
4. Mechatronics : Principles, Concepts and Applications, Nitaigour Mahalik, Mc Graw Hill.
5. Mechatronics, As per AICTE: Integrated Mechanical Electronic Systems, K.P.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the basics of mechanics, construct free body diagrams and appropriate equilibrium equations.

CO2 Understand and draw shear force and bending moment diagram for a beam under different loading conditions

CO3 Understand the basic concepts of thermodynamics and their applications

CO4 Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump

CO5 Understand the concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation, hydraulic and pneumatic

CO6 Understand the analysis of different machine parts and working principal and future prospects of mechatronics fields.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Fundamentals of Electronics Engineering
Course Code:SEEC-111/121	**Title:** Fundamentals of Electronics Engineering

Course Objectives:

1. To develop a strong foundation of concept of PN Junction and solid state devices
2. To present the Operational amplifier and its applications
3. To familiarize with digital electronics & the design of various digital circuits using logic gates
4. To introduce the various communication systems

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Overview of Semiconductors**, PN junction Diode, Zener Diodes, Diode Application: Half and Full Wave rectification, Clippers, Clampers Special Purpose two terminal Devices: Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**8L**
II	**BJT**: Transistor Construction, Operation, Amplification action (Common Base, Common Emitter, Common Collector) **Field Effect Transistor:** Construction, Operation and Characteristic of JFET and MOSFET (Depletion and Enhancement) Type	**8L**
III	**OP AMP:** Introduction, Op-amp symbol, terminals, packages, Block diagram Representation of op-amp- Ideal opamp& practical op-amp – Open loop & closed loop configurations, characteristics of op-amp, Op-Amp Circuits: Inverting Amplifier, Non-inverting Amplifier, Voltage Follower, Summing Amplifier, scaling & averaging amplifiers, Integrator, Differentiator.	**8L**
IV	**Digital Electronics:** Number systems, Binary codes – Binary Arithmetic, Logic gates, Boolean algebra, laws and theorems, Simplification of Boolean expressions, Implementation of Boolean expressions using logic gates Standard forms of Boolean expression, K Map Minimization upto 4 Variables.	**8L**
V	**Fundamentals of Communication Engineering**: Block diagram of a basic communication system, Frequency spectrum, Need for modulation, Methods of modulation, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	**8L**

Reference / Text Books:

Text Books:

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication

Reference Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford Uni Press India

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1. Understand the concept of PN Junction and devices.
CO2. Understand the concept of BJT, FET and MOFET
CO3. Understand the concept of Operational amplifier
CO4. Understand the Principles of digital electronics
CO5. Principles of various communication systems
CO6. Design rectifier & measure the waveform parameters

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Fundamentals of Electronics Engineering Lab
Course Code:SEEC-111P/ SEEC-121P	**Title:** Fundamentals of Electronics Engineering Lab

Course Objectives: The objectives of studying this course are,
1. To introduce the concepts of electronic circuits and its components
2. To introduce the concepts of diodes & transistors
3. To impart the knowledge of various configurations, characteristics and applications.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks/2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
Practical-2	To verify the PN diode characteristics
Practical-3	To verify the Zener diode characteristics
Practical-4	To verify the BJT characteristics (either of the configurations)
Practical-5	Study of Logic Gate
Practical-6	Design and implementation of Adder and Subtractor using logic gates.
Practical-7	To determine the external characteristics of DC Shunt generator
Practical-8	Implement an Adder and Subtractor Circuit using Operational Amplifier
Practical-9	To study Full Wave Rectifier Circuit
Practical-10	Study of AM modulator and Demodulator

Reference / Text Books:
Text Books:

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", Mc Graw Publication

Reference Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Conduct experiments illustrating the application of Fundamentals of semiconductor, electronic components/devices.

CO2. Demonstrate the behavior of Principles of digital electronics.

CO3. Apply the operation and discuss the performance of several fundamentally important op-amp circuits that have certain features or characteristics oriented to special applications.

CO4. Analyze the concept with the working principles of forward and reverse bias characteristics.

CO5. Demonstrate the basic skills in design and analysis of filter circuits, biasing circuits.

CO6. Discriminate the principle, construction and operation of BJTs, FETs and MOSFETs.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Basic Electrical Engineering
Course Code:SEEE-111/121	**Title:**Basic Electrical Engineering

Course Objectives:
1. The objective of this course is to teach the students Introduction to Electrical Engineering
2. To understand the fundamental concept of Electrical Engineering like DC Network, AC Network,
3. Measuring Instruments, Energy Conversion Devices

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Circuit theory Concepts**-Mesh and nodal analysis; Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem; Star Delta transformation..	**8L**
II	Sinusoidal and phasor representation of voltage and current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel; Apparent, active & reactive powers, Power factor; Series and parallel resonance; Bandwidth and quality factor.	**8L**
III	**Measuring Instruments:** Construction and principles of operation of voltage and current measuring instruments; introduction to power and energy meters. **Three Phase A.C. Circuits:** Star-Delta connections; Line and phase voltage/current relations; Three phase power and its measurement.	**8L**
IV	**Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and voltage regulation of single phase transformer. **D.C. Machines:** Principles of electromechanical energy conversion; Types of D.C. machines; E.M.F. equation; Losses and efficiency; applications of DC machines.	**8L**
V	**Three phase induction Motor:** Principle of operation; Types, slip-torque characteristics; Applications. **Synchronous Machines:** Principle of Operation of Alternator and synchronous motor. **Single phase Motors:** Principle of operation of induction motor.	**8L**

Reference / Text Books:
Text Books:
1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.

2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill. 3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons. 4. BL Theraja , A Textbook of Electrical Technology - Volume I, S. Chand Publishing **Reference Books:** 1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill. 2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. 3. A Grabel, Basic Electrical Engineering, McGraw Hill. 4. Cotton H., Advanced Electrical Technology, Wheeler Publishing.	
If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: **CO1** Apply the concepts of KVL/KCL and network theorems in solving DC circuits. **CO2** Analyze the steady state behavior of single phase and three phase AC electrical circuits. **CO3** Identify the application areas of a single phase two winding transformer and calculate their efficiency. **CO4** Illustrate the working principles of induction motor, synchronous machine and employ them in different area of applications. **CO5** To make students capable of analyzing and solving the varieties of problems and issues coming up in the vast field of electrical measurements. **CO6** Illustrate the working principles of DC machine and employ them in different area of applications.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Basic Electrical Engineering Lab
Course Code:SEEE-111P/SEEE-121P	**Title:** Basic Electrical Engineering Lab

Course Objectives: The objectives of studying this course are,

1. Understand and gain knowledge about circuit laws and theorems.
2. Gain knowledge about time domain analysis of circuit transients.
3. Understand the concept of resonance in series and parallel circuits.

Nature of Paper: Core/DSE/SEC/GE/AECC

Minimum Passing Marks/Credits:50% Marks/2

L: 0
T: 0
P: 2 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To verify the Kirchhoff's current and voltage laws
Practical-2	To verify the Superposition theorem
Practical-3	To verify the Thevenin's theorem
Practical-4	To verify the Norton's theorem
Practical-5	To determine the external characteristics of DC Shunt generator
Practical-6	To measure current and speed for speed control of D.C. Shunt Motor
Practical-7	To measure the power in a 3-phase system by two-wattmeter method
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.

CO2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase.

CO3. Calculate efficiency of a single phase transformer and DC machine.

CO4. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

CO5. Understand 3 phase balanced and unbalanced, star and delta connected supply andload and to measure power in 3 phase circuits

CO6. Determination of efficiency of a single-phase transformer by direct load test.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 2 Practical: 0	**Subject:** Professional Communication
Course Code:PCE-111/121	**Title:** Professional Communication
Course Objectives: 1. To enhance one’s ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in. 2. Toincreaseone’sknowledgeandawarenessofemotionalcompetencyandemotionalintelligenceatplaceofstudy/work. 3. To provide opportunity for realizing one’s potential through practical experience.	
Nature of Paper: AECC	
Minimum Passing Marks/Credits: 40% Marks/2	
L: 2 T: 0 P: 0 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Listening** • Techniques of effective listening • Listening and comprehension • Probing questions • Barriers to listening **Speaking** • Pronunciation • Enunciation • Vocabulary • Fluency • Common Errors ***Reading*** • Techniques of effective reading • Gathering ideas and information from a given text i. Identify the main claim of the text ii. Identifythepurposeofthetext iii. Identifythecontextofthetext iv. Identify the concepts mentioned • Evaluating these ideas and information i. Identify the arguments employed in the text ii. Identify the theories employed or assumed in the text	**8L**

BOS

	• Interpretthetext i. To understand what a text says ii. To understand what a text does iii. To understand what a text means	
II	***Writing and different modes of writing*** • Clearly state the claims • Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues • Provide background information • Effectively argue the claim • Provide evidence for the claims • Use examples to explain concepts • Follow convention • Be properly sequenced • Use proper signposting techniques	**8L**
III	• Be well structured i. Well-knit logical sequence ii. Narrative sequence iii. Category groupings • Different modes of Writing - i. E-mails ii. Proposal writing for Higher Studies iii. Recording the proceedings of meetings iv. Any other mode of writing relevant for learners ***Effective use of Social Media*** • Introduction to social media websites • Advantages of social media • Ethics and etiquettes of social media • How to use Google search better • Effective ways of using Social Media • Introduction to Digital Marketing ***Non-verbal communication*** • Meaning of non-verbal communication • Introduction to modes of non-verbal communication • Breaking the misbeliefs • Open and Closed Body language • Eye Contact and Facial Expression • Hand Gestures • Do's and Don'ts • Learning from experts • Activities-Based Learning	**8L**
IV	***Resume Skills*** • Resume Skills : Preparation and Presentation i. Introduction of resume and its importance ii. Difference between a CV, Resume and Bio data iii. Essential components of a good resume	**8L**

	• Resume skills : common errors i. Common errors people generally make in preparing their resume ii. Prepare a good resume of her/his considering all essential components ***Interview Skills*** • Interview Skills : Preparation and Presentation i. Meaning and types of interview (F2F, telephonic, video, etc.) ii. Dress Code, Background Research, Do's and Don'ts iii. Situation, Task, Approach and Response (STAR Approach) for facing an iv. interview v. Interview procedure (opening, listening skills, closure, etc.) vi. Important questions generally asked in a job interview (open and closed vii. ended questions) • Interview Skills : Simulation i. Observation of exemplary interviews ii. Comment critically on simulated interviews	
V	• Interview Skills : Common Errors i. Discuss the common errors generally candidates make in interview ii. Demonstrate an ideal interview	**8L**

Reference / Text Books:

1. Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.
2. Brown, Michele & Gyles Brandreth. How to Interview and be Inter viewed. London: Sheldon Press1994.
3. Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977.
4. Collins, Patrick. Speak with Power and Confidence. New York: Sterling, 2009.
5. Hughes, Shirley. Professional Presentations: A Practical Guide to the Preparation and Performance of Successful Business Presentations. Sydney: McGraw-Hill, 1990.
6. Kratz, Abby Robinson. Effective Listening Skills. Toronto: ON: Irwin Professional Publishing, 1995.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	10 05 35
Total:	50

Prerequisites for the course:

Course Learning Outcomes: **CO1** The students will Gain Self Competency and Confidence. **CO2** They will be fluent speaker and proficient writer and enhance their LSRW Skills. **CO3** The students will demonstrate a fuller and deeper understanding of all the facets of Professional communication. **CO4** They will be able to enrich their vocabulary and their correct usage. **CO5** They will develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation. **CO6** The students will Gain Knowledge about the world of work**.**

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

<table>
<tr><td>Programme: UG
Class: B.TECH(CSE,AIML,ME,CE,EE)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 0
Practical: 2</td><td>Subject: Professional Communication Lab</td></tr>
<tr><td>Course Code: PCE-111P/121P</td><td>Title: Professional Communication Lab</td></tr>
<tr><td colspan="2">Course Objectives: The objectives of studying this course are,
1. Improve the dynamics of professional presentations.
2. Develop the ability to compeer professional occasions.
3. Enable to read newspaper for their communicative competence.
4. Equip with effective business correspondence.
5. Develop in them communication and social graces necessary for functioning.</td></tr>
<tr><td colspan="2">Nature of Paper: Core/DSE/SEC/GE/AECC</td></tr>
<tr><td colspan="2">Minimum Passing Marks/Credits:50% Marks/2</td></tr>
<tr><td colspan="2">L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Practical	Contents
Practical 1	Group Discussion: Practice Based on Accurate and Current Grammatical Patterns
Practical 2	Intonation Pattern Practice: Rising, Falling, and Level Tones.
Practical 3	Communication Skills /Conversational Skills for Interviews/ Seminars/ Workshops with Emphasis on Kinesics/Para linguistics along with Promotion of Phonetic Script Skills.
Practical 4	Presentation Skills for Technical Paper / Project Reports / Professional Report based on Proper Stress and Intonation Mechanics.
Practical 5	Theme Presentation Practices Based on Linguistic Patterns
Practical6	***Digital Literacy4Hours*** • Role of Digital literacy in professional life • Trends and opportunities in using digital technology in workplace • Internet Basics • Introduction to MS Office tools i. Paint ii. Office iii. Excel iv. Powerpoint

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Develop all-round personalities with a mature outlook to function effectively in different circumstances.

CO2. Develop effective communication and presentation skills

CO3. Learn corporate etiquette - organizing and managing professional events and will understand how reading enhances their communicative competency

CO4. Conduct effective correspondence and prepare reports which produce results.

CO5. Write logical sentences and paragraphs, use appropriate diction, grammar and punctuation.

CO6. Produce business documents for mailing to external recipients or intra-organizational circulation

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 2 Practical: 0	**Subject:** Environment Studies
Course Code:SEHU-112/122	**Title:** Environment Studies

Course Objectives:

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
3. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
6. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.

Nature of Paper: AECC

Minimum Passing Marks/Credits: 40% Marks/2

L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to environmental studies** • Multidisciplinary nature of environmental studies; • Scope and importance; Concept of sustainability and sustainable development.	**4L**
II	**Ecosystems** • What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**4L**
III	**Natural Resources: Renewable and Non-renewable Resources** • Land resources and land use change; Land degradation, soil	

	erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & interstate). • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	**4L**
IV	**Biodiversity and Conservation** • Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots • India as a mega--biodiversity nation; Endangered and endemic species of India • Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	**4L**
V	**Environmental Pollution** • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies.	**4L**
VI	**Environmental Policies & Practices** • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.	**4L**
VII	**Human Communities and the Environment** • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. • Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.	**4L**

	• Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	
VIII	**Field work** Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site---Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems---pond, river, Delhi Ridge, etc.	**4L**

Reference / Text Books:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	10
4) Research Project Report Seminar On Research Project Report	05
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1. Gain in-depth knowledge on natural processes that sustain life, and govern economy.
CO2. Estimate and predict the consequences of human actions on the web of life, global economy and quality of human life.
CO3. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
CO4. Acquire values and attitudes towards understanding complex environmental economic social challenges, and participate actively in solving current environmental problems and preventing the future ones.
CO5. Adopt sustainability as a practice in life, society and industry.
CO6. Develop real field experience.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Engineering Workshop Lab
Course Code: SEME-112P/ SEME-122P	**Title:** Engineering Workshop Lab
Course Objectives: The objectives of studying this course are, 1. To understand the importance of tools used in workshop. 2. To prepare various joints used in workshop. 3. To identify & apply the most appropriate tools for various applications. 4. To perform the various types of black smithy and sheet metal shop operations. 5. To prepare core and mould in foundry shop.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:50% Marks/2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Module -1	Carpentry Shop: Practical-1: To prepare half-lap corner joint. Practical-2: To prepare mortise &Tenon joint. Practical-3: To prepare a cylindrical pattern on woodworking lathe
Module -2	Fitting Bench Working Shop: Practical-1: To prepare a V-joint fitting Practical-2: To prepare a U-joint fitting Practical-3: To make a perfect square job
Module -3	Black Smithy Shop: Practical-1: To prepare a square rod from given circular rod Practical-2: To prepare a square S- shape from given circular rod Practical-3: To prepare a nail from given circular rod.
Module -4	Welding Shop: Practical-1: To prepare a butt welded joints using arc welding machine. Practical-2: To prepare a Lap welded joints using arc welding machine. Practical-3: To prepare a Lap welded joint using spot welding machine.
Module -5	Sheet-metal Shop: Practical-1: To make round duct of GI sheet using ‘soldering’ process. Practical-2: To prepare a tray of GI by fabrication
Module -6	Machine Shop: Practical-1: To prepare a bolt on the lathe machine as per given. Diagram. Practical-2: To prepare a job on the lathe machine as per given diagram.

Module -7	Foundry Shop: Practical-1: To prepare core as per given size. Practical-2: To prepare a mould for given casting.
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

Reference Books:

1. Business Communication, II Ed, OUP, by Meenakshi Raman &Prakash Singh, 2012.
2. Speak well----- orient black swan.
3. Everyday dialogues in English----- Robert J.Dixon.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Understand the tools used in workshop & their applications.

CO2. Prepare various joints used in carpentry, fitting and welding shop.

CO3. Identify & apply the most appropriate tools for various manufacturing operations like turning, facing and threading.

CO4. Perform the various types of black smithy and sheet metal shop operations.

CO5. Prepare core and mould in foundry shop.

CO6. Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Graphics & Design Lab
Course Code:SEME-111P/ SEME-121P	**Title:** Engineering Graphics & Design Lab
Course Objectives: The objectives of studying this course are, 1. To study the standard and rules to be trailed by engineers for making precise drawings. 2. To understand the fundamental dimensioning practices that must be continued in the arrangement of drawings. 3. To draw the various types of projection of lines, planes and solids. 4. To apply the CAD for design. 5. To create the engineering models.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:50% Marks/2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Module-1	Introduction to Engineering Drawing, Orthographic Projections: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Module -2	Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.
Module -3	Projections and Sections of Regular Solids: Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans they include: windows, doors. Prism, Cylinder, Pyramid, Cone – Auxiliary Views.
Module -4	Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.
Module -5	Computer Graphics: Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids].

Reference / Text Books:

Text Books:

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Charotar Publishing House
2. Engineering Drawing, Narayana, K.L. & P Kannaiah (2008), Scitech Publishers.
3. Engineering Drawing Paperback, P.S. Gill (Author) , S.K. Kataria& Sons.

Reference Books:

1. Engineering Drawing and Computer Graphics, Shah, M.B. &Rana B.C. (2008), Pearson Education.
2. Engineering Graphics, Agrawal B. &Agrawal C.M. (2012), TMH Publication.
3. Engineering Graphics & Design, A.P. Gautametc, Khanna Publishing House.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Understand the basic concepts and principles of engineering graphics and their significance.
CO2. Understand the theory of projections and regular solids.
CO3. Draw the various types of projection of lines, planes and solids.
CO4. Apply the CAD for design.
CO5. Creating the engineering models using solid modeling.
CO6. Gain knowledge about orthographic and isometric projections

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject: Engineering Mathematics-III**
Course Code: SEAS-231/241	**Title : Engineering Mathematics-III**

Course Objectives:

1. To make the students familiar with complex functions and its calculus.
2. To deal with applications, residues and conformal mapping.
3. To understand the concept and applications of integral transforms
4. To deal with numerical solutions of algebraic equations and differential equations
5. To understand the statistical aspect of functions

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory – 1Hr=1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week)

Unit	Contents	No. of Lectures Allotted
I	**Functions of a Complex Variable I**: Analytic functions; C-R equations and harmonic functions; Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.	08
II	Representation of a function by power series; Taylor's and Laurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilinear transformations.	08
III	**Integral Transforms:** Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations.	08
IV	**Numerical Techniques:** Solution of polynomial and transcendental equations Bisection method, Regula – Falsi method, Newton - Raphson method. **Interpolation:** Finite difference, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals; **Numerical Differentiation**, **Numerical Integration**; Trapezoidal, Simpson's 1/3 and 3/8 rules. **Numerical solutions of first order differential equations** by Euler's method and 4th order Runge-Kutta method.	08

V	**Statistical Techniques:** Moments, Moment generating functions, Skewness, Kurtosis, Curve Fitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	08

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course: 12th Mathematics

Course Learning Outcomes:
After undergoing this course, the students will be able to:
1. Understand and check the Analyticity of a complex function.
2. To apply the concept of Analytic functions in residue and conformal mappings.
3. To solve and apply the concepts of transforms in the area of engineering.
4. To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.
5. To understand and use the concept of statistical tools to analyze the different data.
6. To apply the knowledge of mathematics in solving various engineering problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject: Network Analysis & Synthesis**
Course Code: SEEE-231	**Title : Network Analysis & Synthesis**

Course Objectives:

- Apply the knowledge of basic circuital law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach.
- To learn network synthesis

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	DC Circuit: Review-Mesh and Nodal Analysis for DC circuits. Theorems-Thevenin's, Norton's, Superposition, Compensation-Tellegan's-Reciprocity-Maximum power transfer theorems- Millman's theorem– Applications to DC circuits.	09
II	AC Circuit: Review-Loop and Nodal method for AC circuits. Theorems-Thevenin's, Norton's, Superposition, Compensation-Tellegan's-Reciprocity-Maximum power transfer theorems- Millman's theorem– Applications to AC circuits.	09
III	Matrix approach of network containing voltage & current sources. Basic concepts of graph theory: Graph-directed graph-branch chord-Tree for two port networks, incidence and reduced incidence matrices-application to network solutions. Link current and tie set, tree branch voltage and cut set, duality and dual networks.	09
IV	Transient response of RL, RC and RLC circuits to DC and AC excitation - Natural and forced oscillations - Laplace transform application to transient conditions.	09
V	Resonant circuits-series, parallel, series - parallel circuits-effect of variation of Q on resonance. Relations between circuit parameters- Q, resonant frequency and bandwidth Coupled circuits: mutual inductance – coefficient of coupling–dot convention– analysis of simple coupled circuits - Inductively coupled circuits - single tuned and double tuned circuits.	09

If the course is available as Generic Elective then the students of following departments may opt it.**Not applicable**

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Facilitate electrical research and to introduce fundamental principles of circuit theory.
2. Familiar in applying circuit theorems to simplify and find solutions to electrical circuits.
3. Course makes them to analyze three phase circuits.
4. Able to apply graph theory such as incidence matrix, reduced incidence matrix, tie set and cutset matrix.
5. Able to solve and analyze transient response of RL, RC and RLC circuits to DC and AC excitation.
6. Familiar in applying Resonant circuits.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject: Electrical and Electronics Measurements & Instrumentation**
Course Code: SEEE-232	**Title : Electrical and Electronics Measurements & Instrumentation**

Course Objectives: The objectives of studying this course are,
1. To understand the basics of measurement and instrumentation and to acquire knowledge about calibration, and different types of electrical instruments.
2. Introduces the working principle of various bridges and magnetic measurements.
3. Enable the students to identify and choose appropriate instruments for specific application.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Measurement system, Characteristics of instruments, Methods of measurement, Errors in Measurement & Measurement standards, Review of indicating and integrating instruments: Voltmeter, Ammeter and Wattmeter. Instrument transformer: Current and Potential transformer, ratio and phase angle errors.	09
II	**Measurements:** Measurement of resistance-Low, Medium and High-AC Bridges-Maxwell's, Hay's, Anderson's, Desauty's bridge and Schering bridge for C and Wien's bridge for measurement of frequency. B-H curve and hysteresis loop using ballistic galvanometer, and Loss measurement using wattmeter method.	09
III	**Electronic instruments:** Voltmeter, Multimeter, Wattmeter & energy meter. Time, Frequency and phase angle measurements using CRO; Storage oscilloscope, Spectrum & Wave analyzer, Digital counter, frequency meter, and Digital Voltmeter.	09
IV	**Display and Recording Device:** LED & LCD Display Dot Matrix Display, 7 Segment Display Strip Chart Recorders Single point and multipoint Recorders–X-Y Recorders- Magnetic Tape Recorders-Data Loggers– Electromagnetic and Electrostatic interference.	09

V	**Transducers:** Temperature transducers-RTD, thermostat, Thermocouple-Displacement transducer- Inductive, capacitive, LVDT, Pressure transducer–Bourdon tube, Bellows–Flow transducer–Electromagnetic flow meter – Strain gauges– Piezoelectric and Hall effect transducer	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1. Understand different measuring methods.
CO2. Identify various types of errors.
CO3. Learn the concept of display devices
CO4. Display the knowledge of transducers, their classifications and their applications
CO5. Display the knowledge of transducers, their classifications and their applications for the measurement of physical quantities like motion, force, pressure and temperature.
CO6. Familiar in applying of transducers in circuits.

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject: Linear Integrated Circuits**
Course Code: SEEE-233	**Title : Linear Integrated Circuits**

Course Objectives: The objectives of studying this course are,

1. Learn the basics of op-amp, its characteristics, circuit model.
2. Discuss the performance and analyze the operation of several fundamentally important op- amp circuits that have certain features or characteristics oriented.
3. Describe the basic operating principles of oscillator and discuss how different types of oscillators produce.
4. Describe the filter types, filter response characteristics, and analyze basic categories of active filters, which are low-pass, high-pass, band-pass, and band-stop.
5. Introduce data converter terminology and its performance parameters.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Op-amp symbol, terminals, packages and specifications, Block diagram Representation of op-amp- Ideal op-amp & practical op-amp - Open loop & closed loop configurations, Characteristics of op-amp	09
II	Basic op-amp circuits: Inverting & Non-inverting voltage amplifiers, Voltage follower, Summing, Scaling & Averaging amplifiers, Linear Applications: Instrumentation Amplifiers, V-to-I and I-to-V converters, Differentiators and Integrators, Non-linear Applications: Precision Rectifiers, Wave Shaping Circuits (Clipper and Clampers), Analog voltage multiplier circuit and its applications, Comparators and its applications, Sample and Hold circuit.	09
III	Waveform Generators: Sine-wave Generators- RC Phase Shift Oscillator, Wien Bridge Oscillator, Square/ Triangle Wave generators. IC 555 Timer: Monostable operation and its applications, Astable operation.	09
IV	Filters: Comparison between Passive and Active Networks, Active Network Design, Filter Approximations, Design of 1st& 2nd order LPF, HPF, BPF and Band Reject Filters.	09

V	Digital to Analog Conversion: DAC Specifications, Weighted Resistor DAC, R-2R Ladder DAC and Inverted R-2R Ladder DAC, Analog to Digital conversion: ADC specifications, Ramp Type ADC, Successive Approximation ADC, Dual Slope ADC, Flash Type ADC.	09

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1.	This is a course on the design and applications of operational amplifiers and analog integrated circuits
CO2.	This course introduces basic op-amp principles and show how the opamp can be used to solve a variety of application problems.
CO3.	Much attention is given to basic op-amp configurations, linear and non-linear applications of op-amp and active filter synthesis
CO4.	It also deals with oscillators, waveform generators and data converters
CO5.	Students will gain knowledge about the working principle of data converters along with application specific ICs such as 555 timer and PLL.
CO6.	Familiar in applying of Digital to Analog Conversion.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 0** **Practical: 2**	**Subject : Network Analysis Lab**
Course Code: SEEE-231P	**Title : Network Analysis Lab**

Course Objectives: The objectives of studying this course are,

1. Understand and gain knowledge about circuit laws and theorems.
2. Gain knowledge about time domain analysis of circuit transients.
3. Understand the concept of resonance in series and parallel circuits.
4. Learn how to use the P Spice software for simulating circuits.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks/ 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	Verification of principle of Superposition with AC sources.	03
Practical-2	Verification of The venin theorem in AC Circuit.	03
Practical-3	Verification of Maximum Power Transfer theorem in AC Circuit.	03
Practical-4	Verification of Norton theorems in AC Circuit.	03
Practical-5	Verification of Tellegen's theorem for two networks of the same topology.	03
Practical-6	To verify Frequency Response of Series RLC Circuit.	03
Practical-7	To verify Frequency Response of Parallel RLC Circuit.	03
Practical-8	Determination of transient response of current in RL and RC circuits with step voltage input.	03
Practical-9	Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.	03

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Understand and gain knowledge about circuit laws and theorems.
2. Gain knowledge about time domain analysis of circuit transients.
3. Understand the concept of resonance in series and parallel circuits.
4. Learn how to use the PSPICE software for simulating circuits.
5. To evaluate and judge performance of various active filters
6. Understand the practical knowledge of circuit theory.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 0** **Practical: 2**	**Subject: Electrical and Electronics Measurements & Instrumentation Lab**
Course Code: SEEE-232P	

Course Objectives: The objectives of studying this course are,

1. Learn the measurement of non-electrical variables and electrical quantities using LABVIEW
2. Gain knowledge about the working of various Transducers

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks/2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents	No. of Lectures Allotted
Practical-1	Measurement of inductance using Maxwell's Bridge.	03
Practical-2	Calibration of AC voltmeter and AC ammeter.	03
Practical-3	Measurement of capacitance using Schering Bridge.	03
Practical-4	Measurement of low resistance using Kelvin's Double Bridge.	03
Practical-5	Extension of range and meters (voltmeter and ammeter).	03
Practical-6	Calibration of energy meters (single phase and three phase)	03
Practical-7	Measurement of inductance using Anderson's Bridge.	03
Practical-8	Measuring displacement using LVDT	03
Practical-9	Measuring temperature using thermocouple.	03
Practical-10	PC based data logging of temperature sensor using LabVIEW/ MATLAB	03

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Identify different measuring instruments for the measurement of various electrical and non-electrical parameters.
2. Select various transducers for the measurement of physical quantities like temperature, pressure, distance and displacement.
3. Compute the errors present in measuring instruments and calibrate them.
4. Examine AC bridges for the measurement of inductance, capacitance and frequency.
5. Analyze the characteristics of Solar panel, earth resistance and temperature transducers.
6. Understand the advance measurement techniques.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 0** **Practical: 3**	**Subject: Linear Integrated Circuits Lab**
Course Code: SEEE-233P	**Title : Linear Integrated Circuits Lab**

Course Objectives: The objectives of studying this course are,
1. To understand the basics of linear integrated circuits and available ICs
2. To understand the characteristics of the operational amplifier.
3. To apply operational amplifiers in linear and nonlinear applications.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	To design and verify experimentally the closed loop voltage gain of inverting and Non- Inverting and amplifier using IC 741.	03
Practical-2	To design op-amp as summing amplifier.	03
Practical-3	To design op-amp as Subtractor.	03
Practical-4	To design and test the performance of integrator circuits using Op-amp.	03
Practical-5	To design and test the performance of differentiator circuits using op-amp.	03
Practical-6	To study the operation of different types of Digital to Analog converters.	03
Practical-7	To study the operation of different types of Analog to Digital converters.	03
Practical-8	To study the Instrumentation Amplifier.	03
Practical-9	To study V-I and I-V Converters.	03
Practical-10	To generate square waveform using IC555.	03

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Study the basic principles, configurations and practical limitations of op-amp.
2. Understand the various linear and non-linear applications of op-amp.
3. Understand the operation and analysis of op-amp oscillators.
4. Gain knowledge on data converter terminology, its performance parameters, and various circuit arrangements for A/D and D/A conversions.
5. Gain hands-on experience to put theoretical concepts learned in the course to practice.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject : Electrical Machines-I**
Course Code: SEEE-241	**Title : Electrical Machines-I**

Course Objectives: The objectives of studying this course are,

1. To present a problem oriented introductory knowledge of Electrical Machines.
2. To focus on the study of electro mechanical energy conversion & different parts of electrical machine
3. To address the underlying concepts & methods behind Electrical Engineering machines.
4. To identify & formulate solutions to problems relevant to Electrical Machines and find the efficiency of machine.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**ELECTROMAGNETIC ENERGY CONVERSION:** Simple magnetic circuit calculations– B-H Relationship – Magnetically induced emf and force – AC operation of magnetic circuits – Hysteresis and Eddy current losses - Energy in magnetic system – Field energy and mechanical force – Energy conversion via electric field.	09
II	**SINGLE-PHASE TRANSFORMER:** Principle-Construction – No load operation – Ideal Transformer- phasor diagram-no load and on load -Equivalent circuit – Parallel operation and load sharing of single-phase transformers – Testing – Losses — Efficiency, voltage regulation and all day efficiency, Applications.	09
III	**AUTO TRANSFORMER:** Working principal, construction and saving in copper. **THREE PHASE TRANSFORMERS:** Principle-Construction - Polyphase connections – Star, Open-delta, Scott connection, three-phase to single phase conversion – On load tap changing – variable frequency transformer – Voltage and Current Transformers.	09

IV	**DC GENERATOR:** Elementary concepts of rotating machines – MMF of distributed winding - DC Generator Construction – Lap and wave winding – emf equation- excitation, Communication Process and types of generators Characteristics - armature reaction-methods of improving commutation.	09
V	**DC MOTOR:** Armature Reaction, torque equation – types-back emf and voltage equations-characteristics- Starting-Speed control- testing-direct, indirect and regenerative tests-Power flow and efficiency-separation of losses-retardation test- Braking - DC machines dynamics – Applications, Maintenance Schedule of DC Machine.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1. Understand and evaluate the performance of single phase and three phase transformers.
CO2. Understand the basic concepts of electromechanical energy conservation through energy and co-energy.
CO3. Ability to describe various methods to DC motor speed control.
CO4. Ability to use applications based on the characteristics of machines.
CO5. Demonstrate and perform various connections of three phase transformers.
CO6. Familiar in applying speed control in dc motors.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (EE)**	**Year:2** **Semester: IV**
Credits **Theory: 4** **Practical:00**	**Subject: Digital Electronics**
Course Code:SEEC-242	**Title: Digital Electronics**

Course Objectives: The students will learn
1. To develop a strong foundation in analysis, design and implementation of digital electronic circuits
2. To present the Digital fundamentals, Boolean algebra and its applications in digital systems
3. To familiarize with the design of various combinational digital circuits using logic gates
4. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
5. To introduce the fundamentals of digital logic families.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Digital System and Binary Numbers**: Number System and its arithmetic, Signed binary numbers, Binary codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc Clusky method (Tabular method).	(L-9)
II	Combinational Circuits: Analysis & Design procedure, Binary Adder, Subtractor, n-bit parallel Adder & Subtractor, Magnitude Comparator, Multiplexers, Demultiplexer, Decoders, Encoders.	(L-9)
III	Sequential Logic: Flip-flop and Latch, SR latch, JK flip-flop, T flip-flop, D flip-flop, Master-slave JK flip-flop, Flip Flop Conversion, Registers & Counters: Shift registers (SISO, SIPO, PISO, PIPO), Counters: Asynchronous/Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.	(L-9)
IV	Digital Logic Families: DTL, TTL, ECL & Metal Oxide Semiconductor logic families: N- MOS, P-MOS and CMOS logic circuits, Fan Out, Fan in, Noise Margin.	(L-9)
V	**Memory & Programmable Logic Devices:** RAM, ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Circuit Implementation using ROM, PLA and PAL.	(L-9)

Reference / Text Books:

1. *M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.*
2. *David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.*
3. *RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.*
4. *Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5th Edition, 2010.*

If the course is available as Generic Elective then the students of following departments may opt it.
- NA

Evaluation/Assessment Methodology

Max. Marks

1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

After completing the course, students should be able to:

1. Understand the concept of number system, Logic Gates, Boolean algebra, K-map and Quine Mclusky method
2. Design combinational and sequential logic circuits and their applications
3. Understand concepts of Synchronous & Asynchronous Sequential Circuits
4. Understand the idea of Digital Logic Families, memory and Programmable Logic Devices
5. To develop a strong foundation in analysis, design and implementation of digital electronic circuits.
6. To introduce the fundamentals of digital logic families.

Format-3

IIMTU-NEPIMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class: B-Tech (EE)**	Year: II Semester: IV
Credits Theory: 4 Practical: 0	**Subject:** Embedded Systems Design
Course Code: SDEE-241	**Title:** Embedded Systems Design

Course Objectives:
1: Understand the basics of embedded systems and their structural units.
2: Analyze the embedded system specification and develop software programs.
3: Evaluate the requirements of the programming embedded systems, related software architecture.
4: Understand the RTOS-based embedded system design.
5: Understand all the applications of the embedded system and designing issues.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Basic Terms in Embedded system:** Introduction to Micro controllers and Micro processors, Embedded versus external memory devices, CISC and RISC processors, Harvard and V on Neumann Architecture, 8051 micro controllers- Assembly language, Architecture of 8051, Registers, Addressing Modes,	8
II	**8051 internal architecture and programming:** I/Oports, memory organization, Programs showing use of I/O Pins, Interrupts, Interrupt Programming, Timer and counters, Serial Communication, Programming of serial Communication.	8
III	**Introduction to operating system and basics of higher embedded system:** Introduction to RTOS, Tasks, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes, Advanced processor (Only architecture), 80386, 80486, ARM (References)	8
IV	**Introduction to advanced concept in embedded system:** Introduction: Embedded System, Application of Embedded System, Embedded operating system, Design Parameters of embedded and its Significance, Design life cycle, Hardware fundamentals, Digital circuit parameter, O. C and Tristate outputs, I/O sink and Source, Customsing lepurpose processor Optimization, FSMD, data path & FSM, General purpose	8

V	**Communication basics and interfacing of various devices the micro controller:** Micro processor interfacing I/ O addressing, direct memory access (DMA), Arbitration, multi level bus architecture, serial protocol, parallel protocols and wireless protocol, Real world interfacing: LCD, Step ping motor, ADC, DAC, LED, Push buttons, Keyboard, Latch connection, PPI.	8

If the course is available as Generic Elective then the students of following departments may Opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations/Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1: Understand the basics of embedded system and its structural units.
CO2: Analyze the embedded system specification and develop software programs.
CO3: Evaluate the requirements of the programming embedded systems, related software Architecture.
CO4: Understand the RTOS based embedded system design.
CO5: Understand all the applications of the embedded system and designing issues
CO6: To understand the Communication basics and interfacing of various devices with

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV

<table>
<tr><td colspan="2">Programme: UG
Class: B-Tech (EE)</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: 0
Practical: 3</td><td>Subject: Electrical Machines-I Lab</td></tr>
<tr><td colspan="2">Course Code: SEEE-241P</td><td>Title : Electrical Machines-I Lab</td></tr>
<tr><td colspan="3">Course Objectives: The objectives of studying this course are,
1. To present a problem oriented introductory knowledge of Electrical Machines.
2. To focus on the study of electro mechanical energy conversion & different parts of electrical machine
3. To address the underlying concepts & methods behind Electrical Engineering machines.
4. To identify & formulate solutions to problems relevant to Electrical Machines and find the efficiency of machine.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks/2</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 3 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Practical</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>Practical-1</td><td>To study Load test on DC shunt and series Motors.</td><td>03</td></tr>
<tr><td>Practical-2</td><td>To study Open Circuit Characteristics and load test on self- excited DC shunt Generator</td><td>03</td></tr>
<tr><td>Practical-3</td><td>To study Open Circuit Characteristics and load test on separately excited DC shunt Generator</td><td>03</td></tr>
<tr><td>Practical-4</td><td>To study Load test on DC series Generator</td><td>03</td></tr>
<tr><td>Practical-5</td><td>To study Load test on single phase transformer</td><td>03</td></tr>
<tr><td>Practical-6</td><td>To study O.C and S.C test on single phase transformer</td><td>03</td></tr>
<tr><td>Practical-7</td><td>To study Magnetizing Characteristics of DC Shunt generator</td><td>03</td></tr>
<tr><td>Practical-8</td><td>To study Scott Connection of single-phase transformers</td><td>03</td></tr>
<tr><td>Practical-9</td><td>To verify Sumpner’s test on single phase transformers</td><td>03</td></tr>
<tr><td>Practical-10</td><td>Study of three phase transformer connections</td><td>03</td></tr>
<tr><td>Practical-11</td><td>To study Speed Torque Characteristics of DC Shunt Motor</td><td>03</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 0 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Perform single phase and three phase transformers under no load and load conditions.
2. Understand the intricacies in connecting the circuit and conducting the experiments.
3. Familiarize with the load performance of different types of DC motors and generators.
4. Understand the predetermination methods for finding the losses and efficiencies of transformers and DC motors.
5. Determine the performance characteristics of DC machine by conducting direct and indirect tests.
6. Understand the speed control of dc motors.

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Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: IV**
Credits **Theory: 0** **Practical:03**	**Subject: Digital Electronics Lab**
Course Code:SEEC-242P	**Title: Digital Electronics lab**

Course Objectives: The students will learn
1. Students will be able to analyze and do some simple design of combinational logic.
2. Students will examine the various logic gates and circuits in the laboratory. They will design, build and troubleshoot logic circuits in the laboratory.
3. Students will be able to analyze and do some simple design of sequential logic. They will be familiar with and incorporate into circuits the latches, flip-flops, and counters.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 3 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	Introduction to digital electronics lab- verification of the truth tables of logic gates.	3
Practical-2	Design and implementation of Adder and Subtractor using logic gates.	3
Practical-3	Design and implementation of 2 bit Magnitude Comparator using logic gates.	3
Practical-4	Design and implementation of Decoder using logic gates.	3
Practical-5	Design and implementation of Encoder using logic gates.	3
Practical-6	Design and implementation of Multiplexer using logic gates.	3
Practical-7	Design and implementation of De-multiplexer using logic gates.	3
Practical-8	Verification of state tables of RS, JK, T and D flip-flops using NAND gates.	3
Practical-9	Construction and verification of shift registers.	3
Practical-10	Design, and verify the 4-bit synchronous counter.	3

Reference / Text Books:

1. *M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.*
2. *David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.*
3. *RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.*
4. *Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5th Edition, 2010.*

If the course is available as Generic Elective then the students of following departments may opt it. - NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course: NA

Course Learning Outcomes:

After completing the course, students should be able to:

1. Understand the Digital Binary System and implementation of Gates.
2. Understand and design combinational and sequential systems.
3. Design the counters with the help of sequential circuit and basic Gates.
4. Understand concepts of digital integrated circuits
5. Implement the projects using the digital ICs and electronics components.
6. Understand concepts of logic gates and flip-flops

Format-3

IIMTU- NEPIMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: IV**
Credits **Theory: 0** **Practical:3**	**Subject: Sensors Modeling & Simulation Lab**
Course Code:SEEE-243P	**Title: Sensors Modeling & Simulation Lab**

Course Objectives:
1. Develop simulation model using heuristic method.
2. Analysis of Simulation models using input analyzer, and output analyzer.
3. Explain Verification and Validation of simulation model.

Nature of Paper: DSE

Minimum Passing Marks/Credits:50% Marks/2

L:0
T:0
P:3(In Hours/Week) Theory-
0 Hr. =0 Credit
Practical-3 Hrs.=2 Credit (3Hrs./Week=2Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	Characterize the temperature sensor (RTD)	3
Practical-2	Simulate the performance of a bio-sensor	3
Practical-3	Measurement of level in a tank using capacitive type level	3
Practical-4	Characterize the LVDT	3
Practical-5	Design an orifice plate for a typical application	3
Practical-6	Simulate the performance of a chemical sensor	3
Practical-7	Characterize the strain gauge sensor	3
Practical-8	Characterize the temperature sensor (Thermocouple)	3

If the course is available as Generic Elective then the students of following departments may Opt it.
Not applicable

Text Books:

1.	Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.
2.	Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai and Co, New Delhi, 2013.

Reference Books:

1.	Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2010.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations/Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

1. Understand Characterize the sensor under test
2. To Identify and plot the static and dynamic characteristics of the sensor.
3. Understand the Select proper material of construction and allied components for specific application of a sensor.
4. Understand performance of a chemical sensor
5. Understand performance of a bio-sensor
6. Understand Characterizing the LVDT

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical:0**	**Subject: Control Systems**
Course Code: SEEE-351	**Title : Control Systems**
Course Objectives: The objectives of studying this course are, 1. To understand the basic components of control systems and gain knowledge in time and frequency domain tools for the design and analysis of feedback control systems. 2. To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions and identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system. 3. Formulate different types of analysis in frequency domain to explain the nature of stability of the system.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Classical control theory concepts; Mathematical modeling of physical systems, transfer function approach; concept of poles and zeros, Open and closed loop control systems; Simplification of complex systems using block diagram reduction technique and Mason's gain formula (signal flow graphs).	09
II	**Time Response Analysis:** Standard test signals; Transient analysis of first and second order systems using standard test signals; correlation between pole location in s-plane and time-response; time-response analysis specification, Steady state analysis, Error criteria and its	09
III	**Root locus:** concepts, construction of root loci, root contours; **Frequency response analysis:** Introduction and its importance; correlation between frequency response and time-response analysis; frequency response specifications, Frequency response plots, Polar plot	09
IV	**Stability Analysis:** Concept of stability of LTI systems, Routh and Hurwitz Stability criteria; relative stability analysis using Routh's stability criterion, Stability analysis in frequency domain, Nyquist stability criterion; Relative stability analysis using phase margin and gain margin specifications.	09

V	**State Space Analysis:** Introduction to state-variable, advantages of state variable approach over transfer function–derivation of transfer function from state space model- Solution to state equation–homogenous system–state transition matrix and its properties–Introduction to controllability and observability concepts.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course: Mathematics, Signal & Systems, Physics

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1. Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form.
CO2. Understand the concept of LTI control systems, Importance of feedback in control systems and stability concept.
CO3. Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.
CO4. Formulate different types of analysis in frequency domain to explain the nature of stability of the system.
CO5. Analyze the stability of the closed and open loop systems. CO6. Develop and analyze state space models.

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year:III** **Semester: V**
Credits **Theory: 4 Practical:0**	**Subject: Electrical Machines-II**
Course Code: SEEE-352	**Title : Electrical Machines-II**

Course Objectives: The objectives of studying this course are,

1. Comprehend the construction, principle of operation, characteristics of three phase induction motor and their application.
2. Know the construction and performance of synchronous machines.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Induction Machine-I:** Construction and application of single-phase induction motor, AC windings, Establishment of magnetic poles, Rotating magnetic field; Three phase induction motor: Construction, types and operation, Torque equation, Condition for Maximum Torque, Mechanical characteristics effect of supply voltage and rotor resistance on torque, No load & blocked rotor tests, efficiency- derivation of exact	09
II	**Induction Machine-II:** Torque-Power and torque-slip relationship, Performance characteristics/calculations, Starting methods, braking-Cogging and crawling, Speed control methods and influence on speed-torque curve, Double cage rotor, Induction generator, Synchronous induction Motor.	09
III	**Synchronous Generator:** Types, construction and principle of operation - emf equation- winding factor , effect of chording and winding distribution – armature reaction – Voltage regulation by synchronous impedance, MMF and Poitier triangle methods - load characteristics – Parallel operation of synchronous generators, Synchronizing to infinite bus-bars- power transfer equations, capability curve- two reaction model of salient pole synchronous machines and power angle characteristics - determination of Xd & Xq by slip test- Short circuit transients	09

IV	**Synchronous Motor:** Principle of operation, methods of starting, power flow, power developed by Synchronous motor, phasor diagrams – torque angle characteristics, effects of varying load and varying excitation, excitation and power circles for synchronous machine – 'V' and inverted 'V' curves – hunting – Synchronous phase modifier – Induction motor Vs Synchronous motor.	09
V	**Special Machine:** Construction, Principle of operation and applications of Reluctance motor, Two phase Servo motor, Stepper motors, Universal motor, linear induction motor, Permanent magnet DC motor, Hysteresis Motor, Repulsion motor and AC series Motor.	09

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Mathematics, Physics

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1. Understand the operating principle and characteristics of 3-phase induction motor.
CO2. Describe different tests for calculating the performance parameters of three phase induction motors.
CO3. Explain the fundamental control practices like starting, reversing and speed control strategies for different applications.
CO4. Analyse working principal and performance characteristics of synchronous machines.
CO5. Understand working principal, characteristics and applications of special machines.
CO6. Explain the basic concepts of Synchronous Machines, construction, EMF equation and armature reaction.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: V**
Credits **Theory: 4 Practical:0**	**Subject: Elements of Power Systems**
Course Code: SEEE-353	**Title : Elements of Power Systems**

Course Objectives: The objectives of studying this course are,

1. Recognize elements of power system and their functions, as well as compare the different types of supply systems.
2. Illustrate different types of conductors, transmission lines and various performance parameters of transmission line for short, medium and long transmission line.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Power Generation:** Basic structure of power system, conventional and nonconventional sources; Load curve, load duration curve, Concept of Connected Load, Maximum Demand, Average load, Demand Factor, Load factor, Diversity Factor, Capacity Factor, Utilization factor, Plant use factor, installed capacity, Reserves, role of load diversity in power system economy.	09
II	**Configuration of Transmission lines:** Single line diagram of Power system, choice of transmission voltage, Different kinds of supply system and their comparison; Types of conductors, Bundled Conductors, resistance of line, skin effect, Kelvin's law, Proximity effect; Corona Effect, factors affecting the Corona, Corona Power Loss, Advantages and Disadvantages; Representation of lines, short transmission lines, medium length lines, nominal T and л-representations, long transmission lines, Ferranti Effect.	09
III	**Mechanical Design of Overhead Lines**: Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers; **Insulators:** Overhead line Insulators, Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.	09
IV	**Line Parameters:** Inductance and Capacitance Calculations of Transmission Lines: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical, Composite conductors- transposition.	09

V	**Insulated cables:** Introduction, insulation, insulating materials, Extra high voltage cables, grading of cables, insulation resistance of a cable, Capacitance of a single core and three core cables, Overhead lines versus underground cables, types of cables	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Mathematics, Physics

Course Learning Outcomes: After undergoing this course, the students will be able to:

CO1. Describe the working principle and basic components of conventional power plants as well as the other aspects of power generation.

CO2. Recognize elements of power system and their functions, as well as compare the different types of supply systems.

CO3. Compute the inductance and capacitance of single phase, three phase lines with symmetrical and unsymmetrical spacing.

CO4. Understand Composite conductors-transposition, bundled conductors, and understand the effect of earth on capacitance of transmission lines.

CO5. Develop the ability to implement the appropriate safety equipment for design of electrical power system.

CO6. Enhancing the efficiency of the transmission and distribution system with environment friendly technology.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject : Signals and Systems**
Course Code: SDEE-351	**Title : Signals and Systems**

Course Objectives: The objectives of studying this course are,

1. To impart knowledge of fundamentals of signals and systems, and to mathematically analyze different types of signals and their associated systems.
2. Trains students for an intermediate level of fluency with signals and systems in both continuous time and discrete time.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Continuous Time Signals and Systems**: Introduction to continuous time and discrete time signals, Classification of signals with their mathematical representation and characteristics. Transformation of independent variable, Introduction to various type of system, basic system properties. **Analogous System**: Linear& Rotational mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method.	09
II	**Analysis of Continuous Time Signals:** Fourier Transform Analysis: Exponential form and Compact trigonometric form of Fourier series, Fourier symmetry, Fourier transform: Properties, application to network analysis. Definition of DTFS, and DTFT, Sampling Theorem.	09
III	**LTI CT System:** Laplace Transform Analysis: Review of Laplace Transform, Properties of Laplace Transform, Initial & Final value Theorems, Inverse Laplace Transform, Convolution Theorem, Impulse response, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform to complex waveforms	09
IV	**State – Variable analysis:** State – Variable analysis: Introduction, State Space representation of linear systems, Transfer function and state Variables, State Transition Matrix, Solution of state equations for homogeneous and non-homogeneous systems, Applications of State – Variable technique to the analysis of linear systems.	09

V	**Z – Transform:** Z – Transform Analysis: Concept of Z – Transform& ROC, Z – Transform of common functions, Inverse Z – Transform, Initial& Final value Theorems, Applications to solution of difference equations, Properties of Z-transform.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Mathematics, Physics

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1. Acquire knowledge of various classifications of Signals and Systems.
CO2. Utilize the mathematical computing tool for analysis of signals and systems.
CO3. Analyze Periodic and Aperiodic Continuous time Signals using Fourier series.
CO4. Analyze and characterize the Continuous time system through Laplace transform and Fourier transform.
CO5. Analyze and characterize the Discrete time system through Z transform.
CO6. Classify systems based on their properties and determine the response of LTI system using convolution.

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject : Sustainable Energy**
Course Code: SDEE-352	**Title : Sustainable Energy**

Course Objectives: The objectives of studying this course are,

1. To understand the different types of non-conventional energy resources like solar, wind, biomass, ocean, tidal and wave sources and their conversion techniques.

Nature of Paper:DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**SOLAR ENERGY:** Various solar energy systems and their applications, Solar spectra-latitude and longitude, Declination angle, solar window, cosine law, seasonal variations, daily variation, hour angle, Calculation of angle of incidence, Principle of photovoltaic conversion of solarenergy - Types of solar cells and fabrication, Photovoltaic - battery charger, domestic lighting, street lighting, water pumping etc, Solar Photovoltaic power plant – Net metering concept.	09
II	**WIND ENERGY:** Nature of the wind – wind power– factors influencing wind, Wind data and energy estimation - wind speed monitoring - wind resource assessment - Betz limit - site selection, Types of wind turbines – Various control-Tip Speed Ratio – Solidity, Torque on wind-wind thrust calculations.	09
III	**BIO-ENERGY:** Energy from Biomass - Biomass as Renewable Energy Source-Types of Biomass Fuels - Solid, Liquid and Gas, Biomass Conversion Techniques- Wet Process, Dry Process-Photosynthesis - Biogas Generation, Factors affecting Bio-digestion –Different digesters – Digesters sizing - Advantages and Disadvantages, Energy Forming – Pyrolysis.	09
IV	**ENERGY FROM OCEANS:** Ocean Thermal Energy Conversion (OTEC): Principle- Lambert Law of absorption - Open and closed OTEC Cycles-.Major problems and operational experience, Tidal energy: Tide – Spring.	09

	tide, Neap tide – Tidal range – Tidal Power – Types of Tidal power plant, Single and dual basin schemes- Requirements in tidal power plant, Wave Energy – Wave Characteristics,	
V	**GEOTHERMAL ENERGY:** Geothermal Energy – Classification, Fundamentals of geophysics, Dry rock and hot aquifers energy analysis, Estimation of thermal power , Extraction techniques	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1. Understand the concept of various non-conventional energy resources.
CO2. Acquire in-depth knowledge on the conversion of non-conventional energy resources into Electrical power.
CO3. Become intellectual in new developments of renewable energy studies.
CO4. Attain knowledge in green energy technologies.
CO5. Understand the various applications and uses of renewable sources.
CO6. Examine various Electric Energy Conversion Systems.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject: HVDC & AC Transmission**
Course Code: SDEE-353	**Title : HVDC & AC Transmission**

Course Objectives: The objectives of studying this course are,

1. To acquire knowledge in basic principles, economic aspects and calculations involved in EHVAC and HVDC System.
2. To familiarize the students with the HVDC converters and their control system.
3. To expose the students to the harmonics and faults occur in the system and their prevention.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**EHV transmission-I:** standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub- conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission.	09
II	**EHV Transmission-II:** Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferro-resonance, reduction of switching surges on EHV system.	09
III	**Extra High Voltage Testing:** Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers. Consideration for Design of EHV Lines: Design factors under steady state limits, EHV line insulation design based upon transient over voltages.	09
IV	**HVDC Transmission–I:** Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters, working principle and characteristics of a 6 pulse converter with two & three valve conduction mode, three valve conduction mode and three and four valve conduction mode, Principle of DC link control.	09

V	**EHV DC Transmission–II:** Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications.	09
If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**		

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.	Trace the comparison of EHVAC and HVDC transmission while understanding various issues related to transmission.
CO2.	Calculate and study the corona loss and its impacts. Cite examples of the causes of switching overvoltage, Ferro-resonance.
CO3.	Explain the generation and measurement circuits for impulse, high DC & AC voltages.
CO4.	Analyze various types of converters and their working.
CO5.	Study and understand the control scheme of HVDC converters.
CO6.	Discuss firing angle control of 6 pulse,12 pulse circuits.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year : III** **Semester : V**
Credits **Theory: 4** **Practical: 0**	**Subject : Power System Stability**
Course Code : SDEE-354	**Title : Power System Stability**

Course Objectives: The objectives of studying this course are,

1. To acquire knowledge on the fundamental concepts of stability of power systems and its classification.
2. To expose the students to dynamic behavior of the power system for small and large disturbances.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Definition, Causes, Nature and Effects of disturbances, Classification of stability, Modelling of electrical components - Basic assumptions made in stability studies-Modelling of Synchronous machine for stability studies (classical model) - Rotor dynamics and the swing equation.	09
II	**SMALL-SIGNAL STABILITY:** Basic concepts and definitions – State space representation, Physical Interpretation of small–signal stability, Eigen properties of the state matrix: Eigenvalues and eigenvectors, modal matrices, eigenvalue and stability, mode shape and	09
III	**TRANSIENT STABILITY:** Review of numerical integration methods: modified Euler and Fourth Order Runge-Kutta methods, Interfacing of Synchronous machine (classical machine) model to the transient stability algorithm (TSA).	09
IV	**VOLTAGE STABILITY:** Factors affecting voltage stability-Classification of Voltage stability-Transmission system characteristics-Generator characteristics- Load characteristics- Characteristics of reactive power compensating Devices.	09
V	**ENHANCEMENT OF SMALL-SIGNAL STABILITY AND TRANSIENT STABILITY:** Power System Stabilizer – Principle behind transient stability enhancement methods: high-speed fault clearing, regulated shunt compensation, dynamic braking, reactor switching.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Power System Analysis, Mathematics

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1. To attains knowledge about the stability of power system.
CO2. Learners will have knowledge on small-signal stability, transient stability and voltage stability.
CO3. To understand the dynamic behaviour of synchronous generator for different disturbances.
CO4. Understand Voltage stability problem and preventive methods for voltage collapse.
CO5. To understand the various methods to enhance the stability of a power system.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: V**
Credits **Theory: 0** **Practical:2**	**Subject : Control Systems Lab**
Course Code: SEEE-351P	**Title : Control Systems Lab**

Course Objectives: The objectives of studying this course are,

1. Understand and be able to use the laboratory techniques, tools, and practices of control engineering.
2. Be able to specify components, implement a control system, test and debug it, and appropriately report the results of a control design project.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks /2

L: 0
T: 0
P: 3(in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

	Contents
Practical-1	To determine response of second order systems for step input.
Practical-2	To determine response of second order systems for square input.
Practical-3	To study P, PI and PID temperature controller for an oven and compare their performance.
Practical-4	To study and calibrate temperature using resistance temperature detector (RTD)
Practical-5	To study DC position control system
Practical-6	To study synchro-transmitter and receiver and obtain output vs input characteristics
Practical-7	To determine speed-torque characteristics of an ac servomotor.
Practical-8	To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.
Practical-9	To simulate PID controller for transportation lag

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	
5) ESE	30
Total:	50

Prerequisites for the course: Mathematics, Signal & Systems, Physics
Course Learning Outcomes: After undergoing this course, the students will be able to:
CO1. Compare the performance of control systems by applying different controllers. CO2. Apply different stability methods of time domain in control systems & examine their stability. CO3. Evaluate possible causes of discrepancy in practical experimental observations in

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year:III** **Semester: V**
Credits Theory: 0 Practical:2	**Subject : Electrical Machine-II Lab**
Course Code: SEEE-352P	**Title : Electrical Machine-II Lab**

Course Objectives: The objectives of studying this course are,

1. To provide the practical exposure to the student regarding construction and operation of various electrical machines like Alternators, Synchronous motors, Induction Motors.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks /2

L: 0
T: 0
P: 3 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Study Load test on 3-phase squirrel cage Induction Motor
Practical-2	To perform No load & Blocked rotor test on 3-phase squirrel cage Induction Motor (Performance determination using equivalent circuit and circle diagram)
Practical-3	Study Load test on 1 phase Induction Motor
Practical-4	Study of speed control of Induction Motor
Practical-5	To perform OC and SC test on 3-phase Alternator
Practical-6	Study Synchronization of 3-phase Alternator with bus bars
Practical-7	To determine Xd and Xq 3-Phase Alternator.
Practical-8	To plot Study V-Curve of 3-Phase Alternator.
Practical-9	To plot Study inverted V-Curve of 3-Phase Alternator.
Practical-10	Brake Test On 3- ϕ Squirrel Cage Induction Motor
Practical-11	Equivalent circuit of a single-phase induction motor

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	--
4) Research Project Report Seminar On Research Project Report	--
5) ESE	30
Total:	50

Prerequisites for the course: Mathematics, Physics

Course Learning Outcomes:
After undergoing this course, the students will be able to:
CO1. To understand the Load test setup for Induction motor (Induction machine).
CO2. Demonstrate the working of three phase synchronous machine under different operating conditions.
CO3. Evaluate possible causes of discrepancy in practical experimental observations in comparison to theory by introducing the concepts of different stability theorems.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: V**
Credits **Theory: 0** **Practical:2**	**Subject: Power Systems Lab**
Course Code: SEEE-353P	**Title : Power Systems Lab**

Course Objectives: The objectives of studying this course are,
1. To develop computer programs for analysis of power systems.
2. To analyze the performance of power system networks by conducting various experiments.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks /2

L:0
T:0
P:3 (In Hours/Week)
Theory - 0
Practical- 3

	Contents
Practical-1	Calculate the parameters of single-phase transmission line
Practical-2	Determine the ABCD constant for transmission line.
Practical-3	Simulate the Ferranti effect in transmission line
Practical-4	To determine fault current in single Line to Ground fault
Practical-5	To determine fault current in Line to Line fault
Practical-6	To study IDMT over current Relay.
Practical-7	To study instantaneous over current Relay.
Practical-8	To study over Voltage Relay.
Practical-9	To determine breakdown strength of Transformer Oil.

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course: Mathematics, Physics	
Course Learning Outcomes: After undergoing this course, the students will be able to:	
CO1.	To understand the various Test on relays for different characteristics and compare with the performance characteristics provided by manufacturers.
CO2.	Analyze various types of short circuit faults.
CO3.	To understand the performance of different relays.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III /Semester: VI

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Power Electronics**
Course Code: SEEE-361	**Title : Power Electronics**

Course Objectives: The objectives of studying this course are,

- Introduce the different power electronics circuits, like AC/DC, DC/DC and DC/AC converters, in power processing applications.
- The major power switching devices used in power electronics applications will be the preliminary objective.
- Operation and performance evaluation of AC/DC power conversion circuit using controlled rectifiers will be discussed for different types of loads.
- Use of these circuits in various applications will be discussed.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures
I	**Introduction**: Power switching devices overview: ideal & real switching characteristics -power diode, BJT, SCR, TRIAC, MOSFET, GTO, IGBT- V-I characteristics, turn- on, turn-off methods; protection- di/dt,dv/dt, over current, overvoltage; specifications, losses, thermal characteristics, series and parallel operation, triggering circuits.	09
II	**Rectifiers:** Operation and analysis of single and three phase rectifiers – half and fully controlled Converters, converter and inverter operation – waveforms, gate time control, output voltage, input current, power factor, effect of load and source inductances. Series converter, dual converter – four-quadrant operation with and without circulating current.	09
III	**Chopper**: Principles of high-power chopper circuits – class A, B, C, D and E chopper, voltage commutated, current commutated chopper, principle of operation of buck, boost and buck boost regulators; time ratio control, variable frequency control, duty cycle.	09
IV	**Inverters**: Principles of high power VSI and CSI inverters, Modified McMurray, auto sequential inverter–waveforms at load and commutating elements; inverters: analysis of three phase inverter circuits with star and delta loads.	09

V	**AC voltage controller**: Principle of single phase – ON/OFF and phase angle control **Cyclo converters**: Principle of single phase cyclo converters circuits, input and output performances- different control techniques and firing pulse generation. Applications – regulated power supply, UPS.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
3) Assignments 4) Research Project Report 5) Seminar On Research Project Report	20
6) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:

CO-1	Understand the operating concepts of SCR, BJT, TRIAC etc
CO-2	Understand the applications of rectifiers, choppers, inverters
CO-3	Comprehend the non-isolated DC-DC converters and apply their use in different Power electronics applications.
CO-4	Understand the principal of different types of inverters
CO-5	Apprehend the working of single-phase ac voltage controllers, cyclo-converters and their various applications.
CO-6	Apprehend the different control techniques and firing pulse generation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Microprocessor & Microcontroller**
Course Code: SEEE-362	**Title : Microprocessor & Microcontroller**

Course Objectives: The objectives of studying this course are,

1. Introduce the generalized concepts of functional blocks namely registers, ALU, timing and control, interfacing of the microprocessor unit
2. Introduces the concept of interfacing memory and I/O devices and data transfer techniques.
3. Functions and operations of the microprocessors and microcontrollers and develop assembly code using different addressing modes for various applications.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures
I	**Microprocessor Architecture:** 8085 Microprocessor architecture– Registers, Arithmetic and logic section, Timing and Control section and Interface section-Machine Cycles and bus timings. Program structure & programming techniques for microprocessors, 8085 Addressing modes.	09
II	**8085 Programming and Interrupts:** 8085 Instruction set, Assembly language programming of 8085 microprocessor with examples (arithmetic operations on 8-bit numbers – add, subtract, multiply, divide, square & square root etc, largest / smallest number; ascending / descending order). 8085 Interrupt structure-vectored interrupts	09
III	**Memory I/O Interface:** Memory Interfacing, Programmable Peripheral device(8255), Timer/ Counter (8253), Programmable keyboard display interfaces (8279) - Programmable interrupt controller (8259) - USART	09
IV	Intel 8086 microprocessor: Internal architecture (Bus Interface Unit, Execution unit, Pipelining, Register organization), Pin Diagram, Memory addressing, Physical memory organization, Interrupts (hardware & software	09
V	**Microcontroller:** Introduction to Microcontrollers– 8051– Architecture – programming -hardware -Input/ Output ports and circuits-Memory -Counter and Timers- Serial net Input/ Output-Interrupts-interfacing keyboard, LCD, ADC and DAC.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course:	

Course Outcomes:

After studying the above course the student will be able to,

CO-1	Understand the various sections/blocks of microprocessor.
CO-2	Able to implement the programming concepts through designing programme.
CO-3	Understand the concept of interfacing & Interfacing/Peripheral devices
CO-4	Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements
CO-5	Understand the working of microcontroller.
CO-6	Understand the working of various peripheral like -Counter and Timers- Serial net Input/Output-Interrupts-interfacing keyboard, LCD, ADC and DAC.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B-Tech (EE)**	Year: III Semester: VI
Credits Theory: 4 Practical: 0	**Subject: Power System Analysis**
Course Code: SDEE-361	**Title : Power System Analysis**

Course Objectives: The objectives of studying this course are,

- Perform power flow analysis using numerical techniques and Analyze the behavior of the power system under faulted condition.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures
I	**Review of symmetrical components**: Transformation matrices used in resolution of unbalanced voltages and currents-Positive, Negative and Zero sequence networks of power system components-Sequence networks of impedance loads. Symmetrical Faults and asymmetrical Faults: Derivation of fault current for LG, LL, LLG.	09
II	**Load Flow**: Introduction, Formation of YBUS, Formulation of load flow equations-Solution of simple problems by considering voltage-controlled buses, tap changing transformers, phase shift control, Effect due to new lines, loads and voltages- Gauss, Gauss- Seidel method for calculating line voltages and real and reactive powers.	09
III	**Power System Protection:** Operating Principle and Classifications of Relays according to time and applications. Overcurrent Relay, Distance Protection, Differential Protection, Circuit Breakers: Arc Extinction Theories, Restriking Voltage & Recovery Voltage, Types and Selection of Circuit Breaker. Alternator Protection, transformer Protection, Transmission	09
IV	**Power System Stability**: Power flow through a transmission line, Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion. Factors affecting steady state and transient stability and methods of improvement.	09
V	**Travelling Waves on Transmission Lines**: Production of traveling waves, open circuited line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Outcomes:
After studying the above course the student will be able to,

CO-1	Understand the configuration of different transmission lines. Also illustrate various performance parameters and types of conductors in Transmission line
CO-2	Understand and interpret the results of load flow analysis in an electrical power network.
CO-3	Understand the basics of power system protection and different types of relays and circuit breakers
CO-4	Understand the dynamics and stability of power systems
CO-5	Analyse and compute the performance of transmission lines in various conditions
CO-6	Analyse the performance of traveling waves and Attenuation of travelling waves.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B-Tech (EE)**	Year: III Semester: VI
Credits Theory: 4 Practical: 0	**Subject: Modern Control Systems**
Course Code: SDEE-362	**Title : Modern Control Systems**

Course Objectives: The objectives of studying this course are,

- To understand the basic concepts of modern control theory in relation to the stability of a system.
- To co relate the concepts of control theory with the field of electrical engineering

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Classical Design:** Introduction to compensating networks – lead, lag, lead-lag compensation – feedback compensation – P, PI, PID controllers– design using Bode plot and root locus techniques.	09
II	**State Space Analysis:** State space formulation–state variable–phase variables and canonical variables–state model From differential equation–state transition matrix– state space representation of discrete time systems	09
III	**State Space Design:** Eigen values and Eigen vectors – Diagonalization–canonical forms - Controllability and observability–Controller design by state feedback– Necessary and sufficient condition for arbitrary pole placement – tate regulator problem. Observer Design– Fullorder/reduced order observer design.	09
IV	**Stability:** Stability concepts–BIBO Asymptotic Stability-stability definitions in statespace domain–Stability theorems on local and global stability–Lyapunov stability analysis- Krasovskii Method.	09
V	**Optimal Control:** Linear quadratic optimal regulator (LQR) problem formulation–optimal regulator design by parameter adjustment (Lyapunov method) – optimal regulator design by Continuous - time Algebraic Riccatti Equation (CARE)– optimal controller design using LQG	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Outcomes:

After studying the above course the student will be able to,

CO-1	Understand classical controller synthesis techniques like PI control, lead-lag compensation and state space analysis of linear dynamic systems.
CO-2	Understand the Modeling and analysis of systems in the state space domain will be dealt with in detail.
CO-3	Design controllers using state-feedback control approach.
CO-4	Understand the concept of stability in control systems
CO-5	Analyse and synthesize controllers for linear systems in a state-space framework.
CO-6	Understand the concept of stability definitions in state space domain and optimal regulator design by parameter adjustment

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: FACTS Controller**
Course Code: SDEE-363	**Title : FACTS Controller**

Course Objectives: The objectives of studying this course are,

1. To learn the concept of power flow control through various power electronic controllers including state of art FACTS controllers.
2. Operational aspects and their capabilities and their integration in power flow analysis.
3. FACTS controllers and to learn the effectiveness of FACTS controllers in distribution system for harmonic mitigation etc.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Compensators:** Introduction to FACTS controllers– Reactive power control-Reactive power, uncompensated Transmission line, reactive power compensation– Principles of conventional reactive power compensators-Synchronous condensers, saturated reactor, phase angle regulator and other controllers.	09
II	**Thyristor Controlled Shunt Compensator:** Objective of shunt compensation–Principle and operating characteristics of Thyristor Controlled Reactor (TCR)– Thyristor Switched Capacitor (TSC)– Static VAR Compensators (SVC)–SVC control system–SVC voltage regulator model–Transfer function and dynamic performance of SVC–Transient stability enhancement.	09
III	**Thyristor Controlled Series Compensator:** Series compensation–Principles of operation of TCSC–Capability characteristics of TCSC–Modeling of TCSC–TCSC control system– enhancement of system damping-mitigation of sub synchronous resonance.	09
IV	**VSC Based Shunt and Series Compensator:** Static Synchronous Compensator (STATCOM)- Principle of operation- VI Characteristics Harmonic performance – Steady state model– SSR mitigation-Static Synchronous Series Compensator(SSSC)-Principle of operation and characteristics of SSSC–control range and VA rating– capability to provide real power compensation–Immunity to sub-synchronous	09

V	**Unified Power Flow Controller:** Basic operating principles– conventional transmission control capability of UPFC– Independent Real and reactive power flow control– control scheme for UPFC– Basic control system for P and Q control – dynamic performance	09

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	150
Prerequisites for the course:	

Course Outcomes:

After studying the above course the student will be able to,

CO-1 Understand concepts of FACTS controller

CO-2 Understand the concept of TCR,TCS,SVC, STATCOM

CO-3 Analyse the Modeling of TCSC and enhancement of system damping

CO-4 To understand operation principal of various compensators

CO-5 To understand basics of unified power flow controller

CO-6 To understand operating principles of conventional transmission control capability of UPFC

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Electrical Machine Design**
Course Code: SDEE-364	**Title : Electrical Machine Design**

Course Objectives: The objectives of studying this course are,
1. To impart the knowledge on the concepts of design of different types of electrical machines.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Fundamentals of Design Rating and dimensions – Temperature rise – heating and cooling curves – rating of electric machines - insulation requirements – insulation materials -MMF for air-gap - Net iron length – MMF for Iron - MMF for teeth – Real and Apparent flux densities - Leakage flux	09
II	Design of DC Machines Magnetic circuit calculations-Output equation-Main Dimensions-Choice of specific electric and magnetic loadings-Selection Of Number of Poles- Armature design–Design of shunt field coil– Design of commutator and brushes.	09
III	Design of Transformers Output Equations of Single phase and three phase transformer–Main Dimensions- KVA output for single and three phase transformers–Window space factor–Overall Dimensions–Determination of number of turns and length of mean turns of windings-Resistance of windings- No load current calculation.	09
IV	Design of Three Phase Induction motor Output Equation of Induction motor–Main dimensions–Length of air gap- Design of squirrel cage rotor-Rules for selecting rotor slots of squirrel cage machines–Design of rotor bars & slots– Design of end rings–Design of wound rotor	09
V	Design of Synchronous machines and Computer Aided Design Output Equations–choice of loadings– Design of salient pole machines–Design of stator– Design of rotor– Design of damper winding–Design of turbo alternators– Introduction to CAD- Benefits Flowchart methods.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 2. Assignments 3. Research Project Report Seminar On Research Project Report 4. ESE	30 20 100
Total:	150
Prerequisites for the course:	
Course Outcomes: After studying the above course the student will be able to, **CO-1** Design considerations of static and rotating electrical machines. **CO-2** Design considerations of DC Machines Magnetic circuit **CO-3** Construction details of transformers DC and AC machines. **CO-4** Design aspects of both DC and AC rotating electrical machines. At the end of the course. **CO-5** Design the various elements of DC machines, transformers, induction motors and alternators **CO-6** Design of stator, rotor, damper winding and turbo alternators.	

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B-Tech (EE)**	Year: III Semester: VI
Credits Theory: 3 Practical: 0	**Subject: Universal Human Values and Professional Ethics**
Course Code: UVE-601	**Title : Universal Human Values and Professional**

Course Objectives: The objectives of studying this course are,

1. To reinstate the rich cultural legacy and human values of which we are the custodians.
2. To focus on professional ethics which are broader indicators of desirable actions vis-à-vis undesirable actions?
3. To lay down broader guidelines of values and ethics for internal and external stakeholders.
4. To suggest operational guidelines for value-based and ethical practices in the higher educational institutions leading to implementation and monitoring.
5. To indicate the outcomes of creating a value-based and ethical culture in HEIs.
6. To suggest indicative reinforcement programmes for nurturing human values and ethics in HEIs.

Nature of Paper: AEC

Minimum Passing Marks/Credits: 40% Marks/3

L: 3
T: 0
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction - Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	09
II	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programsto ensure Sanyam	09

III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva*as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!.	09
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co- existence (*Sah-astitva*) of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.	09
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human for Conduct, Basis Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco- friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	10
2) Presentations /Seminar	
3) Assignments	5
4) Research Project Report Seminar On Research Project Report	
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:

1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where 'rights' enjoy and 'wrongs' are discouraged.
6. Understand Harmony in the Nature and Existence

IIMTU-NEP IMPLEMENTATION
Year: III /Semester: VI

Programme: UG **Class: B-Tech (EE)**	**Year: III** **Semester: VI**
Credits: 2 **Practical: 3**	**Subject: Power Electronics Lab**
Course Code: SEEE-361P	**Title : Power Electronics Lab**

Course Objectives: The objectives of studying this course are,

- To provide hands on experience with power electronic converter design and testing
- To study the behavior of voltage waveforms of PWM inverter applying various modulation techniques
- To study the VI characteristics of SCR, TRIAC, MOSFET and IGBT.

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 3 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

S.No	Experiment's List	No. of Labs Allotted
Practical-1	To study triggering of power transistor	03
Practical-2	To study triggering of MOSFET	03
Practical-3	To study triggering of IGBT	03
Practical-4	To study bridge inverter using IGBT	03
Practical-5	To study Micro Controller Based Single Phase Cyclo Converter	03
Practical-6	To study MOSFET Based Chopper Motor Controller	03
Practical-7	To study Series Inverter Using MOSFET	03
Practical-8	To study V-I Characteristics of SCR	03
Practical-9	To study Single Phase Half Controlled Bridge Converter	03
Practical- 10	To study three phase fully controlled converter	03

Text Books:

1. M.H. Rashid, "*Power Electronics*", PHI, New Delhi, 2007.
2. P.S. Bimbhra, "*Power Electronics*", Khanna Publishers, New Delhi, 2008.
3. Ned Mohan, M. Underland, William P. Robbins, "*Power Electronics Converters, applications and design*", John Wiley & sons, Singapore, 2001.

Reference Books:

1. M.D. Singh, K.B. Khanchandani, "*Power Electronics*", Tata McGraw Hill, New Delhi, 2007.
2. Cyril W. Lander, "*Power Electronics*", McGraw Hill Book Company, Singapore(1993).
3. Williams B.W., "*Power Electronics Devices, drivers, applications and passive components*", McMillan Press Ltd., London, 1992.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Outcomes: After studying the above course the student will be able to,	

CO-1	Demonstrate the characteristics and triggering of IGBT, MOSFET, Power transistor and SCR.
CO-2	Analyse the performance of inverters using MOSFET and IGBT.
CO-3	Understand single phase and three phase controlled converters.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B-Tech (EE)**	Year: **III** Semester: **VI**
Credits: 2 Theory: 0 Practical: 3	**Subject: Microprocessor & Microcontroller Lab**
Course Code: SEEE-362P	**Title : Microprocessor & Microcontroller Lab**

Course Objectives: The objectives of studying this course are,

- To develop skills in designing and conducting experiments related to applications of 8086 microprocessor and 8051 microcontroller.
- Interface different I/Os with Microprocessors

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 3(n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	8085 based microprocessor system.	03
Practical-2	To perform mathematical operations (addition & subtraction) on two 8-bit numbers.	03
Practical-3	To perform multiplication on two 8-bit numbers.	03
Practical-4	To perform division on two 8-bit numbers.	03
Practical-5	To develop and run a program for finding out the largest number from given two 8-bit numbers.	03
Practical-6	To develop and run a program for finding out the smallest number from given two 8-bit numbers.	03
Practical-7	To develop and run a program for arranging in ascending order of a given set of 8-bit numbers.	03
Practical-8	To develop and run a program for arranging in descending order of a given set of 8-bit numbers.	03
Practical-9	To perform conversion of temperature from degree F to degree C.	03
Practical10	To perform computation of square root of a given numbers.	03

Prerequisites for the course:

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	
5) ESE	30
Total	50

Course Outcomes: After studying the above course the student will be able to,

CO-1	Demonstrate program proficiency using the various addressing modes and data transfer instructions of the target microprocessor.
CO-2	Apply knowledge of the microprocessor's internal registers and operations by use of a PC based microprocessor simulator.
CO-3	Interface the processor to external devices.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester: VII

Programme: UG **Class: B-Tech (EE)**	**Year: IV** **Semester: VII**
Credits **Theory: 4** **Practical: 0**	**Subject: Smart Grid**
Course Code: SEEE-471	**Title : Smart Grid**

Course Objectives: The objectives of studying this course is,

1. To provide students with a working knowledge of fundamentals and development of Smart Grid, from the basic concepts of power systems.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Smart Grid:** Evolution of Electric Grid– Need for smart grid– Difference between conventional & smart grid – Overview of enabling technologies– International experience in smart grid deployment efforts– Smart grid road map for INDIA– smart grid architecture.	08
II	**Wide Area Monitoring System:** Fundamentals of synchro phasor technology – concept and benefits of wide area monitoring system– Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC)–Road Map for synchro phasor applications (NAPSI)–Operational experience and Blackout analysis using.	08
III	**Smart Meters:** Features and functions of smart meters– Functional specification–category of smart meters– AMR and AMI drivers and benefits– AMI protocol– Demand Side Integration-Peak load, Outage and Power Quality management.	08
IV	**Information and Communication:** Overview of smart grid communication system– Modulation and Demodulation techniques-Radio communication–Mobile communication–Power line communication– Optical fiber communication – Communication	08
V	**Smart Grid Applications:** Overview and concept of renewable integration – role of protective relaying in smart grid– House Area Network– Advanced Energy Storage Technology - Flow battery– Fuel cell–SMES–Super capacitors– Plug–in Hybrid electric Vehicles– Cyber Security requirements–Smart grid information model	08

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
5) Seminar On Research Project Report	
6) ESE	100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1: Understand smart grids and analyse the smart grid policies and developments in smart grids.
CO2: Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
CO3: Understand smart substations, feeder automation, GIS etc.
CO4: Analyse micro grids and distributed generation systems.
CO5: Analyse the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.
CO6: To ensure a transparent, sustainable and environmental-friendly system operation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester: VII

Programme: UG **Class: B-Tech (EE)**	**Year:IV** **Semester:VII**
Credits **Theory: 4** **Practical: 0**	**Subject:Power System Protection**
Course Code: NTEE-472	**Title : Power System Protection**

Course Objectives: The objectives of studying this course is,
To provide students with a working knowledge of fundamentals and development of Power System Protection Schemes, from the basic concepts of power systems.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit

Unit	Contents	No. of Lectures Allotted
I	**UNIT-1 Fundamentals of Protection System:** Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology. Relays: Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.	08
II	**UNIT- 2 Application and Characteristics of Relay:** Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay Static Relays: Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance	08
III	**UNIT- 3 Transmission Line Protection:** Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing.	08
IV	**UNIT- 4 Circuit Breaking:** Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.	08
V	**UNIT- 5 Equipment Protection** Protection of Transformer, generator and motor. Circuit Breaker: Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.	08

If the course is available as Generic Elective then the students of following departments may opt it.**Not applicable**

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
5) Seminar On Research Project Report	
6) ESE	100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1: Understand fundamentals of Protection system

CO2: Learn various applications & characteristics of relay

CO3: Learn the concept of circuit braking

CO4: Learn the ways for equipment protection

Format-3

IIMTU- NEPIMPLEMENTATION
Year: IV / Semester: VII

Programme: UG **Class: B-Tech (EE)**	**Year: IV** **Semester: VII**
Credits **Theory: 0** **Practical: 2**	**Subject: Industrial Electric Drives Lab**
Course Code: SEEE-471P	**Title : Industrial Electric Drives Lab**

Course Objectives: The objectives of studying this course is,

1. Students will be able to learn simulations experiments on introduction to PLC, introduction to digital I/O interface to PLC and ladder logic and applications of PLC.
2. To impart knowledge about fundamentals of Electric drives and control, operational strategies of dc and ac motor drives as per different quadrant operations.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 3 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	Introduction to PLC and Introduction to digital I/O interface to PLC	03
Practical-2	Introduction to ladder logic	03
Practical-3	PLC On-Delay Timer Instruction	03
Practical-4	PLC Off-Delay Timer Instruction	03
Practical-5	PLC Count-Up instruction	03
Practical-6	PLC Count-Down instruction	03
Practical-7	Garage Shutter Opening and Closing Using PLC	03
Practical-8	Container Filling Process Using PLC	03

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Industrial Electric Drives Lab deals with the simulations experiments on introduction to Programmable Logic Controller (PLC).
2. Introduction to digital I/O interface to PLC and ladder logic and, applications of PLC.
3. Student should be able to understand the design concepts of transformers and know about how to design the parts
4. To apply their knowledge to prepare control schemes as per different types of motors used in industries.
5. To estimate & solve harmonic and power factor related problems in controlling AC and DC drives.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: IV / Semester: VII

Programme: UG **Class: B-Tech (EE)**	Year: IV Semester: VII
Credits Theory: 0 Practical: 4	**Subject: : Minor Project**
Course Code:SEEE-472P	**Title : Minor Project**
Course Objectives: Submit the Minor Project Report, Study Literature Review, Completion of the results, discussion for final project.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:50% Marks /4	
L: 0 T: 0 P: 8 (In Hours/Week) Theory - 0 Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)	

Unit	Contents	No. of Lectures Allotted
	1. Complation of the project 2. Submission of the project report	

If the course is available as Generic Elective then the students of following departments may opt it.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Internal	40
2) External	60
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. Project report serve as a well documented of the project which offering a reference for the future researchers.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: IV / Semester: VII

Programme: UG **Class: B-Tech (EE)**	Year: IV Semester: VII
Credits Theory: 0 Practical: 2	**Subject: : Internship**
Course Code:SEEE-474P	**Title : Internship**
Course Objectives: Submit the training Report	
Nature of Paper: Core	
Minimum Passing Marks/Credits:50% Marks /2	
L: 0 T: 0 P: 2 (In Hours/Week) Theory - 0 Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)	

Unit	**Contents**	**No. of Lectures Allotted**
	Complation of the training report Submission of the training report	

If the course is available as Generic Elective then the students of following departments may opt it.NA

Evaluation/Assessment Methodology

	Max. Marks
Internal	100
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
Training report serve as a well documented of the project which offering a reference for the future researchers.

Format-3

IIMTU- NEPIMPLEMENTATION
Year: IV / Semester: VIII

Programme: UG **Class: B-Tech (EE)**	**Year: IV** **Semester: VIII**
Credits **Theory: 4** **Practical: 0**	**Subject: Electric Drives**
Course Code: SDEE-481	**Title : Electric Drives**

Course Objectives: The objectives of studying this course are,

1. To acquire a comprehensive knowledge on drives, digital control and applications of electric drives.
2. To provide strong foundation to asses performance of different industrial drives considering issues such as, energy efficiency, power quality, economic justification, environmental issues, and practical viabilities
3. To familiarize the operation principles, and design of starting, braking, and speed control arrangements for electric motors and their applications.
4. To familiarize the operation principles, and design of starting, braking, and speed control

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 6
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	**Introduction**: Electric Drives and its parts, advantages of electric drives, Classification of electric drives, Speed- torque conventions and multi-quadrant operations, Constant torque and constant power operation, Types of loads, Load torque: components, nature and classification.	09
II	**Dynamics of Electric Drive:** Dynamics of motor-load combination, Steady state stability of Electric Drive, Transient stability of electric drive; Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty., Load	09
III	**Electric Braking:** Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors, Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking.	09

IV	**Power Electronic Control of DC Drives:** Single phase and three phase-controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited dc motor and dc series motor.	09
V	**Power Electronic Control of AC Drives:** Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cycloconverter based) static rotor resistance and slip power recovery control schemes. Three Phase Synchronous motor: Self-controlled scheme. Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications.	09

If the course is available as Generic Elective, then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1	Understand the operation of electric drives and its classification.
CO2	Select a motor on the basis of power rating
CO3	Understand the concept of electric braking
CO4	Understand Power Electronic Control of DC/AC Drives
CO5	Identify the critical areas in application levels, and derive typical solutions.
CO6	Gain knowledge about the working principle ofPower Electronic Control of AC Drives:

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV /Semester: VIII

Programme: UG **Class: B-Tech (EE)**	Year: IV Semester: VIII
Credits Theory: 4 Practical: 0	**Subject: Analog & Digital Communication**
Course Code: SDEE-482	**Title : Analog & Digital Communication**

Course Objectives: The objectives of studying this course are,
1. To develop ability to analyze system requirements of analogue and digital communication systems.
2. To understand the generation, detection of various analogue and digital modulation techniques.
3. Analyze the pass band data transmission techniques in terms of probability of error.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 6
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	**Amplitude Modulation:** Elements of communication system and its limitations, Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, Super heterodyne Receiver, IF amplifiers, AGC circuits, Frequency Division	09
II	**Angle Modulation:** Angle Modulation: Basic definition, Narrow-Band and wideband frequency modulation, transmission bandwidth of FM signals, Generation and detection of frequency modulation, Generation and detection of Phase Modulation. Noise: External noise, internal noise, noise calculations, signal to noise ratio.	09
III	**Pulse Modulation:** Introduction, sampling process, Analog Pulse Modulation Systems, Pulse Amplitude Modulation (PAM), Pulse width modulation (PWM) and Pulse Position Modulation (PPM). **Waveform coding Techniques:** Discretization in time and amplitude, Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation and Adaptive Delta Modulation.	09
IV	**Digital Modulation Techniques:** Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, coherent and non-coherent methods for the generation of ASK, FSK and PSK.	09

V	**Time Division Multiplexing:** Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques. **Introduction to Information Theory:** Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, Shannan Fano coding.	09

If the course is available as Generic Elective, then the students of following departments may opt it. **Not applicable**

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1. Understand the concepts of analog modulation and demodulation techniques.
CO2. Learn the function of radio transmitters and receivers and familiarize with noise performance of various receivers.
CO3. Understand various digital modulation schemes.
CO4. Understand and analyze various digital pass band data transmission schemes.
CO5. Understanding data transmission using spread spectrum and error coding techniques.
CO6. Identify the critical areas in Digital Modulation Techniques.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester: VIII

Programme: UG **Class: B-Tech (EE)**	**Year: IV** **Semester: VIII**
Credits **Theory: 4** **Practical: 0**	**Subject: Fundamental of Electric Vehicles**
Course Code: SDEE-483	**Title : Fundamental of Electric Vehicles**

Course Objectives: The objectives of studying this course are,
1. To acquire knowledge on the fundamental concepts, principles, and analysis of hybrid electric vehicles.
2. Electric vehicles are more efficient, and that combined with the electricity cost means that charging an electric vehicle is cheaper than filling petrol or diesel for your travel requirements.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 6
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	Components, vehicle mechanics, Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion, Propulsion System Design.	09
II	Basics: Types, Parameters, Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Technical characteristics, Battery pack Design, Properties of Batteries	09
III	Motor and Engine rating, Requirements, DC machines, three phase A/c machines, Induction machines, permanent magnet machines, switched reluctance machines.	09
IV	Transmission configuration, Components: gears, differential, clutch, brakes regenerative braking, motor sizing.	09
V	Types: series, parallel and series-parallel configuration, Design, Drive train, sizing of components.	09

If the course is available as Generic Elective, then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
2) Assignments 3) Research Project Report Seminar On Research Project Report	20
4) ESE	100
Total:	150

BOS

Prerequisites for the course:	
Course Learning Outcomes: After undergoing this course, the students will be able to:	
CO1	Understand the fundamental concepts and techniques used in electric vehicles (EVs).
CO2	Understand basic principle, operation and performance of EVs.
CO3	Interpret working of different configurations of electric vehicles and its components, hybrid vehicle configuration, performance analysis and Energy Management strategies in HEVs.
CO4	Explain the use of different energy storage devices used for hybrid electric vehicles, their technologies and control and select appropriate technology
CO5	Analyze the use of different power electronics devices and electrical machines in hybrid electric vehicles.
CO6	Understand basic of transmission configuration.

IIMTU-NEP IMPLEMENTATION
Year: IV /Semester: VIII

Programme: UG **Class: B-Tech (EE)**	**Year: IV** **Semester: VIII**
Credits **Theory: 4** **Practical: 0**	**Subject: Bio-Medical Instrumentation**
Course Code: SDEE-484	**Title : Bio-Medical Instrumentation**
Course Objectives: The objectives of studying this course are, 1. Analyze the scopes and roles of Biomedical Engineering. 2. Utilize biomedical instrumentation modules 3. Gain the knowledge about Biomedical Engineering	
Nature of Paper: DSE	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0(In Hours/Week) Theory - 6 Practical- NIL	

Unit	Contents	No. of Lectures
I	Introduction to Biomedical Instrumentation: Problems encountered in measurements of living systems, Block diagram of Biomedical Instrumentation System & its components and Biomaterials for medical instrument applications. Transducers use for biomedical applications. Bio electric potential: Genesis, Propagation and Distribution (ECG, EEG and EMG).	09
II	Bio-potential Electrodes: Basic types: Micro, Skin surface and needle electrodes and Biochemical transducers: Blood gas, PH and specific ions electrodes. The cardiovascular system and measurements: Heart and cardiovascular system and its block diagram, Blood pressure, Blood flow & Heart sound characteristics and their measurements. Electrocardiography, ECG leads configurations and recordings of ECG.	09
III	The Nervous System: The anatomy of nervous system, Neuronal communication, EPSP & IPSP. Electroencephalogram characteristic features, Measurement scheme for EEG and 10-20 electrode configuration system. Human Body & Skin Temperature Measurement: Temperature measurements using infrared sensors and other sensors, Ultrasonic measurements and its applications in Blood flow measurement and soft tissue imaging.	09
IV	Automation of biochemical tests, Instrumentation for X- Ray Machine, CAT, Interfacing of computer with medical instrument, MRI imaging and its applications in biomedical engineering.	09

V	Patient care monitoring: Elements of intensive care unit, Organization of the Hospital for patient-care monitoring, Pace-maker systems, their types and modes, Defibrillators and their types. Shock hazards from electrical equipment and safety measures. Bio-telemetry and its applications in patient care and sports.	09

If the course is available as Generic Elective, then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1. Understand the physiological system of the body and also an understanding on the generation of various bioelectric signals like ECG, EEG and EMG, their characteristic features and concepts of transduction.
CO2. Remember the various techniques and clinical instruments available for the measurement of various physiological parameters.
CO3. Apply the various techniques and clinical instruments available for the measurement of various Nervous system parameters
CO4. Evaluate fundamentals of medical instrumentation along with their working principle.
CO5. Differentiate patient monitoring system, there types and safety hazards
CO6. Understand the bio-telemetry and its applications in patient care and sports.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV /Semester: VIII

<table>
<tr><td colspan="2">Programme: UG
Class: B-Tech (EE)</td><td colspan="2">Year: IV
Semester: VIII</td></tr>
<tr><td colspan="2">Credits
Theory: 0
Practical: 10</td><td colspan="2">Subject: : Major Project</td></tr>
<tr><td colspan="2">Course Code:SEEE-481P</td><td colspan="2">Title : Major Project</td></tr>
<tr><td colspan="4">Course Objectives: Completinon of the results, discussion and conclusion of the final project report.</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits:50% Marks /10</td></tr>
<tr><td colspan="4">L: 0
T: 0
P: 16 (In Hours/Week)
Theory - 0
Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td></td><td colspan="2">1. Complation of the project
2. Submission of the project report</td><td></td></tr>
<tr><td colspan="4">If the course is available as Generic Elective then the students of following departments may opt it.NA</td></tr>
<tr><td colspan="4" align="center">Evaluation/Assessment Methodology</td></tr>
<tr><td colspan="4" align="right">Max. Marks</td></tr>
<tr><td colspan="3">1) Internal
2) External</td><td>100
150</td></tr>
<tr><td colspan="3" align="right">Total:</td><td>250</td></tr>
<tr><td colspan="4">Prerequisites for the course:</td></tr>
<tr><td colspan="4">Course Learning Outcomes:
1. Project report serve as a well documented of the project which offering a reference for the future researchers.</td></tr>
</table>

**ENGINEERING SCIENCE ELECTIVES
(Effective from session 2022-23)

S. No	Subject Code	Subject Name	Evaluation Scheme								Total Marks	Credits
			Periods			Internal Marks			External Marks			
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-231/ SESB-241	Engineering Mechanics	3	1	0	30	20	0	100	0	150	4
2	SESB-232/ SESB-242	Material Science	3	1	0	30	20	0	100	0	150	4
3	SESB-233/ SESB-243	Energy Science & Engineering	3	1	0	30	20	0	100	0	150	4
4	SESB-234/ SESB-244	Sensor & Instrumentation	3	1	0	30	20	0	100	0	150	4
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	3	1	0	30	20	0	100	0	150	4
6	SESB-236/ SESB-246	Introduction to Soft Computing	3	1	0	30	20	0	100	0	150	4
7	SESB-237/ SESB-247	Analog Electronics Circuits	3	1	0	30	20	0	100	0	150	4
8	SESB-238/ SESB-248	Electronics Engineering	3	1	0	30	20	0	100	0	150	4
9	SESB-239/ SESB-249	Digital Electronics	3	1	0	30	20	0	100	0	150	4

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II /Semester: III

Programme: UG **Class: B-Tech (EE)**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject:** Energy Science and Engineering
Course Code:SESB-233	**Title:** Energy Science and Engineering
Course Objectives: 1. To develop a strong foundation of concept of Energy and its units 2. To familiarize with Conventional & non-conventional energy source. 3. To introduce the various Systems and Synthesis.	
Nature of Paper: ESE	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Energy and its Usage: Units and scales of energy use, Mechanical energy and transport, Heat energy: Conversion between heat and mechanical energy, Electromagnetic energy: Storage, conversion, transmission and radiation, Introduction to the quantum, energy quantization, Energy in chemical systems and processes, flow of CO2, Entropy and temperature, carnot and Stirling heat engines, Phase change energy conversion, refrigeration and heat pumps, Internal combustion engines, Steam and gas power cycles, the physics of power plants. Solid-state phenomena including photo, thermal and electrical aspects	**8L**
II	**Nuclear Energy:** Fundamental forces in the universe, Quantum mechanics relevant for nuclear physics, Nuclear forces, energy scales and structure, Nuclear binding energy systematics, reactions and decays, Nuclear fusion, Nuclear fission and fission reactor physics, Nuclear fission reactor design, safety, operation and fuel cycles.	**8L**
III	**Solar Energy:** Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, Basic physics of semiconductors, Carrier transport, generation and recombination in semiconductors, Semiconductor junctions: metal-semiconductor junction & p-n junction, Essential characteristics of solar photovoltaic devices, First Generation Solar Cells, Second Generation Solar Cells, Third Generation Solar Cells	**8L**
IV	**Conventional & non-conventional energy source:** Biological energy sources and fossil fuels, Fluid dynamics and power in the wind, available resources, fluids, viscosity, types of fluid flow, lift, Wind turbine dynamics and design,	**8L**

	wind farms, Geothermal power and ocean thermal energy conversion, Tidal/wave/hydro power.	
V	**Systems and Synthesis:** Overview of World Energy Scenario, Nuclear radiation, fuel cycles, waste and proliferation, Climate change, Energy storage, Energy conservation. Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts, LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption	**8L**

Reference/Text Books

1. Energy and the Challenge of Sustainability, World Energy Assessment, UNDP, New York, (2000).
2. Perspective of Modern Physics, A. Beiser, McGraw-Hill International Editions (1968).
3. Introduction to Modern Physics, H.S. Mani and G.K.Mehta, East-West Press (1988).
4. Introduction to Electrodynamics, D. J. Griffiths, Fourth Edition, Prentice Hall (2013).
5. Introductory Nuclear Physics, R. K. Puri and V.K. Babbar, Narosa Publishing House (1996).
6. Physics of Solar Cells: From Basic Principles to Advanced Concepts by Peter Wurfel, John Wiley & Sons, 2016
7. Principles of Solar Engineering, D.Y. Goswami, F.Kreith and J.F. Kreider, Taylor and Francis, Philadelphia, 2000.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3)Assignments	20
4)Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of Energy and its Usage
CO2 Understand the concept of Nuclear Energy.
CO3 Understand the concept of solar Energy
CO4 Understand the Principles of Conventional & non-conventional energy source
CO5 Principles of various Systems and Synthesis

IIMTU-NEP IMPLEMENTATION
Year: II /Semester: III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject: Sensor and Instrumentation**
Course Code: SESB-234	**Title : Sensor and Instrumentation**

Course Objectives: The objectives of studying this course are,

1. Apply the use of sensors for measurement of displacement, force and pressure.
2. Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
3. Demonstrate the use of virtual instrumentation in automation industries.
4. Identify and use data acquisition methods.
5. Comprehend intelligent instrumentation in industrial automation.

Nature of Paper: ESE

Minimum Passing Marks/Credits:40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, and Measurement of **pressure** using LVDT based diaphragm & piezoelectric sensor.	09
II	Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.	09
III	Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs, Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation.	09
IV	Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R Ladder type, Use of Data Sockets for Networked Communication.	09

V	Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.	09

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:
After undergoing this course, the students will be able to:

1. Apply the use of sensors for measurement of displacement, force and pressure.
2. Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
3. Demonstrate the use of virtual instrumentation in automation industries.
4. Identify and use data acquisition methods.
5. Comprehend intelligent instrumentation in industrial automation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II /Semester: IV

Programme: UG **Class: B-Tech (EE)**	**Year:III** **Semester: IV**
Credits **Theory: 4** **Practical:0**	**Subject: Electronics Engineering**
Course Code:SESB-238	**Title: Electronics Engineering**

Course Objectives: The students will learn

1. Understand the operation, characteristics, parameters and specifications of semiconductor diodes 2.To present the electronics applications in diode systems
2. Discuss the operation and performance of important applications of diodes, Special Diodes.Understand Operational amplifiers
3. Explain the bipolar and field-effect transistor construction, operation, characteristics
4. Learn the basics of op-amp, its characteristics, circuit model.
5. Build a circuit, then make functional measurements to understand the operating characteristics of the device / circuit

Nature of Paper: ESE

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Basic semiconductor theory**: Intrinsic & extrinsic semiconductors, Current flow in semiconductors, PN junction theory: Equilibrium PN junction, Reverse biased PN junction, Forward biased PN junction, Current-Voltage relationship, Calculation of depletion width, potential barrier, diode current, Capacitive effects in PN junction, Energy band structure, Zener diode, Zener diodes breakdown mechanism (Zener and avalanche).	(L-9)
II	**Diode Circuits:** half and full wave rectification, clippers, clampers, Zener diode voltage regulator, Voltage multipliers, special purpose two terminal devices : light-emitting diodes, Varactor (Varicap) diodes, tunnel diodes, liquid crystal displays.	(L-9)
III	**Bipolar Junction Transistors**: Physical structure and device operation of BJT, operation, amplification action, common base, common emitter, common collector configuration, dc biasing BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration, BJT circuit models (h-parameter parameter). **Field-Effect Transistors**: Construction and characteristic of JFETs. AC analysis of CS amplifier, MOSFET (depletion and enhancement) type, transfer characteristic.	(L-9)

IV	**Operational amplifiers**: Introduction and block diagram of Op-Amp, ideal & practical characteristics of Op-Amp, differential amplifier circuits, practical Op-Amp circuits (inverting amplifier, non-inverting amplifier, unity gain amplifier, summing amplifier, integrator, differentiator), OpAmp parameters: input offset voltage, output offset voltage, input biased current, input offset current differential and common-mode operation.	(L-9)
V	**Electronic instrumentation and measurements**: Digital voltmeter: Introduction, RAMP techniques digital multimeters: Introduction Oscilloscope: introduction, basic principle, CRT, block diagram of oscilloscope, simple, measurement of voltage, current phase and frequency using CRO, introduction of digital storage oscilloscope and comparison of DSO with analog oscilloscope.	(L-9)

Reference / Text Books:

1. Robert L. Boylestand / Louis Nashelsky, "Electronic Devices and Circuit Theory," LatestEdition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.
3. Meetidehran/ A.K. singh "fundamental of electronics Engineering", New ageinternational publisher.

If the course is available as Generic Elective then the students of following departments may opt it.
- NA

Evaluation/Assessment Methodology

Max. Marks

1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the concept of PN junction and special purpose diodes.
2. Study the application of conventional diode and semiconductor diode.
3. Analyse the I-V characteristics of BJT and FET.
4. Analyzethe of Op-Amp, amplifiers, integrator, and differentiator.
5. Understand the concept of digital storage oscilloscope and compare of DSO with analogoscilloscope

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II /Semester: IV

Programme: UG **Class: B-Tech (EE)**	**Year:III** **Semester: IV**
Credits **Theory: 4** **Practical:0**	**Subject: Digital Electronics**
Course Code:SESB-239	**Title: Digital Electronics**

Course Objectives: The students will learn

1. To develop a strong foundation in analysis, design and implementation of digital electronic circuits
2. To present the Digital fundamentals, Boolean algebra and its applications in digital systems
3. To familiarize with the design of various combinational digital circuits using logic gates
4. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
5. To introduce the fundamentals of digital logic families.

Nature of Paper: ESE

Minimum Passing Marks/ Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Digital System and Binary Numbers**: Number System and its arithmetic, Signed binary numbers, Binary codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc Clusky method (Tabular method).	(L-9)
II	Combinational Circuits: Analysis & Design procedure, Binary Adder, Subtractor, n-bit parallel Adder & Subtractor, Magnitude Comparator, Multiplexers, Demultiplexer, Decoders, Encoders.	(L-9)
III	Sequential Logic: Flip-flop and Latch, SR latch, JK flip-flop, T flip-flop, D flip-flop, Master-slave JK flip-flop, Flip Flop Conversion, Registers & Counters: Shift registers (SISO, SIPO, PISO, PIPO), Counters: Asynchronous/Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.	(L-9)
IV	Digital Logic Families: DTL, TTL, ECL & Metal Oxide Semiconductor logic families: N- MOS, P-MOS and CMOS logic circuits, Fan Out, Fan in, Noise Margin.	(L-9)
V	**Memory & Programmable Logic Devices:** RAM, ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Circuit Implementation using ROM, PLA and PAL.	(L-9)

Reference / Text Books:

1. *M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.*
2. *David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.*
3. *RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.*
4. *Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5th Edition, 2010.*

If the course is available as Generic Elective then the students of following departments may opt it.
- NA

Evaluation/Assessment Methodology

Max. Marks

1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

After completing the course, students should be able to:

1. Understand the concept of number system, Logic Gates, Boolean algebra, K-map and Quine Mclusky method
2. Design combinational and sequential logic circuits and their applications
3. Understand concepts of Synchronous & Asynchronous Sequential Circuits
4. Understand the idea of Digital Logic Families, memory and Programmable Logic Devices
5. To develop a strong foundation in analysis, design and implementation of digital electronic circuits.
6. To introduce the fundamentals of digital logic families.

Format-3

ENGINEERING SCIENCE ELECTIVES
IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 3** **Practical: 0**	**Subject: Material Science**
Course Code: SEME-231	**Title : Material Science**

Course Objectives: The objectives of studying this course are,

1. To reinstate the Solid solutions – Hume Rothery's rules – the phase rule – single component system
2. To focus on iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels
3. To lay down Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip
4. To suggest Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials
5. To indicate Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics
6. To suggest shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/ Credits: 40% Marks/ 4

L: 3
T: 0
P: 0(In Hours/Week)
Theory - 0
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	Phase Diagrams: Solid solutions – Hume Rothery's rules – the phase rule – single component system – one-component system of iron – binary phase diagrams – isomorphous systems – the tie-line rule – the lever rule – application to isomorphous system – eutectic phase diagram – peritectic phase diagram – other invariant reactions – free energy composition curves for binary systems – microstructural change during cooling.	09
II	Ferrous Alloys: The iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels – eutectoid steel, hypo and hypereutectoid steels – effect of alloying elements on the Fe-C system – diffusion in solids – Fick's laws – phase transformations – T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations – tempering of martensite – steels – stainless steels – cast irons.	09
III	Mechanical Properties: Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip – strengthening methods – strain	09

	hardening – refinement of the grain size – solid solution strengthening – precipitation hardening – creep resistance – creep curves – mechanisms of creep – creep-resistant materials – fracture – the Griffith criterion – critical stress intensity factor and its determination – fatigue failure – fatigue tests – methods of increasing fatigue life – hardness – Rockwell and Brinell hardness – Knoop and Vickers microhardness.	
IV	Magnetic, Dielectric & Superconducting Materials: Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites – dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization – dielectric breakdown – insulating materials – Ferroelectric materials – superconducting materials and their properties.	09
V	New Materials: Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications – shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:

1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where ‘rights’ enjoy and ‘wrongs’ are discouraged.
6. Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B-Tech (EE)**	**Year: II** **Semester: III**
Credits **Theory: 3** **Practical: 0**	**Subject: Engineering Mechanics**
Course Code: SESB-231-SESB-249	**Title : Engineering Mechanics**

Course Objectives: The objectives of studying this course are,

1. To reinstate Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel positionthe Solid solutions – Hume Rothery's rules – the phase rule – single component system
2. To focus on shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.
3. To lay down Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem.
4. To suggest plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.
5. To indicate normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants.

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 0
P: 0(In Hours/Week)
Theory - 0
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium. Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.	09
II	Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams. Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.	09
III	Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.	09

IV	Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity. Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.	09
V	Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy. Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections. Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where 'rights' enjoy and 'wrongs' are discouraged.
6. Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (EE)**	Year: II Semester: IV
Credits Theory: 4 Practical:2	**Subject:** Basic Data Structure & Algorithm
Course Code: SESB-235/245	**Title:** Basic Data Structure & Algorithm

Course Objectives:

- Acquire some basic mathematical tools and techniques of algorithm analysis.
- To familiarise with basic data structures and to develop the ability to choose the appropriate data structure for designing efficient algorithms.
- Learn some basic algorithms with their rigorous proofs of correctness and efficiency analysis of implementation using appropriate data structures

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction to data structure and Algorithms: Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and Multi dimensional arrays, spare matrices, Character storing in C, String operations.	**8**
II	Stack And Queue and Link List: Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue , Priority Queue , D-Queue , Singly and circularly linked list, List operations Lists implementations	**8**
III	Trees : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree.	**8**
IV	Graphs: Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths.	**8**

V	Searching and Sorting: Linear search, binary Search, Internal and External sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices : Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting.	**8**

Reference / Text Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Weiss, "Data Structure & Algorithm Analysis in C", Addision Wesley.
4. Basse, "computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
5. Lipschutz, "Data structure, "Schaum series.
6. Aho, hopcropt, Ullman, "Data Structure & Algorithm", Addision Wesley.
7. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

- Understand and analyze the time and space complexity of an algorithm
- Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)
- Discuss various algorithm design techniques for developing Algorithms
- Discuss various searching, sorting and graph traversal Algorithms
- Understand operation on Queue, Priority Queue , D-Queue.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (EE)**	Year: II Semester: IV
Credits Theory: 4 Practical:2	**Subject:** Introduction to Soft Computing
Course Code: SESB-236/246	**Title:** Introduction to Soft Computing
Course Objectives:	
Nature of Paper: Engineering Science Elective	
Minimum Passing Marks/Credits: 40% Marks/4	
L:3 T:1 P:3(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Introduction to Soft Computing, ARTIFICIAL NEURAL NETWORKS Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network.	**8**
II	FUZZY SYSTEMS Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	**8**
III	NEURO - FUZZY MODELING Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation	**8**
IV	GENETIC ALGORITHMS Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method	**8**
V	APPLICATION OF SOFT COMPUTING Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques	**8**

Reference / Text Books:

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)

5. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
6. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
7. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
8. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
9. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
10. Wang, "Fuzzy Logic", Springer

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning,fuzzy inference systems, and fuzzy logic
- Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self learning situations.
- Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.
- Develop some familiarity with current research problems and research methods in Soft Computing Techniques

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

B.Tech: Electrical Engineering (IIIrd/IVth Semester/ SECOND Year)		
SESB-237/ SESB-247	**Analog Electronics Circuits**	**L T P C 3-1-0-4**
Course Objectives:	• The objectives of studying this course are,	
1.	• Analyse the frequency response of amplifier circuits	
2.	• Understand the characteristics of the various types of feedback configurations to be able to determine the type of feedback circuit	
3.	• Understand the principle of sine-wave oscillators, and to analyse and design various audio & radio frequency oscillator circuits.	
4.	• Learn the basics of op-amp, its characteristics, circuit model.	
	Detailed Syllabus	
Unit-I	**Diode circuits, amplifier models:** Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	**9L**
Unit-II	**High frequency transistor models,** frequency response of single stage and multistage amplifiers, cascode amplifier, various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	**9L**
Unit-III	**Oscillators:** Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.	**9L**
Unit-IV	**Current mirror:** Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	**9L**
Unit-V	**Op-Amp applications**: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines.	**9L**
Course Outcomes:	After studying the above course the student will be able to,	**Level**
CO-1	Understand the characteristics of diodes and transistors.	**K1, k2**

CO-2	Design and analyze various rectifier and amplifier circuits.	**k2**
CO-3	Design sinusoidal and non-sinusoidal oscillators.	**K3**
CO-4	Understand the functioning of OP-AMP and design OP-AMP based circuits.	**k2**
CO-5	Design LPF, HPF, BPF, BSF.	**K2**
Text Books:		
1.	J.V. Wait, L.P. Huelsman and GA Korn, "Introduction to Operational Amplifier theory and applications," McGraw Hill, 1992.	
2.	J. Millman and A. Grabel, "Microelectronics," 2ndedition, McGraw Hill, 1988.	
3.	P. Horowitz and W. Hill, "The Art of Electronics," 2ndedition, Cambridge University Press, 1989.	
Reference Books:		
1.	Paul R. Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits," John Wiley, 3rd edition	
2.	A.S. Sedra and K.C. Smith, "Microelectronic Circuits,"Saunder's College11 Publishing, 4 th edition.	

Evaluation Scheme

Bachelor of Technology (B.Tech) in Computer Science and Engineering

B.Tech (CSE)
FIRST YEAR, SEMESTER-I

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-111	Engineering Mathematics-I	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAS-113 / SEAS-112	Engineering Chemistry / Engineering Physics	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-111 / SEME-111	Learning Computers with Thinking & Programming in 'C' / Concepts of Mechanical Engineering & Mechatronics	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEE-111 / SEEC-111	Basic Electrical Engineering / Fundamentals of Electronics Engineering	3	1	0	30	20	0	100	0	**150**	**4**
5	PCE-111/ SEHU-112	Professional Communication/ Environmental Studies	3	0	0	10	5	0	35	0	**50**	**2**
6	SEAS-113P / SEAS-112P	Engineering Chemistry (Lab)/ Engineering Physics (Lab)	0	0	3	0	0	20	0	30	**50**	**2**
7	SECS-111 P/ SEME-111P	Learning Computers with Thinking & Programming in 'C' Lab / Engineering Graphics & Design Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEE-111P / SEEC-111P	Basic Electrical Engineering Lab/ Fundamentals of Electronics Engineering Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	PCE-111P/ SEME-112P	Professional Communication Lab / Engineering Workshop Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC -112*	University Social Responsibility - Community Outreach	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-111*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**12**	**130**	**85**	**80**	**435**	**120**	**850**	**26**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-112 & SPT-111 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Applied Science Courses(Core)	Engineering Mathematics-I, Engineering Chemistry / Engineering Physics
Common Engineering Courses (Core)	Learning Computers with Thinking & Programming in 'C' / Engineering Mechanics, Basic Electrical Engineering / Fundamentals of Electronics Engineering,
Skill Enhancement Courses	University Social Responsibility, SPORTS
Ability Enhancement Courses	Professional Communication/ Environmental Studies

B.Tech (CSE)
FIRST YEAR, SEMESTER-II

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-121	Engineering Mathematics-II	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAS-122 / SEAS-123	Engineering Physics / Engineering Chemistry	3	1	0	30	20	0	100	0	**150**	**4**
3	SEME-121 / SECS-121	Concepts of Mechanical Engineering & Mechatronics / Learning Computers with Thinking & Programming in 'C'	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEC-121 / SEEE-121	Fundamentals of Electronics Engineering / Basic Electrical Engineering	3	1	0	30	20	0	100	0	**150**	**4**
5	SEHU-122/ PCE-121	Environmental Studies / Professional Communication	3	0	0	10	5	0	35	0	**50**	**2**
6	SEAS-122P / SEAS-123P	Engineering Physics Lab / Engineering Chemistry lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SEME-121P / SECS-121 P	Engineering Graphics & Design Lab / Learning Computers with Thinking & Programming in 'C' Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEC-121P / SEEE-121P	Fundamentals of Electronics Engineering Lab / Basic Electrical Engineering Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEME-122P/ PCE-121P	Engineering Workshop Lab/ Professional Communication Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC -125	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
11	NECC-121*	Industrial Visit/Seminar on the report of visit	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
12	NECC -122*	University Social Responsibility - Community Outreach	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
13	SPT-121*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**14**	**130**	**85**	**130**	**435**	**120**	**900**	**28**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- External Practical, NC- Non Credit Course	
Note: NECC-121, NECC-122 & SPT-121 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits , social visits /awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Applied Science Courses(Core)	Engineering Mathematics-II, Engineering Physics/ Engineering Chemistry
Common Engineering Courses (Core)	Engineering Mechanics / Learning Computers with Thinking & Programming in 'C', Fundamentals of Electronics Engineering / Basic Electrical Engineering
Skill Enhancement Courses	Industrial Visit/Seminar on the report of visit, University Social Responsibility, MOOCS (SWAYAM/NPTEL), SPORTS
Ability Enhancement Courses	Environmental Studies / Professional Communication

B.Tech (CSE)
SECOND YEAR, SEMESTER-III

S. No	Subject Code	Subject Name	Evaluation Scheme								Total Marks	Credits
			Periods			Internal Marks			External Marks			
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-231	Engineering Mathematics-III	3	1	0	30	20	0	100	0	**150**	**4**
2	SECS-231	Data Structures	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-232	Computer Organization and Architecture	3	1	0	30	20	0	100	0	**150**	**4**
4	SECS-233	Operating System	3	1	0	30	20	0	100	0	**150**	**4**
5	STCS-239	Python Programming	3	0	0	10	5	0	35	0	**50**	**2**
6	SECS-231P	Data Structures using C Lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SECS-232P	Computer Organization and Architecture Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SECS-233P	Operating System Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	*NECC-232	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
10	*SPT-231	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**09**	**130**	**85**	**60**	**435**	**90**	**800**	**24**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-232 & SPT-231 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Applied Science Courses(Core)	Mathematics-III
Engineering Courses (Core)	Data Structures, Computer Organization and Architecture, Operating System and Python Programming.
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship / Mini Project Assessment, Python Programming

B.Tech (CSE)
SECOND YEAR, SEMESTER-IV

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-241-9	Engineering Science Electives**	3	1	0	30	20	0	100	0	**150**	**4**
2	SECS-241	Theory of Automata and Formal Languages	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-242	Software Engineering	3	1	0	30	20	0	100	0	**150**	**4**
4	SDCS-241-4	DSE-I	3	1	0	30	20	0	100	0	**150**	**4**
5		Generic Elective-I	4	0	0	30	20	0	100	0	**150**	**4**
6	SESB-241-9 P	Engineering Science Electives** Lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SECS-241P	Theory of Automata and Formal Languages Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SECS-242P	Software Engineering Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	NECC-245	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
10	NECC-242*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-241*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**16**	**04**	**11**	**150**	**100**	**110**	**500**	**90**	**950**	**28**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-241, NECC-242 & SPT-241 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of Industrial visits, social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Engineering Courses (Core)	1. Theory of Automata and Formal Languages 2. Software Engineering.
Discipline Specific Electives	1. Data Analytics 2. Web Designing 3. Computer Graphics 4. Object Oriented System Design using Java
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship / Mini Project Assessment, Python Programming, MOOCS (SWAYAM/NPTEL)

****ENGINEERING SCIENCE ELECTIVES**
(Effective from session 2022-23)

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-231/ SESB-241	Engineering Mechanics	3	1	0	30	20	0	100	0	150	4
2	SESB-232/ SESB-242	Material Science	3	1	0	30	20	0	100	0	150	4
3	SESB-233/ SESB-243	Energy Science & Engineering	3	1	0	30	20	0	100	0	150	4
4	SESB-234/ SESB-244	Sensor & Instrumentation	3	1	0	30	20	0	100	0	150	4
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	3	1	0	30	20	0	100	0	150	4
6	SESB-236/ SESB-246	Introduction to Soft Computing	3	1	0	30	20	0	100	0	150	4
7	SESB-237/ SESB-247	Analog Electronics Circuits	3	1	0	30	20	0	100	0	150	4
8	SESB-238/ SESB-248	Electronics Engineering	3	1	0	30	20	0	100	0	150	4
9	SESB-239/ SESB-249	Digital Electronics	3	1	0	30	20	0	100	0	150	4

S.No	SubjectCode	Subject Name	Remark
1	SESB-231/ SESB-241	Engineering Mechanics	Subject can be offered to any branch except ME/ CE/ AG and allied branches
2	SESB-232/ SESB-242	Material Science	
3	SESB-233/ SESB-243	Energy Science & Engineering	Subject can be offered to any branch except EE and allied branches
4	SESB-234/ SESB-244	Sensor & Instrumentation	
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	Subject can be offered to any branch except CSE and allied branches
6	SESB-236/ SESB-246	Introduction to Soft Computing	
7	SESB-237/ SESB-247	Analog Electronics Circuits	Subject can be offered to any branch except EC and allied branches
8	SESB-238/ SESB-248	Electronics Engineering	
9	SESB-239/ SESB-249	Digital Electronics	Subject can be offered to any branch except EC/ EE and allied branches

B.Tech(CSE)
THIRD YEAR, SEMESTER-V
STUDY & EVALUATION SCHEME

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SECS-351	Design and Analysis of Algorithm	3	1	0	30	20	0	100	0	**150**	**4**
2	SECS-352	Database Management System	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-353	Discrete Structures & Theory of Logic	3	1	0	30	20	0	100	0	**150**	**4**
4	SDCS-351-4	DSE-II	3	1	0	30	20	0	100	0	**150**	**4**
5	SECS-351P	Design and Analysis of Algorithm Lab	0	0	3	0	0	20	0	30	**50**	**2**
6	SECS-352P	Database Management System Lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SECS-353P	Discrete Structures & Theory of Logic Lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SECS-354P	Internship / Mini Project Assessment	0	0	2	0	0	50	0	0	**50**	**2**
9	NECC-351	Research Project I (Industry Training/Internship Survey)	*0*	*0*	*2*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
10	NECC-352	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-351	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**12**	**04**	**13**	**120**	**80**	**110**	**400**	**90**	**800**	**24**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non-Credit Course

*Note:NECC-351,NECC-352 & SPT-351 are Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Engineering Courses (Core)	1. Design and Analysis of Algorithm 2. Database Management System 3. Discrete Structures & Theory of Logic
Discipline Specific Elective-II	1. Machine Learning Techniques 2. Application of Soft Computing 3. Augmented & Virtual Reality 4. Human Computer Interface
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship / Mini Project Assessment,

B.Tech (CSE)
THIRD YEAR, SEMESTER-VI

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SECS-361	Computer Networks	3	1	0	30	20	0	100	0	**150**	**4**
2	SECS-362	Compiler Design	3	1	0	30	20	0	100	0	**150**	**4**
3	SDCS-361-4	DSE-III	3	1	0	30	20	0	100	0	**150**	**4**
4	UVE-601	Universal Human Values & Professional Ethics	*3*	*0*	*0*	*10*	*05*	*0*	*35*	*0*	***50***	***3***
5	SECS-361P	Computer Networks Lab	0	0	3	0	0	20	0	30	**50**	**2**
6	SECS-362P	Compiler Design Lab	0	0	3	0	0	20	0	30	**50**	**2**
7	SECS-363P	Mini Project	0	0	3	0	0	50	0	0	**50**	**2**
8	NECC-365	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
9	NECC-361	Research Project(Industry Training/ Internship Survey)	*0*	*0*	*2*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
10	NECC-362	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	*SPT-361	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**12**	**03**	**13**	**100**	**65**	**140**	**335**	**60**	**700**	**23**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-361, NECC-362 & SPT-361 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of Industrial visits, social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Engineering Courses (Core)	1.Computer Networks 2. Compiler Design
Discipline Specific Elective-III	1. Big Data 2. Image Processing 3. Real Time Systems 4. Data Compression
Ability Enhancement Courses	## Universal Human Values & Professional Ethics is a non-credit course (Audit Course)
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship / Mini Project Assessment, Python Programming, MOOCS (SWAYAM/NPTEL)

B.Tech (CSE)
FOURTH YEAR, SEMESTER-VII

S. No	Subject Code	Subject Name	Evaluation Scheme										
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SECS-471	Distributed Systems	3	1	0	30	20	0	100	0	**150**	**4**
2		GE-2	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-471P	Distributed Systems Lab	0	0	3	0	0	20	0	30	**50**	**2**
4	SECS-472P	Minor Project Lab	0	0	8	0	0	40	0	60	**100**	**4**
5	SECS-474P	Internship / Mini Project Assessment	0	0	2	0	0	50	0	0	**50**	**2**
6	NECC-475	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	**50**	**2**
7	NECC-472	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
8	SPT-471	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**06**	**02**	**15**	**60**	**40**	**160**	**200**	**90**	**550**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non-Credit Course

*Note: NECC-352 & SPT-351 is a Non-credit course (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Engineering Courses (Core)	1. Distributed Systems
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship / Mini Project Assessment, Minor Project Lab, Seminar/ Presentation

FOURTH YEAR, SEMESTER-VIII
STUDY & EVALUATION SCHEME

S. No	Subject Code	Subject Name	Evaluation Scheme										
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1		GE-3	3	1	0	30	20	0	100	0	**150**	**4**
2	SDCS-481-4	DSE-IV	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-481P	Major Project Lab	0	0	20	0	0	100	0	150	**250**	**10**
		Grand Total	**06**	**02**	**20**	**60**	**40**	**100**	**200**	**150**	**550**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non-Credit Course

*Note: NECC-352 & SPT-351 is a Non-credit course (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Discipline Specific Elective-IV	1. Mobile Computing 2. Internet of Things 3. Cloud Computing 4. Block chain Architecture Design
Skill Enhancement Courses	Major Project Lab

Annexure 1

Program: B.Tech (CSE)

Program Outcomes (P0S):

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Annexure 2

Program: B.Tech (CSE)

Program Specific Outcomes (PSOs):

1. Enabling students to learn continuously and to provide effective answers to new computational issues.

2. Understand analyze data and create software to create computer-based systems of varying complexity that are designed effectively.

Format-2

Format-2

IIMTU-NEP Implementation: (B.Tech (CSE))

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES inB.Tech (CSE)	FIRST YEAR (54 Cr.)	SEMESTER -I (26 Cr.)	i) C1 (Th.4 Cr.) ii) AECC-1 (Th.2Cr + P 2Cr.)	4 2 2	4 3 3	40 40 24	Engineering Mathematics –I Professional Communication Professional Communication Lab	5 5		
			i) C2(Th.4 Cr.+ P 2 Cr).	4 2	4 3	40 24	Engineering Chemistry Engineering Chemistry (Lab)	5		
			i)C3 (Th.4 Cr.+ P 2Cr.)	4 2	4 3	50 24	Learning Computers with Thinking and Programming in C Learning Computers with Thinking and Programming in C lab	5		
			i) C4 (Th.4 Cr.+ P 2Cr.)	4 2	4 3	45 24	Basic Electrical Engineering Basic Electrical Engineering Lab	5		
		SEMESTER – II (28 Cr.)	i) C5 (Th.4 Cr.+ P 2 Cr.) ii) AECC-2(Th. 2 Cr.) iii) SEC-1(2 Cr.)	4 2 2 2	4 3 3 4	40 24 30 40	Engineering Mathematics –II Engineering Workshop Lab Environmental Studies MOOCS (Swayam/ NPTEL)	5 5		
			i) C6 (Th.4Cr. + P 2 Cr.)	4 2	4 3	40 24	Engineering Physics Engineering Physics Lab	5		
			i)C7 (Th.4 Cr.+P 2 Cr.)	4 2	4 3	43 24	Concepts of Mechanical Engineering & Mechatronics Engineering Graphics & Design Lab	5		
			i) C8 (Th.4Cr.+ P 2 Cr.)	4 2	4 3	45 24	Fundamentals of Electronics Engineering Fundamentals of Electronics Engineering Lab	5		

PO1-PO12 (Annexure- 1) **PSO1-**
PSO2(Annexure-2)

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR (52 Cr.)	**SEMESTER -III (24 Cr.)**	i) C9 (Th. 4 Cr. + P 2 Cr.) ii) SEC-2(2 Cr.)	4 2 2	4 3 3	48 36 36	Data Structures Data Structures using C Lab Python Programming	5		
			ii) C10 (Th. 4 Cr. + P 2 Cr.)	4 2	4 3	48 36	Computer Organization and Architecture Computer Organization and Architecture Lab	5		
			iii) C11 (Th. 4 Cr)	4	4	48	Engineering Mathematics-III	5		
			iv) C12 (Th. 4 Cr+ P 2 Cr.)	4 2	4 3	48 36	Operating System Operating System Lab	5 5		

		SEMESTER -IV (28 Cr.)	i) C13 (Th. 4 Cr. + P 2 Cr.) ii) SEC-3(2 Cr.) iii) DSE-1(Th.4 Cr.) iv) GE-1(Th. 4 Cr.)	4 2 2 4 4	4 3 3 4 4	48 36 36 48	Engineering Science Electives** (List is attached separately) Engineering Science Electives Lab MOOCS (Swayam/ NPTEL) 1. Data Analytics 2. Web Designing 3. Computer Graphics 4. Object Oriented System Design using Java ***#To be opted from other School***	5 5		
			ii) C14 (Th. 4 Cr. + P 2 Cr.)	4 2	4 3	48 36	Software Engineering Software Engineering Lab	5		
			iii) C15 (Th. 4 Cr+ P 2 Cr.)	4 2	4 3	48 36	Theory of Automata and Formal Languages Theory of Automata and Formal Languages Lab	5		

PO1-PO12 (Annexure- 1) **PSO1-PSO2**
(Annexure-2)

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	THIRD YEAR (47 Cr.)	SEMESTER -V (24 Cr.)	i) C16 (Th. 4 Cr. +P 2 Cr.) ii) SEC-4 iii) DSE-2	4 2 2 4	4 3 3 4	48 36 36 48	Design and Analysis of Algorithm Design and Analysis of Algorithm Lab Internship / Mini Project Assessment 1. Machine Learning Techniques 2. Application of Soft Computing 3. Augmented & Virtual Reality 4. Human Computer Interface	5 5		
			i) C17 (Th. 4 Cr. +P 2 Cr.)	4 2	4 3	48 36	Discrete Structures & Theory of Logic Discrete Structures & Theory of Logic Lab	5		
			i) C18 (Th. 4 Cr. +P 2 Cr.)	4 2	4 3	48 36	Database Management System Database Management System Lab			
		SEMESTER – VI (23 Cr.)	i) C19 (Th. 4 Cr. + P 2Cr.) ii) SEC-5(2 Cr.) iii) DSE-3(Th. 4 Cr.)	4 2 2 4	4 3 3 4	48 36 36 48	Computer Networks Computer NetworksLab MOOCS (Swayam/ NPTEL) 1.Big Data 2.Image Processing 3.Real Time Systems 4.Data Compression	5 5		
			i) C20 (Th. 4 Cr. + P 2 Cr.)	4 2	4 3	48 36	Compiler Design Compiler Design Lab	5		

			i) AECC-4 (Th. 3Cr) ii) SEC-6(P 2 Cr)	3 2	3 3	36 36	Universal Human Values & Professional Ethics Mini Project Lab	5		

PO1-PO12 (Annexure- 1) **PSO1-PSO2**
(Annexure-2)

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	FOURTH YEAR (36 Cr.)	SEMESTER -VII (18 Cr.)	i) C21 (Th. 4Cr. + 2 Cr.) ii) SEC-7 (2 Cr.) iii)GE-2(4 Cr.)	4 2 2 4	4 3 2 4	48 36 24 48	Distributed Systems Distributed Systems Lab MOOCS (SWAYAM/NPTEL) ***#To be opted from another School***	5		
			i) SEC-8(2 Cr.)	2	3	36	Internship			
			i) Research Project (Industrial Training/ Internship Survey)	4	8	120	Minor Project			

		SEMESTER – VIII (18 Cr.)	i) GE-3 (Th. 4Cr) ii) DSE-4(Th. 4 Cr.) iii) Research Project (Industrial Training/ Internship Survey)	4 4 10	4 4 30	48 48 360	***#To be opted from another School*** 1. Mobile Computing 2. Internet of Things 3. Cloud Computing 4. Block chain Architecture Design Major Project Lab	 5		

***Major Project report will be evaluated by external & internal examiners & Research topic may be selected from the main core paper**
*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

PO1-PO12 (Annexure- 1) **PSO1-PSO2**
(Annexure-2)

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I

Programme: UG **Class:** B.TECH (CSE)	Year: I Semester: I
Credits Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-I
Course Code:SEAS-111	**Title:** Engineering Mathematics-I

Course Objectives:

1. To apply the knowledge of differential calculus in the field of engineering.
2. To deal with functions of several variables that is essential in optimizing the results of real life problems.
3. To understand the essential tools of matrices and linear algebra, Eigen values and diagonalization in a Comprehensive manner are required.
4. To understand Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc.
5. To deal with vector calculus that is required in different branches of Engineering to graduate engineers.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T:1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**DIFFERENTIAL CALCULUS-I:** Successive Differentiation (nth order derivatives), Leibnitz theorem and its application. Curve tracing: Cartesian and Polar co-ordinates. Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions.	**8L**
II	**DIFFERENTIAL CALCULUS-II:** Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians.	**8L**
III	**MATRICES:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, System of linear equations, Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem and its application Diagonalisation of a Matrix	**8L**
IV	**INTEGRAL CALCULUS:** Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Application: Areas and volumes.	**8L**
V	**Vector Calculus:** Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem	**8L**

	(without proof) and their applications	

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3)Assignments	
4)Research Project ReportSeminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of differentiability and apply in the study of Successive differentiation, Leibnitz theorems and Partial differentiation.

CO2 Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.

CO3 Remember the concept of matrices and apply for solving linear simultaneous equations

CO4 Illustrate the working methods of multiple integral and apply for finding area, volume.

CO5 Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

CO6 Apply the concept of calculus in solving engineering problems

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-II

Programme: UG **Class:** B.TECH (CSE)	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-II
Course Code:SEAS-121	**Title:** Engineering Mathematics-II

Course Objectives:

1. To understand the effective mathematical tools for the solutions of differential equations that model physical processes
2. To get the idea of types of partial differential equations and their solutions.
3. To deal with applications of partial differential equations e.g. wave and heat equations.
4. To understand the concept of Laplace Transform and its application to solve differential and integral equations.
5. To be familiar with the concept and expansion of Fourier series.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**ORDINARY DIFFERENTIAL EQUATIONS:** Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation.	**8L**
II	**PARTIAL DIFFERENTIAL EQUATIONS:** Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.	**8L**
III	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**: Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension.	**8L**
IV	**LAPLACE TRANSFORM:** Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential	**8L**

	equations.	
V	**FOURIER SERIES:** Euler's Formulae, Functions having arbitrary periods,πPeriodic functions, Fourier series of period 2 Change of interval, Even and odd functions, Half range sine and cosine series.	**8L**

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments	30
4)Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1 Understand the concept of differentiation and apply for solving differential equations

CO2 Remember the concept of partial differential equation and to solve partial differential equations.

CO3 Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations

CO4 Understand the concept of Laplace Transform and apply for solving differential equations.

CO5 Remember &Understand the concept of Fourier Series.

CO6 Apply the concept of calculus in solving engineering problems

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH (CSE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Physics
Course Code:SEAS-112/122	**Title:** Engineering Physics

Course Objectives:
1. To Understand the concept of Relativistic Mechanics
2. To know the significance of Maxwell's equations in the Engineering applications of electromagnetic waves.
3. Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore.
4. To know the concept of Interference and Diffraction.
5. To Understand the Phenomenon of Polarization and Laser.

Nature of Paper: Core

Minimum Passing Marks/Credits: 60%Marks /4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Relativistic Mechanics:** Inertial and Non- Inertial Frames; Michelson-Morley Experiment; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Mass Energy Equivalence and Variation of Mass with Velocity.	**8L**
II	**Electromagnetic:** Gauss law Ampere's law and displacement current; Equation of continuity; Maxwell's equations in Integral and Differential Forms; Electromagnetic Wave Propagation in Free Space and Conducting Media; Poynting Theorem	**8L**
III	**Quantum Mechanics:** Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box.	**8L**
IV	**Wave Optics:** **Interference:** Basics of interference of light; Principle of superposition, coherent Sources, Conditions of Interference; Interference by division of wave front and amplitude (Fresnel's bi-prism, Interference due to thin film, Newton's Rings). **Diffraction:** Fraunhoffer Diffraction Due Single and N-slit; Diffraction Grating; Rayleigh's criterion of resolution; absent spectra, dispersive Power of grating, Resolving power of Grating.	**8L**

V	**Polarization:** Phenomenon of double refraction; Ordinary and extra-ordinary rays; Nicol Prism; quarter wave plate and half wave plate; Production and analysis of Plane, Circularly and Elliptically Polarized Light; Optical Activity; Specific Rotation, Laurent half's half shade Polari meter.	**8L**

Reference / Text Books:

Text Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

Reference Books:

1. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
2. Engineering Physics-Malik HK and Singh AK (McGrawHill)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 To describe the classical relativity and wave mechanics problems.
CO2 To demonstrate the electromagnetic waves and their application in various processes
CO3 To calculate and solve the engineering problems of quantum mechanics.
CO4 To evaluate and grade the engineering problems of wave optics.
CO5 To prepare the classical physics & to prepare the ideas in solving the problems in their parent streams.
CO6 To prepare the Production and analysis of Plane

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Physics Lab
Course Code:SEAS-112P/ SEAS-122 P	**Title:** Engineering PhysicsLab

Course Objectives: The objectives of studying this course are,
1. To understand the concept of wave length by the interference
2. To understand the concept of wave length by the diffraction.
3. To understand the concept of viscosity of liquid and flow of liquid.
4. To understand the energy band gap in the semiconductors.
5. To understand the concept of polarization.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 1

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To determine the wavelength of Sodium light by Newton's rings
Practical-2	To determine the wavelength of prominent lines of mercury by plane diffraction grating
Practical-3	To determine the focus length combination of two lenses separated by distance and verify the formula for the focal length of combination of lenses
Practical-4	To determine the wave length of sodium light with the help of Fresnel's bi-prism
Practical-5	To determine the coefficient of viscosity of a given liquid
Practical-6	To verify Stefan's law
Practical-7	Calibration of a volt meter with potentiometer
Practical-8	To determine the resistance per unit length and specific resistance of a given resistance using Carey Foster 's Bridge
Practical-9	To determine the energy bend gap of a given semiconductor material
Practical-10	To determine the Specific Rotation of the Cane sugar solution with the help of Polarimeter.

Reference / Text Books:

1. Practical Physics- K. K. Dey& B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics- Practical- Katiyar&Pandey (Wiley India)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.**To determine the wavelength of sodium light by Newton's ring experiment. **CO2.**To determine the wavelength of sodium light with the help of Fresnel's bi-prism. **CO3.**Understand measurement technology, usage of new instruments and real time applications in engineering studies. **CO4.**To determine the viscosity of liquid. **CO5.**To determine the emission of energy with respect the temperature and verify Stefan's law. **CO6.** To determine the calibration of potential and draw the curve.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Chemistry
Course Code:SEAS-113/123	**Title:** Engineering Chemistry

Course Objectives:

1. Student will be able to apply fundamental concepts of chemistry in different fields of Engineering.
2. Student will be able to identify compounds using different spectroscopic techniques
3. Student will be able to understand the basic principles of electrochemistry for different engineering applications
4. Student will be able to illustrate different types of impurities in water and its softening techniques
5. Student will be able to apply the concepts of determination of calorific values and analyze the coal
6. Student will be able to recall the basic knowledge of polymerization & and applications

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Atomic and Molecular Structure:** Molecular orbitals of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application	**8L**
II	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	**8L**
III	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system.	**8L**
IV	**Water Analysis:** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulon'smethos).	**8L**
V	**Polymers:** Basic concepts of Polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.	**8L**

Reference / Text Books:

Text Books:
1. University Chemistry ByB.H.Mahan
2. University Chemistry ByC.N.R.Rao
3. Organic Chemistry By I.L.Finar
4. Physical Chemistry By S.Glasstone
5. Engineering Chemistry By S.S.Dara
6. Polymer Chemistry By FreW.Billmeyer

Reference Books:
1. Elementary Organic Spectroscopy ByY.R.Sharma
2. Principles of Physical Chemistry By Puri, Sharma,Pathania
3. Principles of Inorganic Chemistry By Puri, Sharma,Kalia
4. Concise Inorganic Chemistry ByJ.D.Lee

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Apply fundamental concepts of chemistry in different fields of Engineering
CO2 Identify compounds using different spectroscopic techniques.
CO3 Understand the basic principles of electrochemistry for different engineering applications
CO4 Illustrate different types of impurities in water and its softening techniques
CO5 Apply the concepts of determination of calorific values and analyze the coal
CO6 Recall the basic knowledge of polymerization and its applications

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH (CSE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Chemistry Lab
Course Code: SEAS-113P/SEAS-123P	**Title:** Engineering Chemistry Lab

Course Objectives: The objectives of studying this course are,

1. Student will be able to Estimate different impurities present in water sample.
2. Student will be able to Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution
3. Student will be able to Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 1

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To determine total alkalinity in the given water sample.
Practical-2	To determine the temporary and permanent hardness in water sample using EDTA as standard solution.
Practical-3	To determine the available chlorine in bleaching powder solution.
Practical-4	To determine the chloride content in the given water sample by Mohr's method.
Practical-5	To determine the pH of the given solution using pH meter and pH-metric titration.
Practical-6	To determine the Equivalent weight of Iron by the chemical displacement method.
Practical-7	To determine the Viscosity of an addition polymer like polyester by Viscometer.
Practical-8	To find chemical oxygen demand of waste water sample by potassium dichromate
Practical-9	To determine the iron content in the given sample using external indicator
Practical-10	To determine the strength of given HCL solution by titrating against N/10 Standard Sodium hydroxide solution

Reference / Text Books:

1. Practical Chemistry B.Tech. Text Book, Dr. UshaNakra and Laxmi Kant Sharma Dr. VivekPandey, Dr. T. L. Rajawat, Dr. Sama Jain, Dr. Monika Sharma, Dr. Virendra Singh (Neelkanth Publishers(P) Ltd.)

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Analyze the need, design and perform a set of experiments.

CO2. Identify the structure of unknown/new compounds with the help of spectroscopy

CO3. Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.

CO4. Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution

CO5. Equipped with basic knowledge of polymer reinforced composites, applications of semiconductor photochemistry in energy harnessing and optical sensors.

CO6. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Learning Computers with Thinking and Programming in C
Course Code:SECS-111/121	**Title:** Learning Computers with Thinking and Programming in C

Course Objectives:

1. After studying this course students will be able to develop simple algorithms for arithmetic and logical problems.
2. After studying this course students will be able to translate the algorithms to programs &finally execution in C language.
3. After studying this course students will be able to implement conditional branching, iteration and recursion in C language.
4. After studying this course student will be able to decompose a problem into functions and synthesize a complete program using divide and conquer approach using C language.
5. After studying this course students will be able to use arrays, pointers and structures to develop algorithms and programs for implementation in C language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Programming basics.** Conceptual Introduction to components of a computer system i.e. Memory, processor, I/O Devices, storage, operating system. Understanding assembler, compiler, interpreter, loader and linker. Understanding Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics of C language**. Core Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.	**8L**
II	**Arithmetic expressions & Conditional Branching in C language**: Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator,	**8L**

	operator precedence and associatively. Conditional Branching: Applying if and switch statements, nesting of if and else, use of break and default with switch	
III	**Loops & Functions in C language:** Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.	**8L**
IV	**Arrays & Basic Algorithms in C language**: Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.	**8L**
V	**Pointer& File Handling in C language**: Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.	**8L**

Reference / Text Books:

Text Books:

1. Let Us C By Yashwant P. Kanetkar.
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.
3. Computer Basics and C Programming by V.Rajaraman, PHI Learning Pvt. Limited, 2015.

Reference Books:

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Programming in C by Kochan Stephen G. Pearson Education – 2015.
3. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
4. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
CO1 To understand the basic computer concepts and programming principles of C language.
CO2 To develop simple algorithms for arithmetic and logical problems.
CO3 To translate the algorithms to programs & execution (in C language).
CO4 To implement conditional branching, iteration and recursion.
CO5 To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO6 To use arrays, pointers and structures to develop algorithms and programs

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Learning Computers with Thinking and Programming in C Lab
Course Code:SECS-111 P/SECS-121P	**Title:** Learning Computers with Thinking and Programming in C Lab

Course Objectives: The objectives of studying this course are,

1. After studying the above course the student will be able to implement algorithms and draw flowcharts for solving easy and complex Mathematical as well as engineering problems..
2. After studying the above course the student will be able to, understand and demonstrate programming language concepts by implementing programs in C language.
3. After studying the above course the student will be able to, design and develop programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage in computer language C.
4. After studying the above course the student will be able to, able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures in C language which will be latter helpful in understanding the concept of object oriented programming in C++.
5. After studying the above course the student will be able to, develop confidence for self-learning and ability for life-long learning needed for learning any computer language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 1

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	**Contents**
Practical-1	Write a program to calculate the area of triangle using formula Area=√s(s- a)(s-b)(s-c) where s=(a+b+c)/2.
Practical-2	We input the basic salary of an employee through the keyboard. The Dearness allowance (DA) is25% of the basic salary while the house rent allowance (HRA) is 15% of the basic salary. While the provident fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA). Write a program in C to calculate the Net Salary.
Practical-3	Write a program in C to determine the roots of quadratic equation.
Practical-4	Write a program in C to find the largest of three numbers using the nested if else construct.
Practical-5	Write a program in C to receive marks of history, geography & civics from user& check its eligibility for course if a) Marks of history>40 b) Marks of geography>50

	c) Marks of civics>60 d) Total of history & civics marks>150 or Total of three subjects marks>200
Practical-6	Write a program in C to find the value of y for a particular value of n. The a, x, b, n is input by user if n=1 y=ax%b if n=2 y=ax2+b2 if n=3 y=a-bx ifn=4 y=a+x/b
Practical-7	Write a program in C to construct a Fibonacci series up to n terms.
Practical-8	Write a program in C to find whether the number is Armstrong number or not.
Practical-9	Write a programin C togeneratesumofseries1!+2!+3!+ n!
Practical-10	Write a program in C to find the sumoffollowingseries1-X1/1!+X2/2!-……Xn/n!.
Practical-11	Write a program in C to print the entire prime no between1and 500.
Practical-12	Write a program in C to print out all the Armstrong number between 50and 600.
Practical-13	Write a program in C to draw the following figure: 4 3 2 1 321 2 1 1
Practical-14	Writeaprogram in Ctoreceiveafive-digit no anddisplayas like12345: 1 2 3 4 5
Practical-15	Writea function in Cthatreturnsumofalltheevendigitsofagivenpositiveno entered through keyboard.
Practical-16	Writeaprogram in C toprintareaofa trapezium using function&returnitsvalue to main function.
Practical-17	Writeaprogram in Ctocalculatethefactorialforgivennumberusingfunction.
Practical-18	Writea program in CtofindsumofFibonacciseriesusingfunction.
Practical-19	Writeaprogramin C to findthefactorialofgivennumberusingrecursion.
Practical-20	Writeaprogram in Ctofindthesumofdigitsofa5digit number using recursion.
Practical-21	Writeaprogramin C tocalculatetheGCDofgivennumbersusingrecursion.
Practical-22	Writeaprogram in Ctoconvertdecimalnumberintobinarynumber.
Practical-23	Writeaprogramin C toconvertbinarynumberintodecimalnumber.
Practical-24	Writeaprogramin C todeleteduplicateelementina listof20elements& display it on screen.
Practical-25	Writeaprogram in Ctomergetwosortedarray&no element isrepeatedduringmerging.
Practical-26	Writeaprogram in C to evaluatetheadditionofdiagonalelementsoftwo square matrixes.
Practical-27	Writeaprogram in Ctofindthetransposeofagivenmatrix&checkwhether it is symmetric or not.
Practical-28	Writeaprogram in Cto print themultiplicationoftwoN*N (Square) matrix.

Practical-29	WriteaprograminCtocheckwhetherthegivenstringisapalindromeor not.
Practical-30	Writeprogram in Ctosortthearrayofcharacter (String) inalphabeticalorder like STRING in GNIRTS.
Practical-31	Writeaprogram in Ctoremovealltheblankspacefromthestring&print it, also count the no of characters.
Practical-32	Writeaprogram in Ctostorethefollowingstring“zero”,“one” ---------“five”. Printthenoinwords,giveninfigureas3205.
Practical-33	Write a program in C to compare two given dates. To store a date use a structurethatcontainsthreemembersnamelyday, monthandyear.Ifthe dates are equal then display message equal otherwise unequal.
Practical-34	WriteaCprogramtocopy&countthecharactercontentofonefilesays c.txt to another file d.txt.
Practical-35	Writeaprogram in Ctoprint alltheprimenumber,between2to 200ina file nameprime.txt.
Practical-36	WritethefollowingCprogramusingpointer: a) Tosortthelistofnumbersthroughpointer b) Toreversethestringthroughpointer.
Practical-37	Writeaprogram in Ctofindthe largest no among30 integersarrayusing dynamic memory allocation.
Practical-38	UsingDynamicMemoryAllocation, Writeaprogramin C to findthetranspose of given matrix.
Practical-39	Writeaprogram in Ctofindthefactorialofgivennumberusingcommand line argument.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Implementation of algorithms and drawing flowcharts for solving easy and complex Mathematical as well as Engineering problems.

CO2. Computer programming language concepts understanding and demonstration.

CO3. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

CO4. Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures.

CO5. Development of confidence for self-education and ability for life-long learning needed for Computer language.

CO6. Understand the basics of file handling mechanisms

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Concepts of Mechanical Engineering &Mechatronics
Course Code:SEME-111/121	**Title:** Concepts of Mechanical Engineering & Mechatronics

Course Objectives:
1. Acquire knowledge of various types of force system , free body diagram and equilibrium of body under various types of forces
2. Acquire knowledge of basic concepts of strength of materials, and statically determinate and indeterminate structures, simple beams subjected to various types of loading and plot shear force and bending moment diagrams
3. Acquire knowledge of the fundamentals of thermodynamics, temperature scales and various modes of heat transfer so that student will now begin to utilize these concepts in real-world applications
4. Acquire knowledge of various types of engines and its components, mechatronics with their advantages,
5. The learner will have a good understanding of the all-important basic technologies that are useful in daily activities

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks% /4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	**Contents**	**No. of Lectures Allotted**
I	**Force Systems**: Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Classification of forces & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces **Coplanar Concurrent Force system and Coplanar:** Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem.	**8L**
II	**Introduction to mechanics of solid:** Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety. Basic Numerical problems. Types of beams under various loads, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment. Basic Numerical problems	**8L**
III	**Basic concepts of thermodynamics**: Basic concepts, Concept of continuum, Microscopic and Macroscopic approach, Thermodynamic equilibrium, State and process, Reversible and Quasi-static process, Work,	

	Zeroth law, Concept of temperature and heat. First law of thermodynamics and its importance, **Second law of thermodynamics**: Kelvin Planck and Clausius statements, Heat engine, Refrigerator and Heat pump, Efficiency and COP, Thermodynamic temperature scale. **Heat transfer and its various modes**: Conduction, Convection and Radiation.	**8L**
IV	**Introduction to IC engines**: IC Engine: Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to electric, and hybrid electric vehicles	**8L**
V	**Introduction to mechatronics**: Evolution, Scope, Advantages and disadvantages of Mechatronics, Industrial applications of Mechatronics, Introduction to autotronics, bionics, and avionics and their applications. Sensors and Transducers: Types of sensors, types of transducers and their characteristics. **Overview of mechanical actuation system**: Kinematic Chains, Cam, Train Ratchet Mechanism, Gears and its type, Belt, Bearing. **Hydraulic and pneumatic actuation systems**: Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems	**8L**

Reference / Text Books:

Text Books:

1. Engineering Mechanics: Statics" , J.L Meriam , Wiley.
2. "Engineering Mechanics", Thimoshenko& Young , 4ed, Tata McGraw Hill.
3. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson.

Reference Books:

1. Engineering Mechanics", Dr Sadhu Singh , Umesh Publications.
2. "Engineering Mechanics", Bhavikatti , New Age.
3. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI.
4. Mechatronics : Principles, Concepts and Applications, NitaigourMahalik, McGraw Hill.
5. Mechatronics, As per AICTE: Integrated Mechanical Electronic Systems, K.P.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments	30
4)Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the basics of mechanics, construct free body diagrams and appropriate equilibrium equations.

CO2 Understand and draw shear force and bending moment diagram for a beam under different loading conditions

CO3 Understand the basic concepts of thermodynamics and their applications

CO4 Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump

CO5 Understand the concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation, hydraulic and pneumatic

CO6 Understand the analysis of different machine parts and working principal and future prospects of mechatronics fields.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:**B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Fundamentals of Electronics Engineering
Course Code: SEEC-111/121	**Title:** Fundamentals of Electronics Engineering
Course Objectives: 1. To develop a strong foundation of concept of PN Junction and solid state devices 2. To present the Operational amplifier and its applications 3. To familiarize with digital electronics & the design of various digital circuits using logic gates 4. To introduce the various communication systems	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Overview of Semiconductors**, PN junction Diode, Zener Diodes, Diode Application: Half and Full Wave rectification, Clippers, Clampers Special Purpose two terminal Devices: Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**8L**
II	**BJT**: Transistor Construction, Operation, Amplification action (Common Base, Common Emitter, Common Collector) **Field Effect Transistor:** Construction, Operation and Characteristic of JFET and MOSFET (Depletion and Enhancement) Type	**8L**
III	**OP AMP:** Introduction, Op-amp symbol, terminals, packages, Block diagram Representation of op-amp- Ideal opamp& practical op-amp – Open loop & closed loop configurations, characteristics of op-amp, Op-Amp Circuits: Inverting Amplifier, Non-inverting Amplifier, Voltage Follower, Summing Amplifier, scaling & averaging amplifiers, Integrator, Differentiator.	**8L**
IV	**Digital Electronics:** Number systems, Binary codes – Binary Arithmetic, Logic gates, Boolean algebra, laws and theorems, Simplification of Boolean expressions, Implementation of Boolean expressions using logic gates Standard forms of Boolean expression, K Map Minimization upto 4 Variables.	**8L**
V	**Fundamentals of Communication Engineering**: Block diagram of a basic communication system, Frequency spectrum, Need for modulation, Methods of modulation, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	**8L**

Reference / Text Books:

Text Books:

1. Robert L. Boylestand / Louis Nashelsky “Electronic Devices and Circuit Theory”, Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, “Basic Electrical and Electronics Engineering”, Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, “Electronic Communication Systems”, McGraw Publication

Reference Books:

1. David A. Bell, “Electronic Devices and Circuits”, Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, “Electronic Devices and Circuits”, McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford Uni Press India.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments	30
4)Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of PN Junction and devices.
CO2 Understand the concept of BJT, FET and MOFET
CO3 Understand the concept of Operational amplifier
CO4 Understand the Principles of digital electronics
CO5 Principles of various communication systems
CO6 Design rectifier & measure the waveform parameters

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Fundamentals of Electronics Engineering Lab
Course Code:SEEC-111P/ SEEC-121P	**Title:** : Fundamentals of Electronics Engineering Lab

Course Objectives: The objectives of studying this course are,
1. To introduce the concepts of electronic circuits and its components
2. To introduce the concepts of diodes & transistors
3. To impart the knowledge of various configurations, characteristics and applications.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 1

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
Practical-2	To verify the PN diode characteristics
Practical-3	To verify the Zener diode characteristics
Practical-4	To verify the BJT characteristics (either of the configurations)
Practical-5	Study of Logic Gate
Practical-6	Design and implementation of Adder and Subtractor using logic gates.
Practical-7	To determine the external characteristics of DC Shunt generator
Practical-8	Implement an Adder and Subtractor Circuit using Operational Amplifier
Practical-9	To study Full Wave Rectifier Circuit
Practical-10	Study of AM modulator and Demodulator

Reference / Text Books:

Text Books:
1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication

Reference Books:
1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** Conduct experiments illustrating the application of Fundamentals of semiconductor, electronic components/devices. **CO2**. Demonstrate the behavior of Principles of digital electronics. **CO3.** Apply the operation and discuss the performance of several fundamentally important op-amp circuits that have certain features or characteristics oriented to special applications. **CO4.** Analyze the concept with the working principles of forward and reverse bias characteristics. **CO5.** Demonstrate the basic skills in design and analysis of filter circuits, biasing circuits. **CO6.** Discriminate the principle, construction and operation of BJTs, FETs and MOSFETs.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Basic Electrical Engineering
Course Code:SEEE-111/121	**Title:** Basic Electrical Engineering
Course Objectives: 1. The objective of this course is to teach the students Introduction to Electrical Engineering 2. To understand the fundamental concept of Electrical Engineering like DC Network, AC Network, 3. Measuring Instruments, Energy Conversion Devices	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Circuit theory Concepts**-Mesh and nodal analysis; Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem; Star Delta transformation..	**8L**
II	Sinusoidal and phasor representation of voltage and current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel; Apparent, active & reactive powers, Power factor; Series and parallel resonance; Bandwidth and quality factor.	**8L**
III	**Measuring Instruments:** Construction and principles of operation of voltage and current measuring instruments; introduction to power and energy meters. **Three Phase A.C. Circuits:** Star-Delta connections; Line and phase voltage/current relations; Three phase power and its measurement.	**8L**
IV	**Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and voltage regulation of single phase transformer. **D.C. Machines:** Principles of electromechanical energy conversion; Types of D.C. machines; E.M.F. equation; Losses and efficiency; applications of DC machines.	**8L**
V	**Three phase induction Motor:** Principle of operation; Types, slip-torque characteristics; Applications. **Synchronous Machines:** Principle of Operation of Alternator and synchronous motor. **Single phase Motors:** Principle of operation of induction motor.	**8L**

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.
4. BL Theraja , A Textbook of Electrical Technology - Volume I, S. Chand Publishing

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.
4. Cotton H., Advanced Electrical Technology, Wheeler Publishing.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Apply the concepts of KVL/KCL and network theorems in solving DC circuits.

CO2 Analyze the steady state behavior of single phase and three phase AC electrical circuits.

CO3 Identify the application areas of a single phase two winding transformer and calculate their efficiency.

CO4 Illustrate the working principles of induction motor, synchronous machine and employ them in different area of applications.

CO5 To make students capable of analyzing and solving the varieties of problems and issues coming up in the vast field of electrical measurements.

CO6 Illustrate the working principles of DC machine and employ them in different area of applications.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Basic Electrical Engineering Lab
Course Code:SEEE-111P/SEEE-121P	**Title:** Basic Electrical Engineering Lab
Course Objectives: The objectives of studying this course are, 1. Understand and gain knowledge about circuit laws and theorems. 2. Gain knowledge about time domain analysis of circuit transients. 3. Understand the concept of resonance in series and parallel circuits.	
Nature of Paper: Core/DSE/SEC/GE/AECC	
Minimum Passing Marks/Credits: 50% Marks / 1	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Practical-1	To verify the Kirchhoff's current and voltage laws
Practical-2	To verify the Superposition theorem
Practical-3	To verify the Thevenin's theorem
Practical-4	To verify the Norton's theorem
Practical-5	To determine the external characteristics of DC Shunt generator
Practical-6	To measure current and speed for speed control of D.C. Shunt Motor
Practical-7	To measure the power in a 3-phase system by two-wattmeter method
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits. **CO2**. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase. **CO3.** Calculate efficiency of a single phase transformer and DC machine. **CO4.** Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction. **CO5.** Understand 3 phase balanced and unbalanced, star and delta connected supply andload and to measure power in 3 phase circuits **CO6.** Determination of efficiency of a single-phase transformer by direct load test.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td>Programme: UG
Class: B.TECH(CSE)</td><td colspan="2">Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 2
Practical: 0</td><td colspan="2">Subject: Professional Communication</td></tr>
<tr><td>Course Code:PCE-111/121</td><td colspan="2">Title: Professional Communication</td></tr>
<tr><td colspan="3">Course Objectives:
1. To enhance one’s ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2. Toincreaseone’sknowledgeandawarenessofemotionalcompetencyandemotionalintelligenceatplaceofstudy/work.
3. To provide opportunity for realizing one’s potential through practical experience.</td></tr>
<tr><td colspan="3">Nature of Paper: AECC</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks /2</td></tr>
<tr><td colspan="3">L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Listening
• Techniques of effective listening
• Listening and comprehension
• Probing questions
• Barriers to listening
Speaking
• Pronunciation
• Enunciation
• Vocabulary
• Fluency
• Common Errors
Reading
• Techniques of effective reading
• Gathering ideas and information from a given text
. Identify the main claim of the text
. Identifythepurposeofthetext
. Identifythecontextofthetext
. Identify the concepts mentioned
• Evaluating these ideas and information
. Identify the arguments employed in the text
. Identify the theories employed or assumed in the text
• Interpretthetext</td><td>8L</td></tr>
</table>

	. To understand what a text says . To understand what a text does . To understand what a text means	
II	***Writing and different modes of writing*** • Clearly state the claims • Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues • Provide background information • Effectively argue the claim • Provide evidence for the claims • Use examples to explain concepts • Follow convention • Be properly sequenced • Use proper signposting techniques	**8L**
III	• Be well structured . Well-knit logical sequence . Narrative sequence . Category groupings • Different modes of Writing - a. E-mails b. Proposal writing for Higher Studies c. Recording the proceedings of meetings d. Any other mode of writing relevant for learners ***Effective use of Social Media*** • Introduction to social media websites • Advantages of social media • Ethics and etiquettes of social media • How to use Google search better • Effective ways of using Social Media • Introduction to Digital Marketing ***Non-verbal communication*** • Meaning of non-verbal communication • Introduction to modes of non-verbal communication • Breaking the misbeliefs • Open and Closed Body language • Eye Contact and Facial Expression • Hand Gestures • Do's and Don'ts • Learning from experts • Activities-Based Learning	**8L**
IV	***Resume Skills*** • Resume Skills : Preparation and Presentation a. Introduction of resume and its importance b. Difference between a CV, Resume and Bio data c. Essential components of a good resume • Resume skills : common errors . Common errors people generally make in preparing their resume	**8L**

	. Prepare a good resume of her/his considering all essential components ***Interview Skills*** • Interview Skills : Preparation and Presentation a. Meaning and types of interview (F2F, telephonic, video, etc.) b. Dress Code, Background Research, Do's and Don'ts c. Situation, Task, Approach and Response (STAR Approach) for facing an interview d. Interview procedure (opening, listening skills, closure, etc.) e. Important questions generally asked in a job interview (open and closed ended questions) • Interview Skills : Simulation a. Observation of exemplary interviews b. Comment critically on simulated interviews	
V	• Interview Skills : Common Errors a. Discuss the common errors generally candidates make in interview b. Demonstrate an ideal interview	**8L**

Reference / Text Books:

1. Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.
2. Brown, Michele & GylesBrandreth. How to Interview and be Inter viewed. London: Sheldon Press1994.
3. Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977.
4. Collins, Patrick. Speak with Power and Confidence. New York: Sterling, 2009.
5. Hughes, Shirley. Professional Presentations: A Practical Guide to the Preparation and Performance ofSuccessful Business Presentations. Sydney: McGraw-Hill, 1990.
6. Kratz, Abby Robinson. Effective Listening Skills. Toronto: ON: Irwin Professional Publishing, 1995.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	10
2) Presentations /Seminar	
3) Assignments	05
4) Research Project Report Seminar On Research Project Report	
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1 The students will Gain Self Competency and Confidence.
CO2 They will be fluent speaker and proficient writer and enhance their LSRW Skills.
CO3 The students will demonstrate a fuller and deeper understanding of all the facets of Professional communication.
CO4 They will be able to enrich their vocabulary and their correct usage.
CO5 They will develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation.
CO6 The students will Gain Knowledge about the world of work**.**

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

<table>
<tr><td>Programme: UG
Class: B.TECH(CSE)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 0
Practical: 2</td><td>Subject: Professional Communication Lab</td></tr>
<tr><td>Course Code: PCE-111P/121P</td><td>Title: Professional Communication Lab</td></tr>
<tr><td colspan="2">Course Objectives: The objectives of studying this course are,
1. Improve the dynamics of professional presentations.
2. Develop the ability to compeer professional occasions.
3. Enable to read newspaper for their communicative competence.
4. Equip with effective business correspondence.
5. Develop in them communication and social graces necessary for functioning.</td></tr>
<tr><td colspan="2">Nature of Paper: Core/DSE/SEC/GE/AECC</td></tr>
<tr><td colspan="2">Minimum Passing Marks/Credits: 50% Marks / 1</td></tr>
<tr><td colspan="2">L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Practical	Contents
Practical 1	Group Discussion: Practice Based on Accurate and Current Grammatical Patterns
Practical 2	Intonation Pattern Practice: Rising, Falling, and Level Tones.
Practical 3	Communication Skills /Conversational Skills for Interviews/ Seminars/ Workshops with Emphasis on Kinesics/Para linguistics along with Promotion of Phonetic Script Skills.
Practical 4	Presentation Skills for Technical Paper / Project Reports / Professional Report based on Proper Stress and Intonation Mechanics.
Practical 5	Theme Presentation Practices Based on Linguistic Patterns
Practical6	***Digital Literacy*** • Role of Digital literacy in professional life • Trends and opportunities in using digital technology in workplace • Internet Basics • Introduction to MS Office tools a. Paint b. Office c. Excel d. Powerpoint

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons.

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Develop all-round personalities with a mature outlook to function effectively in different circumstances.

CO2. Develop effective communication and presentation skills

CO3. Learn corporate etiquette - organizing and managing professional events and will understand how reading enhances their communicative competency

CO4. Conduct effective correspondence and prepare reports which produce results.

CO5. Write logical sentences and paragraphs, use appropriate diction, grammar and punctuation.

CO6. Produce business documents for mailing to external recipients or intra-organizational circulation

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td>Programme: UG
Class: B.TECH(CSE)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 2
Practical: 0</td><td>Subject: Environment Studies</td></tr>
<tr><td>Course Code:SEHU-111/122</td><td>Title: Environment Studies</td></tr>
<tr><td colspan="2">Course Objectives:
1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
3. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
6. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.</td></tr>
<tr><td colspan="2">Nature of Paper: AECC</td></tr>
<tr><td colspan="2">Minimum Passing Marks/Credits: 40% Marks /2</td></tr>
<tr><td colspan="2">L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	**Introduction to environmental studies** • Multidisciplinary nature of environmental studies; • Scope and importance; Concept of sustainability and sustainable development.	**4L**
II	**Ecosystems** • What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**4L**
III	**Natural Resources: Renewable and Non-renewable Resources** • Land resources and land use change; Land degradation, soil erosion and desertification.	

	• Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & interstate). • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	**4L**
IV	**Biodiversity and Conservation** • Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots • India as a mega--biodiversity nation; Endangered and endemic species of India • Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	**4L**
V	**Environmental Pollution** • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies.	**4L**
VI	**Environmental Policies & Practices** • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.	**4L**
VII	**Human Communities and the Environment** • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. • Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. • Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	**4L**
VIII	**Field work** Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.	**4L**

	Visit to a local polluted site---Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems---pond, river, Delhi Ridge, etc.	

Reference / Text Books:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., &Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	10
4) Research Project Report Seminar On Research Project Report	05
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1. Gain in-depth knowledge on natural processes that sustain life, and govern economy.
CO2. Estimate and predict the consequences of human actions on the web of life, global economy and quality of human life.
CO3. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
CO4. Acquire values and attitudes towards understanding complex environmental economic social challenges, and participate actively in solving current environmental problems and preventing the future ones.
CO5. Adopt sustainability as a practice in life, society and industry.
CO6. Develop real field experience.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Engineering Workshop Lab
Course Code: SEME-112P/ SEME-122P	**Title:** Engineering Workshop Lab

Course Objectives: The objectives of studying this course are,
1. To understand the importance of tools used in workshop.
2. To prepare various joints used in workshop.
3. To identify & apply the most appropriate tools for various applications.
4. To perform the various types of black smithy and sheet metal shop operations.
5. To prepare core and mould in foundry shop.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 1

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Module -1	Carpentry Shop: Practical-1: To prepare half-lap corner joint. Practical-2: To prepare mortise &Tenon joint. Practical-3: To prepare a cylindrical pattern on woodworking lathe
Module -2	Fitting Bench Working Shop: Practical-1: To prepare a V-joint fitting Practical-2: To prepare a U-joint fitting Practical-3: To make a perfect square job
Module -3	Black Smithy Shop: Practical-1: To prepare a square rod from given circular rod Practical-2: To prepare a square S- shape from given circular rod Practical-3: To prepare a nail from given circular rod.
Module -4	Welding Shop: Practical-1: To prepare a butt welded joints using arc welding machine. Practical-2: To prepare a Lap welded joints using arc welding machine. Practical-3: To prepare a Lap welded joint using spot welding machine.
Module -5	Sheet-metal Shop: Practical-1: To make round duct of GI sheet using 'soldering' process. Practical-2: To prepare a tray of GI by fabrication
Module -6	Machine Shop: Practical-1: To prepare a bolt on the lathe machine as per given. Diagram. Practical-2: To prepare a job on the lathe machine as per given diagram.
Module -7	Foundry Shop:

	Practical-1: To prepare core as per given size. Practical-2: To prepare a mould for given casting.
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

Reference Books:

1. Business Communication, II Ed, OUP, by Meenakshi Raman &Prakash Singh, 2012.
2. Speak well----- orient black swan.
3. Everyday dialogues in English----- Robert J.Dixon.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Understand the tools used in workshop & their applications.

CO2. Prepare various joints used in carpentry, fitting and welding shop.

CO3. Identify & apply the most appropriate tools for various manufacturing operations like turning, facing and threading.

CO4. Perform the various types of black smithy and sheet metal shop operations.

CO5. Prepare core and mould in foundry shop.

CO6. Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Graphics & Design Lab
Course Code:SEME-111P/ SEME-121P	**Title:** Engineering Graphics & Design Lab

Course Objectives: The objectives of studying this course are,
1. To study the standard and rules to be trailed by engineers for making precise drawings.
2. To understand the fundamental dimensioning practices that must be continued in the arrangement of drawings.
3. To draw the various types of projection of lines, planes and solids.
4. To apply the CAD for design.
5. To create the engineering models.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 1

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Module-1	Introduction to Engineering Drawing, Orthographic Projections: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Module -2	Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.
Module -3	Projections and Sections of Regular Solids: Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans they include: windows, doors. Prism, Cylinder, Pyramid, Cone – Auxiliary Views.
Module -4	Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.
Module -5	Computer Graphics: Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids].

Reference / Text Books:
Text Books:

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Charotar Publishing House
2. Engineering Drawing, Narayana, K.L. & P Kannaiah (2008), Scitech Publishers.

3. Engineering Drawing Paperback, P.S. Gill (Author) , S.K. Kataria& Sons. **Reference Books:** 1. Engineering Drawing and Computer Graphics, Shah, M.B. &Rana B.C. (2008), Pearson Education. 2. Engineering Graphics, Agrawal B. &Agrawal C.M. (2012), TMH Publication. 3. Engineering Graphics & Design, A.P. Gautametc, Khanna Publishing House.	
If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** Understand the basic concepts and principles of engineering graphics and their significance. **CO2.** Understand the theory of projections and regular solids. **CO3**. Draw the various types of projection of lines, planes and solids. **CO4.** Apply the CAD for design. **CO5.** Creating the engineering models using solid modeling. **CO6.** Gain knowledge about orthographic and isometric projections	

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG **Class: B. Tech CSE**	Year: II Semester: III
Credits 4 Theory: 3 Tutorial: 1 Practical:0	**Subject:** Engineering Mathematics-III
Course Code: SEAS-231	**Title:** Engineering Mathematics-III

Course Objectives:

- To make the students familiar with complex functions and its calculus.
- To deal with applications, residues and conformal mapping.
- To understand the concept and applications of integral transforms.
- To deal with numerical solutions of algebraic equations and differential equations.
- To understand the statistical aspect of functions.

Nature of Paper: Applied Science Courses(Core)

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Functions of a Complex Variable I**: Analytic functions; C-R equations and harmonic functions ;Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.	**8**
II	**Functions of a Complex Variable II**: Representation of a function by power series; Taylor's andLaurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilinear transformations.	**8**
III	**Integral Transforms:** Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations.	**8**
IV	**Numerical Techniques:** Solution of polynomial and transcendental equations Bisection method, RegulaR – Falsi method, Newton - Raphson method. **Interpolation:** Finite difference, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals; **Numerical Differentiation**, **Numerical Integration**; Trapezoidal, Simpson's 1/3 and 3/8 rules. **Numerical solutions of first order differential equations** by Euler's method and 4th order Runge-Kutta method.	**8**

V	**Statistical Techniques:** Moments, Moment generating functions, Skewness, Kurtosis, CurveFitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	**8**

Reference / Text Books:

Text books:

1. *B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.*
2. *B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.*
3. *Dass H.K., Engineering Mathematics Vol-I, S. Chand.*
4. *E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.*
5. *R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002.*
6. *Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.*

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: **Engineering Mathematics-I(SEAS-111)&Engineering Mathematics-II(SEAS-121)**

Course Learning Outcomes:

CO1. Understand and check the Analyticity of a complex function.

CO2.To apply the concept of Analytic functions in residue and conformal mappings.

CO3.To solve and apply the concepts of transforms in the area of engineering.

CO4.To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.

CO5.To understand and use the concept of statistical tools to analyze the different data.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

<table>
<tr><td>Programme: UG
Class: B. Tech (CSE)</td><td>Year: II
Semester: III</td></tr>
<tr><td>Credits
Theory: 4
Practical:2</td><td>Subject: Data Structures</td></tr>
<tr><td>Course Code:
SECS-231</td><td>Title: Data Structures</td></tr>
<tr><td colspan="2">Course Objectives:
Student will be able to describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.
Student will be able to discuss the computational efficiency of the sorting and searching algorithms.
Student will be able to implement trees and Graphs and perform various operations on these data structure.
Student will be able to understand the concept of recursion, application of recursion and its implementation and removal of recursion.
Student will be able to identify the alternative implementations of data structures with respect to its performance to solve a real world problems.</td></tr>
<tr><td colspan="2">Nature of Paper: Engineering Courses (Core)</td></tr>
<tr><td colspan="2">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="2">L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Basic Terminology, Elementary Data Organization, Built in Data Types available in C. Overview of Algorithms, Efficiency of an Algorithms and its time and space complexity. Asymptotic notations: Big Oh, Big Theta and Big Omega, Discussion on Time-Space trade-off, Introduction to Abstract Data Types (ADT). **Arrays**: Definition and types: Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Arrays, Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Subtraction & Multiplications of Single variable & Two variables polynomial.	**10**
II	**Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary	**10**

	search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. **Queues:** Operationson Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue	
III	**Searching:** Concept of Searching and types of searching: Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. **Sorting:** Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	**10**
IV	**Graphs:** Terminology used with Graph, Data Structure for Graph representations by using C: Adjacency Matrices and Adjacency List. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.	**10**
V	**Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary tree. Extended Binary Trees, Tree Traversal algorithms: In order, Preorder and Post order, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search. Threaded Binary trees, Traversing Threaded Binary trees, Huffman coding using Binary Tree, Concept & Basic Operations for AVL Tree, B Tree & Binary Heaps.	**10**

Reference / Text Books:

Text books:

1. Lipschutz,“DataStructures”Schaum’sOutlineSeries,TataMcGraw-hillEducation(India)Pvt.Ltd
2. A K Sharma,“Data Structure Using C”, Pearson Education India.
3. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J.Augenstein, “Data Structures Using C and C++”,PHI Learning Private Limited, Delhi India.
4. HorowitzandSahani,“FundamentalsofDataStructures”,GalgotiaPublicationsPvtLtdDelhiIndia.
5. Thareja,“Data Structure Using C”Oxford Higher Education.
6. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.

CO2.Discuss the computational efficiency of the sorting and searching algorithms.

CO3.Implementation of Trees and Graphs and perform various operations on these data structure.

CO4.Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.

CO5.Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: III
Credits Theory: 4 Practical:2	**Subject:** Computer Organization and Architecture
Course Code: SECS-232	**Title:** Computer Organization and Architecture

Course Objectives:

- Student will be able to study basic structure and operation of a digital computer system.
- Student will be able to analyze the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.
- Student will be able to implement control unit techniques and the concept of Pipelining.
- Student will be able to understand the hierarchical memory system, cache memories and virtual memory
- Student will be able to understand the different ways of communicating with I/O devices and standard I/O interfaces.

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction: Functional units of digital system and their interconnections, Overview of bus their architecture, types of buses and bus arbitration. Details of Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes and their types	**10**
II	**Arithmetic and logic unit:** Look ahead carries adders, Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations, Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers.	**10**
III	**Control Unit:** Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc.), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programming sequencing, concept of horizontal and vertical micro programming.	**10**
IV	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization, ROM memories, Cache memories: concept, design issues & performance, address mapping, Auxiliary memories: magnetic disk, magnetic tape and optical disks,	**10**

	Virtual memory: concept and implementation.	
V	**Input / Output**: Overview of peripheral devices, I/O interface, I/O ports. Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access, I/O channels and processors. Serial Communication: Synchronous & asynchronous communication and standard communication interfaces.	**10**

Reference / Text Books:

Text books:

1. Computer System Architecture-M.Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012

Reference Books:

1. John P. Hayes, Computer Architecture and Organization, Tata Mc Graw Hill, Third Edition,1998.Reference books
2. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
3. Behrooz Parahami, “Computer Architecture”,Oxford University Press, Eighth Impression,2011.
4. David A. Patterson and John L. Hennessy, “Computer Architecture-A Quantitative Approach”, Elsevier, a division of reed India Private Limited, Fifth edition, 2012

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Study of the basic structure and operation of a digital computer system.

CO2.Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.

CO3.Implementation of control unit techniques and the concept of Pipelining

CO4.Understanding the hierarchical memory system, cache memories and virtual memory

CO5.Understanding the different ways of communicating with I/O devices and standard I/O interfaces

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: III
Credits Theory: 4 Practical:2	**Subject:** Operating System
Course Code: SECS-233	**Title:** Operating System
Course Objectives: • Student will be able to understand the structure and functions of OS • Student will be able to learn about Processes, Threads and Scheduling algorithms. • Student will be able to study and understand the principles of concurrency and Deadlocks • Student will be able to study and learn various memory management scheme • Student will be able to study I/O management and File systems.	
Nature of Paper: Engineering Courses (Core)	
Minimum Passing Marks/Credits: 40% Marks/4	
L:3 T:1 P:3(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Introduction of Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems, Multithreaded Systems. Details of Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	**10**
II	Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation. Classical Problem in Concurrency i.e Dining Philosopher Problem and Sleeping Barber Problem. Overview of Inter Process Communication models and Schemes, Process generation.	**10**
III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	**10**
IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory	**10**

	organization, Locality of reference.	
V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	**10**

Reference / Text Books:

Text books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education

Reference Books:

1. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
2. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
3)Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Understand the structure and functions of OS
CO2.Learn about Processes, Threads and Scheduling algorithms.
CO3.Understand the principles of concurrency and Deadlocks
CO4.Learn various memory management scheme
CO5.Study I/O management and File systems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: III
Credits Theory: 2 Practical:0	**Subject:** Python Programming
Course Code: STCS-239	**Title:** Python Programming

Course Objectives:

- Students will be able to read and write simple Python programs.
- Students will be able to develop Python programs with conditionals and loops
- Students will be able to define Python functions and to use Python data structures –- lists, tuples, dictionaries
- Students will be able to do input/output with files in Python
- Students will be able to do searching ,sorting and merging in Python

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 40% Marks/2

L:3 T:0 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction of Python, Overview of Python IDE, Overview of Python Programs, Basic elements of Python, Type Conversion in Python. Basics of python: Concept of expressions, Assignment Statement, Usage of Arithmetic Operators, Operator Precedence, Evaluation of Boolean Expressions.	**10**
II	Illustration of Conditional statements in Python and their implementation, Evaluation of expressions & Float Representation. Loops basics and working of loops, Use of Break and Continue.	**10**
III	Implementation of functions in detail, Strings, Python Data Structure : Tuples , Unpacking Sequences , Lists , Mutable Sequences , List Comprehension , Sets , Dictionaries, Higher Order Functions, Overview of Lambda Expressions	**10**
IV	Implementation of Sieve of Eratosthenes, File input and output operations, Exceptions and Assertions Modules, Importing Modules, Abstract Data types, Classes, Special Methods (such as _init_, _str_, comparison methods and Arithmetic methods etc.), Inheritance and OOP implementations.	**10**
V	Recursive Fibonacci, Tower of Hanoi Search, Binary Search and Sorting& Merging, Selection Sort, List merging, Merge Sort, Higher Order Sort.	**10**

Reference / Text Books:
Text books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016).

2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books:

1. John V Guttag, ―Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments	10
4) Research Project Report Seminar On Research Project Report	05
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1.To read and write simple Python programs.
CO1.To develop Python programs with conditionals and loops
CO1.To define Python functions and to use Python data structures –- lists, tuples, dictionaries
CO1.To do input/output with files in Python
CO1.To do searching ,sorting and merging in Python

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG **Class:B.Tech (CSE)**	Year: II Semester: III
Credits Theory: 0 Practical:2	**Subject:** Data Structures using C Lab
Course Code: SECS-231P	**Title:** Data Structures using C Lab

Course Objectives:

- To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues.
- To write and execute programs in C to solve problems using data¬ structures such as trees, graphs, hash tables and search trees.
- To write and execute write programs in C to implement various¬ sorting and searching methods.

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 50% Marks/2

L:0 P:3(In Hours/Week)
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
1	Write C Programs to illustrate the concept of the following:	**2L**
2	Sorting Algorithms-Non-Recursive.	**2L**
3	Sorting Algorithms-Recursive.	**2L**
4	Searching Algorithm.	**2L**
5	Implementation of Stack using Array.	**2L**
6	Implementation of Queue using Array.	**2L**
7	Implementation of Circular Queue using Array.	**2L**
8	Implementation of Stack using Linked List.	**2L**
9	Implementation of Queue using Linked List.	**2L**
10	Implementation of Circular Queue using Linked List.	**2L**
11	Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search BST Tree, Insertion and Deletion in BST.	**2L**
12	Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.	**2L**

Reference / Text Books:

Text books:

1. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education.
2. Berztiss, AT: Data structures, Theory and Practice, Academic Press.

Reference Books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
3. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Practical Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

At the end of this lab session, the student will

CO1. Be able to design and analyze the time and space efficiency of the data structure

CO2.Be capable to identity the appropriate data structure for given problem

CO3.Have practical knowledge on the applications of data structures.

CO4.Be able to Implement Stack using Array.

CO5.Be able to Implement Tree Structures, Binary Tree, Tree Traversal, Binary Search BST Tree, Insertion and Deletion in BST.

CO6.Be able to do Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG **Class:B.Tech (CSE)**	Year: II Semester: III
Credits Practical:2	**Subject:** Computer Organization and Architecture Lab
Course Code: **SECS-232P**	**Title:** Computer Organization and Architecture Lab

Course Objectives:

1. Understand the theory and architecture of central processing unit.
2. Analyze some of the design issues in terms of speed, technology, cost, performance.
3. Design a simple CPU with applying the theory concepts.
4. Use appropriate tools to design verify and test the CPU architecture.
5. Learn the concepts of parallel processing, pipelining and inter processor communication.
6. Understand the architecture and functionality of central processing unit.
7. Exemplify in a better way the I/O and memory organization. 8. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

Nature of Paper: Engineering Courses: Core

Minimum Passing Marks/Credits: 50% Marks/2

L:0 T:0 P:3(In Hours/Week)
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
1	Implementing HALF ADDER, FULL ADDER using basic logic gates	**2L**
2	Implementing Binary -to -Gray, Gray -to -Binary code conversions.	**2L**
3	Implementing 3-8 line DECODER.	**2L**
4	Implementing 4x1 and 8x1 MULTIPLEXERS.	**2L**
5	Verify the excitation tables of various FLIP-FLOPS.	**2L**
6	Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.	**2L**
7	Design of an 8-bit ARITHMETIC LOGIC UNIT.	**2L**
8	Design the data path of a computer from its register transfer language	**2L**
9	Design the control unit of a computer using either hardwiring	**2L**
10	Micro programming based on its register transfer language description. Transfer language description.	**2L**
11	Implement a simple instruction set computer with a control unit and a data path.	**2L**

Reference / Text Books: **Text books:** 1. Computer System Architecture - M. Mano 2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012 3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books **Reference Books:** 1. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006. 2. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Practical Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course: NA

Course Learning Outcomes:
Student will be able to:
CO1.Analyze the behavior of logic gates
CO2.Design combinational circuits for basic components of computer system and applications.
CO3.Analyze the operational behavior and applications of various flip-flop
CO4.Design Arithmetic logic units and different types of memory blocks.
CO5.Design the control unit of a computer using either hardwiring.
CO6.Implement a simple instruction set computer with a control unit and a data path.

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG **Class: B.Tech(CSE)**		Year: II Semester:III
Credits Theory: 0 Practical: 2		**Subject: Operating System Lab**
Course Code: **SECS-233P**		**Title: Operating System Lab**
Course Objectives: 1. To learn shell programming and the use of filters in the LINUX environment. 2. To practice multithreaded programming. 3. To implement CPU Scheduling Algorithms and memory management algorithms.		
Nature of Paper: Core		
Minimum Passing Marks/Credits: 50% Marks/2		
L: T: P:3(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)		
Unit	**Contents**	**No. of Lectures Allotted**
I	Write a C programs to implement UNIX system calls and file management.	2
II	Write C programs to demonstrate various process related concepts.	2
III	Write C programs to demonstrate various thread related concepts.	2
IV	Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, and Round Robin.	2
V	Write C programs to simulate Intra & Inter – Process Communication (IPC) techniques: Pipes, Messages Queues, and Shared Memory.	2
VI	Write C programs to simulate solutions to Classical Process Synchronization Problems.	2
VII	Dining Philosophers, Producer – Consumer, Readers – Writers.	2
VIII	Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.	2
Reference / Text Books: 1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7 the edition, Wiley India Private Limited, New Delhi.		
If the course is available as Generic Elective then the students of following departments may opt it. 1. NA		

Evaluation/Assessment Methodology	
	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Coures Learning Outcomes:
Student will be able to :
CO1.Ensure the development of students applied skills in operating systems related areas.
CO2.Students will gain knowledge in writing software routines modules or implementing various concepts of operating system.
CO3.Implement Dining Philosophers, Producer – Consumer, Readers – Writers.
CO4.Write C programs to simulate solutions to Classical Process Synchronization Problems.
CO5.Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
CO6.Write C programs to simulate solutions to Classical Process Synchronization Problems.

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: IV
Credits Theory: 4 Practical:2	**Subject:** Theory of Automata and Formal Languages
Course Code:SECS-241	**Title:** Theory of Automata and Formal Languages

Course Objectives:

- Student will be able to analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars
- Student will be able to analyze and design, Turing machines, formal languages, and grammars
- Student will be able to analyze and demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving
- Student will be able to analyze the basic results of the Theory of Computation.
- Student will be able to analyze, State and explain the relevance of the Church-Turing thesis.

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages. Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem.	**8**
II	Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem. Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma. Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	**8**
III	Regular and Non-Regular Grammars: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and	**8**

	Regular grammar into FA, Simplification of CFG, Normal Forms-Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	
IV	Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	**8**
V	Turing Machines and Recursive Function Theory : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory.	**8**

Reference / Text Books:

Text books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI

Reference Books:

1. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars

CO2.Analyze and design, Turing machines, formal languages, and grammars

CO3.Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving

CO4.Prove the basic results of the Theory of Computation.

CO5.State and explain the relevance of the Church-Turing thesis

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: IV
Credits Theory: 4 Practical:2	**Subject:** Software Engineering
Course Code:SECS-242	**Title:** Software Engineering

Course Objectives:

- Knowledge of basic SW engineering methods and practices, and their appropriate application and understanding of software requirements and the SRS documents.
- To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases.
- To provide an idea of using various process models in the software industry according to given circumstances
- Understanding of software testing approaches such as unit testing and integration testing.
- To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Evolution and impact of Software Engineering, Software Development Life Cycle(SDLC) Models: Waterfall Model, Prototype Model, Spiral Model, Agile methodology, Layered Approach. **Software Requirements Analysis and Specifications** Feasibility Study, Functional and Non-Functional Requirements, Requirements Gathering, Requirement Analysis and Specifications using DFD, Data Dictionaries and ER Diagrams, Requirements documentation, Characteristics and Organization of Software Requirement Specifications (SRS)	**8**
II	**Software-Design and Coding:** Principles; Problem Partitioning; Abstraction; Top-Down andBottom-Up design; Structured Approach; Functional vs. Object Oriented Approach; UML, Design Specifications and Verification; Cohesion; Coupling. Distributed Software Design, User Interface Design, Coding standards and Code Review Techniques	**8**
III	**Software Testing :**Software Testing Fundamentals, SDLC Testing : Unit Testing, IntegrationTesting, System Testing, Regression Testing, Smoke Testing, Security Test, Stress Test, Performance Test, Functional Testing or Black Box Testing: Boundary Value Analysis, Alpha Testing, Beta Testing, and Acceptance Testing, Structural Testing or White Box Testing: Basis Path Testing, DD-Paths, Cyclomatic Complexity, Data Flow Testing, Mutation.	**8**

IV	**Test Management:** Test Cycle, Test Estimation, Test Cases, Test Scenarios **Testing Tools:** Static, Dynamic, Characteristics of Modern Tools and Automation. **Software Maintenance:** Updates-Upgrades-Patches-Versions, Error Reporting, Customer Support, Maintenance Process.	**8**
V	**Software Reliability**: Importance, Hardware Reliability and Software Reliability, Failure and Faults, Reliability Models, Software Reuse, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management	**8**

Reference / Text Books:

Text books:

1. Agarwal, K.K., *Software Engineering*, New Age International.
2. Pankaj Jalote, Software Engineering, Wiley
3. Tamres, L., Software Testing, Pearson Education.

Reference Books:

1. Sommerville, I., *Software Engineering*, Addison-Wesley.
2. R S Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
3. Boris, B., *Software Testing Techniques,* Van Nostrand Reinhold

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1. Correctly create a model of the structure and behavior of a software system.

CO2. Design and implement, in a programming language, an executable solution to a given problem using common software principles and best practices.

CO3. Apply appropriate software testing techniques and evaluate the quality of a software product at module, integration, and system granularity levels.

CO4. Select and adapt suitable elements from among conventional and evolving software development life-cycle processes and apply the resulting process to a software project.

CO5. Collaborate in teams to develop a significantly sized software system from conceptualization to completion.

CO6. Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

<table>
<tr><td colspan="2">Programme: UG
Class: B. Tech (CSE)</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical:0</td><td>Subject: Data Analytics</td></tr>
<tr><td colspan="2">Course Code: SDCS-241</td><td>Title: Data Analytics</td></tr>
<tr><td colspan="3">Course Objectives:
Student will be able to describe the life cycle phases of Data Analytics through discovery, planning and building.
Student will be able to understand and apply Data Analysis Techniques.
Student will be able to implement various Data streams
Student will be able to understand item sets, Clustering, frame works & Visualizations.
Student will be able to apply R tool for developing and evaluating real time applications</td></tr>
<tr><td colspan="3">Nature of Paper: Discipline Specific Electives</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="3">L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction to Data Analytics: Sources and nature of data, classification of data, characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. Data Analytics Lifecycle: Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, and operationalization.</td><td>8</td></tr>
<tr><td>II</td><td>Data Analysis: Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, neural networks: learning and generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.</td><td>8</td></tr>
<tr><td>III</td><td>Mining Data Streams: Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – real time sentiment analysis, stock market predictions</td><td>8</td></tr>
<tr><td>IV</td><td>Frequent Itemsets and Clustering: Mining frequent itemsets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream,</td><td>8</td></tr>
</table>

	clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism.	
V	Frame Works and Visualization: MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. Introduction to R - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.	**8**

Reference / Text Books:

Text books:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press

Reference Books:

1. Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.
2. John Garrett, Data Analytics for IT Networks : Developing Innovative Use Cases, Pearson Education
3. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
4. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big Data Analytics”, EMC Education Series, John Wiley

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Describe the life cycle phases of Data Analytics through discovery, planning and building.
CO2.Understand and apply Data Analysis Techniques.
CO3.Implement various Data streams.
CO4.Understand item sets, Clustering, frame works & Visualizations.
CO5.Apply R tool for developing and evaluating real time applications.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: IV
Credits Theory: 4 Practical:0	**Subject:** Web Designing
Course Code: SDCS-242	**Title:** Web Designing

Course Objectives:
- Student will be able to understand principle of Web page design and about types of websites
- Student will be able to visualize and Recognize the basic concept of HTML and application in web designing.
- Student will be able to recognize and apply the elements of Creating Style Sheet (CSS).
- Student will be able to understand the basic concept of Java Script and its application.
- Student will be able to introduce basics concept of Web Hosting and apply the concept of SEO.

Nature of Paper: Discipline Specific Electives

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction : Basic principles involved in developing a web site, Planning process, Domains and Hosting, Responsive Web Designing , Types of Websites (Static and Dynamic Websites), Web Standards and W3C recommendations, Introduction to HTML: What is HTML , HTML Documents, Basic structure of an HTML document , Creating an HTML document, Mark up Tags, Heading-Paragraphs, Line Breaks	**8**
II	Elements of HTML: HTML Tags., Working with Text , Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls	**8**
III	Concept of CSS: Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model (Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs.	**8**
IV	Introduction to Client Side Scripting, Introduction to Java Script , Java script Types, Variables in JS, Operators in JS, Conditions Statements, Java Script Loops, JS Popup Boxes, JS Events, JS Arrays, Working with Arrays, JS Objects, JS Functions, Using Java Script in Real time, Validation of Forms, Related Examples	**8**
V	Web Hosting: Web Hosting Basics, Types of Hosting Packages,	

	Registering domains, Defining Name Servers, Using Control Panel, Creating Emails in Cpanel, Using FTP Client, Maintaining a Website Concepts of SEO: Basics of SEO, Importance of SEO, Onpage Optimization Basics	**8**

Reference / Text Books:

Text books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible, 5ed", Wiley India
2. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design", Wiley India

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Understand principle of Web page design and about types of websites
CO2.Visualize and Recognize the basic concept of HTML and application in web designing
CO3.Recognize and apply the elements of Creating Style Sheet (CSS)
CO4.Understand the basic concept of Java Script and its application
CO5.Introduce basics concept of Web Hosting and apply the concept of SEO.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: IV
Credits Theory: 4 Practical:0	**Subject:** Computer Graphics
Course Code: SDCS-243	**Title:** Computer Graphics

Course Objectives:

- Student will be able to understand the graphics hardware used in field of computer graphics.
- Student will be able to understand the concept of graphics primitives such as lines and circle based on different algorithms.
- Student will be able to apply the 2D graphics transformations, composite transformation and Clipping concepts.
- Student will be able to apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.
- Student will be able to perform the concept of projections, curve and hidden surfaces in real life.

Nature of Paper: Discipline Specific Electives

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	**8**
II	Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithmsLine clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping	**8**
III	Three Dimensional: 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3- D viewing, projections, 3-D Clipping.	**8**
IV	Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	**8**
V	Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model,	**8**

	Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	

Reference / Text Books:

Text books:

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Foley, Vandam, Feiner, Hughes – “Computer Graphics principle”, Pearson Education

Reference Books:

1. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill
2. W. M. Newman, R. F. Sproull – “Principles of Interactive computer Graphics” – McGraw Hill.
3. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, McGraw Hill.
4. R.K. Maurya, “Computer Graphics ” Wiley Dreamtech Publication.
5. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Understand the graphics hardware used in field of computer graphics.

CO2.Understand the concept of graphics primitives such as lines and circle based on different algorithms.

CO3.Apply the 2D graphics transformations, composite transformation and Clipping concepts.

CO4.Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.

CO5.Perform the concept of projections, curve and hidden surfaces in real life.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: IV
Credits Theory: 4 Practical:0	**Subject:** Object Oriented System Design using Java
Course Code: SDCS-244	**Title:** Object Oriented System Design using Java

Course Objectives:

- Student will be able to develop Applications for Range of Problems Using Object-Oriented Programming Techniques.
- Student will be able to design Simple Graphical User Interface Applications.

Nature of Paper: Discipline Specific Electives

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Object Oriented Thinking and Java Basics:** Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.	**8**
II	**Inheritance, Packages and Interfaces:** Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes. The Object ClassDefining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.	**8**
III	**Exception Handling and Multithreading:** Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.String Handling, Exploring Java.Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating	**8**

	Threads, Thread Priorities, Synchronizing Threads, Interthread communication, Thread Groups, Daemon Threads, Enumerations, Autoboxing, Annotations, Generics.	
IV	**Event Handling:** Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes. The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.	**8**
V	**Applets:** Concepts f Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets. **Swing:** Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- J applet, J frame and J component, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.	**8**

Reference / Text Books:

Text books:

1. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.

Reference Books:

1. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
2. An Introduction to Java Programming and Object-Oriented Application Development, R.A. Johnson- Thomson.
3. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Eighth Edition, Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, eighth Edition, Pearson Education

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Develop Applications for Range of Problems Using Object-Oriented Programming Techniques

CO2.Design Simple Graphical User Interface Applications.

CO3.Able to develop multithreaded applications with synchronization.

CO4.Able to develop applets for web applications.

CO5.Able to design GUI based applications

Format-3

IIMTU-NEP IMPLEMENTATION
Year II /Semester IV

Programme: UG **Class: B.Tech (CSE)**	Year: II Semester: IV
Credits Theory: 0 Practical: 2	**Subject: Theory of Automata and Formal Languages Lab**
Course Code: **SECS-241P**	**Title: Theory of Automata and Formal Languages Lab**
Course Objectives: 1. Demonstrate the concept of Finite Automata and Regular Expression. 2. Demonstrate the designing of Finite Automata 3. Design the grammar for respective language. 4. Demonstrate the designing of Push Down Automata 5. Demonstrate the designing of Turing Machine	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks/2	
L: T: P:3(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Understanding of software like JFLAP (Java Formal Languages and AutomataPackage) for experimenting with formal languages	2
II	Deterministic Finite Automata (DFA)	2
III	Nondeterministic Finite Automata (NFA)	2
IV	Conversion of NFA to DFA	2
V	DFA Minimization	2
VI	DFA to regular grammar conversion	2
VII	DFA to regular expression conversion	2
VIII	Combining automata	2
IX	Regular expression to DFA conversion	2
X	Mealy and Moore machine	2

Reference / Text Books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology	
	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Course Learning Outcomes:
Student will be able to:
CO1.Demonstrate the concept of Finite Automata and Regular Expression.
CO2.Demonstrate the designing of Finite Automata.
CO3.Design the grammar for respective language.
CO4.Demonstrate the designing of Push Down Automata.
CO5.Demonstrate the designing of Turing Machine.
CO6.Convert Regular expression to DFA conversion.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II /Semester IV

Programme: UG **Class: B.Tech (CSE)**	Year: II Semester: IV
Credits Theory: Practical: 2	**Subject: Software Engineering Lab**
Course Code: **SECS-242P**	**Title: Software Engineering Lab**

Course Objectives:
To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks/2

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case	2
II	Preparation of Software Requirement Specification Document, Design Documents and	2
III	Develop a Testing Phase related documents.	2
IV	Preparation of Software Configuration Management and Risk Management related documents	2
V	Study and usage of any Design phase CASE tool	2
VI	Performing the Design by using any Design phase CASE tools.	2
VII	Develop test cases for unit testing and integration testing	2
VIII	Develop test cases for various white box and black box testing techniques.	2
IX	Draw the activity diagram	2
X	Draw the state chart diagram.	

Reference / Text Books:
1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology	
	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Course Learning Outcomes:
Student will be able to:
CO1.Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement
CO2.Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship
CO3.Draw a class diagram after identifying classes and association among the
CO4.Graphically represent various UML diagrams , and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially
CO5.Able to use modern engineering tools for specification, design, implementation and testing
CO6.Develop test cases for various white box and black box testing techniques.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG **Class: B.Tech (CSE)**	Year: III Semester: V
Credits Theory:4 Practical: 0	**Subject:** Design and Analysis of Algorithm
Course Code: SECS-351	**Title:** Design and Analysis of Algorithm

Course Objectives:
The Student will Learn:

1. To analyze performance of algorithms & Understanding the growth of function.
2. To choose the appropriate data sorting algorithm for performing sorting in data structure.
3. To choose the appropriate data structure and algorithm design method for a specified application.
4. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
5. To analyze performance of string matching and randomized algorithms. To introduce P and NP classes.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Asymptotic Notations Performance Measurements, Recurrence Relation, Method of Solving recurrence function **Sorting and Order Statistics** – Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	**8L**
II	**Advanced Data Structures:** Red-Black Trees, B – Trees, Binomial Heaps, and Fibonacci Heaps.	**8L**
III	**Divide and Conquer:** Matrix Multiplication, Convex Hull and Searching. Longest Common Subsequence (LCS) Problem **Greedy Methods**: Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths – Dijkstra's and Bellman Ford Algorithms.	8L
IV	**Dynamic Programming:** Knapsack, All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Branch and Bound : Travelling Salesman Problem, **Backtracking:** Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	8L
V	**String Matching:** Algorithm for string matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms.	8L

Reference / Text Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms", 3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
3. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
6. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: Data Structure

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.

CO2.Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).

CO3.Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.

CO4.Apply classical sorting, searching, optimization and graph algorithms.

CO5.Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.

CO6.Understand string matching algorithms, approximation algorithms and randomized algorithms.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

<table>
<tr><td>Programme: UG
Class: B.Tech (CSE)</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td>Credits
Theory:4
Practical:0</td><td colspan="2">Subject: Database Management System</td></tr>
<tr><td>Course Code: SECS-352</td><td colspan="2">Title: Database Management System</td></tr>
<tr><td colspan="3">Course Objectives:
The Student will Learn:
• To understand the basic concepts and the applications of database systems. To apply channel allocation, framing, error and flow control techniques.
• To master the basics of SQL and construct queries using SQL.
• To understand the relational database design principles and implementations.
• To understand the transaction processing
• To implement the concurrency techniques in transaction processing</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="3">L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.</td><td>8L</td></tr>
<tr><td>II</td><td>Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL</td><td>8L</td></tr>
<tr><td>III</td><td>Data Base Design & Normalization: Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design</td><td>8L</td></tr>
<tr><td>IV</td><td>Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable</td><td>8L</td></tr>
</table>

	Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.	
V	Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**8L**

Reference / Text Books:

1. "Data base System Concepts", A. Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition
2. "Fundamental of Database systems " by Elsmasri &Navathe , 6th edition, Addison-Wesley
3. "Data base Concepts" by CJ. Date, 7th edition
4. "Database Management Concepts" by Raghu Ramakrishnan & Johannes Gehrke, 2nd edition.
5. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2nd ed., ELSEVIER.
6. Database Management Systems, G.K. Gupta, TMH.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	10
5) ESE	100
Total:	150

Prerequisites for the course: Nil

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.To memorize the basic concept of database systems and to understand the database modeling concept using ER modeling.

CO2.To understand and apply the concept of relational data model and SQL for database management.

CO3.To understand and apply the concept of normalization using FD, MVD & JD's for designing database effectively.

CO4.To understand the Transaction processing fundamentals and transaction management.

CO5.To understand the concept of deadlock and distributed database.

CO6.To understand various protocols for maintaining concurrency in transactions of real world scenarios.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG **Class: B.Tech (CSE)**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Discrete Structures & Theory of Logic
Course Code: SECS-353	**Title:** Discrete Structures & Theory of Logic

Course Objectives:
The Student will Learn:
- To acquaint the concept of set theory, relations and functions.
- To understand the concepts related to algebraic structures.
- To introduce the fundamentals of Boolean algebra and its properties.
- To acquaint the concept of Propositional Logic and Predicate Logic
- To use concept of trees and graph theory for solving practical problems.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.	**8L**
II	Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.	**8L**
III	Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.	**8L**
IV	Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic	**8L**
V	Trees: Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph	**8L**

	coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle	

Reference / Text Books:

1. Hari Krishan, Discrete Mathematics, Pragati Edition
2. Lipchitz, S. & Lipson S., Discrete Mathematics, Outline series Tata McGraw Hill.
3. Kumar, S.S., Discrete Mathematics, S. Chand.
4. Dean, N., Essence of Discrete Mathematics, Prentice Hall Liu, C.L., Elements of Discrete Mathematics, McGraw Hill.
5. Rosen, Kenneth H., Discrete Mathematics and Its Applications, McGraw Hill.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.To memorize and understand the concept of set theory, relation and function.

CO2.To understand the fundamentals of algebraic structures

CO3.To understand the fundamentals of Boolean algebra and illustrate their properties

CO4.To understand the concept of Propositional Logic and Predicate Logic and illustrate their properties.

CO5.To memorize and understand the concept of trees & graphs and exhibit their properties effectively.

CO6.To memorize and understand the concept of Recurrence Relation, Generating function and Combinatorics.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

<table>
<tr><td colspan="2">Programme: UG
Class: B.Tech CSE</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:0</td><td colspan="2">Subject: Machine Learning Techniques</td></tr>
<tr><td colspan="2">Course Code:
SDCS- 351-1</td><td colspan="2">Title: Machine Learning Techniques</td></tr>
<tr><td colspan="4">Course Objectives:
The Student will Learn:
1. To understand the concept of machine learning.
2. To acquaint the concept of Regression and Support vector machine.
3. To introduce the concept of decision tree learning.
4. To understand the concept of artificial neural network and deep learning.
5. To acquaint the concept of Reinforcement Learning.</td></tr>
<tr><td colspan="4">Nature of Paper: Department Elective</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="4">L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">INTRODUCTION – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;</td><td>8L</td></tr>
<tr><td>II</td><td colspan="2">REGRESSION: Linear Regression and Logistic Regression BAYESIAN LEARNING - Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. SUPPORT VECTOR MACHINE: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel,and Gaussiankernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM</td><td>8L</td></tr>
<tr><td>III</td><td colspan="2">DECISION TREE LEARNING - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning</td><td>8L</td></tr>
<tr><td>IV</td><td colspan="2">ARTIFICIAL NEURAL NETWORKS – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks, Derivation of Backpropagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; DEEP</td><td>8L</td></tr>
</table>

	LEARNING - Introduction,concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc.	
V	REINFORCEMENT LEARNING–Introduction to Reinforcement Learning , Learning Task,Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process , Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning,Introduction to Deep Q Learning. GENETIC ALGORITHMS: Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications	**8L**

Reference / Text Books:

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.To understand the need for machine learning for various problem solving.
CO2.To understand a wide variety of learning algorithms and how to evaluate models generated from data.
CO3.To understand the latest trends in machine learning.
CO4.To design appropriate machine learning algorithms and apply the algorithms to a real-world problems.
CO5.To optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
CO6.To understand the concept of reinforcement Learning and genetic algorithms.

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG **Class: B.Tech CSE**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Application of Soft Computing
Course Code: SDCS- 351-2	**Title:** Application of Soft Computing

Course Objectives:
The Student will Learn:
1. To introduce the concept of soft computing.
2. To acquaint the concept of Fuzzy System.
3. To understand the concepts of Neuro-fuzzy Modeling.
4. To introduce the concept of genetic algorithms.
5. To understand the applications of soft computing and to introduction MATLAB Environment.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction to Soft Computing, ARTIFICIAL NEURAL NETWORKS Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network.	**8L**
II	FUZZY SYSTEMS Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	**8L**
III	NEURO - FUZZY MODELING Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation	**8L**
IV	GENETIC ALGORITHMS Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method	**8L**
V	APPLICATION OF SOFT COMPUTING Optimization of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.	**8L**

Reference / Text Books: **An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)** 1. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer) 2. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley) 3. Neural Networks and Learning Machines Simon Haykin (PHI) 4. Sivanandam, Deepa, " Principles of Soft Computing", Wiley

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: Fuzzy Logic
Course Learning Outcomes: **After completing the course, students should be able to:** CO1.To memorize and understand the concept of soft computing. CO2.To understand the fundamentals of Fuzzy System. CO3.To understand the fundamentals of Neuro-fuzzy Modeling CO4.To understand the concept of genetic algorithms. CO5.To understand the concept of genetic algorithm based Internet Search Techniques. CO6.To memorize and understand the concept of applications of soft computing.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG **Class: B.Tech CSE**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Augmented & Virtual Reality
Course Code: SDCS- 351-3	**Title:** Augmented & Virtual Reality

Course Objectives:
The Student will Learn:
1. To introduce the concept of Virtual reality and virtual environments.
2. To acquaint the concept of 3D user interface input hardware.
3. To understand the concepts of Software technologies and VR environment.
4. To introduce the concept of 3D Interaction Techniques.
5. To understand the applications of Augmented and Mixed Reality.

Nature of Paper: Department elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS: The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces	**8L**
II	3D USER INTERFACE INPUT HARDWARE: Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces.	**8L**
III	SOFTWARE TECHNOLOGIES: Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market	**8L**
IV	3D INTERACTION TECHNIQUES: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment	**8L**

	Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry . DESIGNING AND DEVELOPING 3D USER INTERFACES: Strategies for Designing and Developing Guidelines and Evaluation. VIRTUAL REALITY APPLICATIONS: Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.	
V	Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems	**8L**

Reference / Text Books:

1. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.
4. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.
5. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	10
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Computer Graphics

Course Learning Outcomes:
After completing the course, students should be able to:
CO1.To memorize and understand the concept of Virtual reality and virtual environments.
CO2.To understand the fundamentals of 3D user interface input hardware.
CO3.To understand the fundamentals of Software technologies and VR environment.
CO4.To understand the concept of 3D Interaction Techniques.
CO5.To understand the concept of designing and developing 3D user interface and Virtual reality applications.
CO6.To memorize and understand the concept of Augmented and Mixed Reality.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG **Class: B.Tech CSE**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Human Computer Interface
Course Code: SDCS- 351-4	**Title:** Human Computer Interface
Course Objectives: **The Student will Learn:** 1. To introduce the concept of user interface and graphical user interface. 2. To acquaint the concept of design process. 3. To understand the concepts of screen designing. 4. To introduce the concept of windows and multimedia. 5. To understand the applications of software tools and interaction tools.	
Nature of Paper: Department Elective	
Minimum Passing Marks/Credits: 40% Marks/4	
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Importance of user Interface its definition, importance and benefits of good design, Overview history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	**8L**
II	Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals of screen designing.	**8L**
III	Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	**8L**
IV	Windows: New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors	**8L**
V	Software tools: Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	**8L**

Reference / Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Nil

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.Understanding user interface good design.
CO2.Analyzing the design process and understanding human interaction with computers.
CO3.Analyzing the screen design process and understanding human interaction with computers.
CO4.Understand the technological consideration in interface design.
CO5.Understanding windows, components and multimedia.
CO6.Understanding software tools and interaction devices.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III /Semester: V

Programme: UG **Class:B.Tech-CSE**	Year: III Semester: V
Credits Theory: 0 Practical: 2	**Subject: Design Analysis and Algorithm lab**
Course Code: **SECS-251P**	**Title: Design Analysis and Algorithm lab**

Course Objectives:

1. The principle objective of this course is to build solid foundation in algorithms and their applications.
2. To implement various divide and conquer techniques examples.
3. To implement various Greedy techniques examples.
4. To implement various Dynamic Programming techniques examples.
5. To provide a practical exposure of all algorithms.
6. To understand the importance of algorithm and its complexities

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Write a program to perform operation count for a given pseudo code	2
II	Write a program to perform Bubble sort for any given list of numbers.	2
III	Write a program to perform Insertion sort for any given list of numbers.	2
IV	Write a program to perform Quick Sort for the given list of integer values.	2
V	Write a program to find Maximum and Minimum of the given set of integer values.	2
VI	Write a Program to perform Merge Sort on the given two lists of integer values.	2
VII	Write a Program to perform Binary Search for a given set of integer values recursively and nonrecursively.	2
VIII	Write a program to find solution for knapsack problem using greedy method.	2
IX	Write a program to find minimum cost spanning tree using Prim's Algorithm.	2
X	Write a program to find minimum cost spanning tree using Kruskal's Algorithm	2

Reference / Text Books: 1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India. 2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms".

Evaluation/Assessment Methodology	
	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Course Learning Outcomes: Student will be able to : CO1.To learn the importance of designing an algorithm in an effective way by considering space and time complexity CO2.To learn divide and conquer strategy based algorithms CO3.To learn greedy method based algorithms CO4.To learn the dynamic programming design techniques CO5.To develop Recursive backtracking algorithms CO6.To learn graph search and network flow algorithms

Format-3

IIMTU-NEP IMPLEMENTATION
Year III / Semester V

<table>
<tr><td>Programme: UG (R)
Class: B.Tech(CSE)</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td>Credits
Theory: 0
Practical: 2</td><td colspan="2">Subject: DBMS LAB</td></tr>
<tr><td>Course Code:
SECS-352P</td><td colspan="2">Title: DBMS LAB</td></tr>
<tr><td colspan="3">Course Objectives:
1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. To understand the relational database design principles.
4. To become familiar with the basic issues of transaction</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks/2</td></tr>
<tr><td colspan="3">L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Installing oracle.</td><td>2</td></tr>
<tr><td>II</td><td>Creating Entity-Relationship Diagram using case tools.</td><td>2</td></tr>
<tr><td>III</td><td>Writing SQL statements Using ORACLE</td><td>2</td></tr>
<tr><td>IV</td><td>Writing basic SQL SELECT statements</td><td>2</td></tr>
<tr><td>V</td><td>Restricting and sorting data.</td><td>2</td></tr>
<tr><td>VI</td><td>Displaying data from multipletables.</td><td>2</td></tr>
<tr><td>VII</td><td>Aggregating data using group function</td><td>2</td></tr>
<tr><td colspan="3">Reference / Text Books:
1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill 2. Date C J, "An Introduction to Database Systems", Addision Wesley</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective then the students of following departments may opt it.
1.NA</td></tr>
<tr><td colspan="3">Evaluation/Assessment Methodology</td></tr>
<tr><td colspan="3">Max. Marks:50</td></tr>
<tr><td colspan="2">1) Class tasks/ Sessional Examination
2) Presentations /Seminar
3) Assignments
4) Research Project Report
Seminar On Research Project Report
5) ESE</td><td>20

30</td></tr>
<tr><td colspan="2">Total:</td><td>50</td></tr>
</table>

Course learning outcomes:

Student will be able to :

CO1.Get practical knowledge on designing and creating relational database systems.

CO2.Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.

CO3.Use various software to design and build ER Diagrams, UML, Flow chart for related database systems.

CO4.Able to design and implement database applications on their own.

CO5.Display data from multiple tables

CO6.Able to implement Restrict and sort data.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III/ Semester V

Programme: UG (R) **Class:B.TECH-CSE**	Year: III Semester: V
Credits Theory: 4 Practical: 2	**Subject: Discrete Structures & Theory of Logic Lab**
Course Code: SECS-353P	**Title: Discrete Structures & Theory of Logic Lab**

Course Objectives:

1. To implement basic discrete structures algorithms
2. To analyze algebraic techniques and implement algebraic operations.
3. To implement logical problems like Boolean algebra, poker hand problem and birthday problem
4. To implement closed formula of recursive sequence

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Implementation basic python program related to Data types, operators. a) Evaluate value of 2x3 - 6x2 + 2x - 1 for x = 3 b) Write a Python program to find the roots of a quadratic function ax2 + bx + c = 0, where a, b and c are real numbers and $a \neq 0$	2
II	Implementation of decision, Loop in python. a) Write a program to calculate factorial of a number. b) Write a program to calculate sum of first n natural numbers where n is finite. c) Write a program for cube sum of first n natural numbers where n is finite.	2
III	Implementation of various set operations (union, intersection, difference, symmetric difference, Power set, cardinality).	2
IV	Write program to perform following operation: a) Is the given relation is reflexive? b) Is the given relation is symmetric? c) Is the given relation is Transitive.	2
V	Write program to generate recursive sequence of a closed formula and also calculate its value at particular non negative integer recursively for the following: a) Polynomial 2n b) Fibonacci sequence c) Factorial of a number	2
VI	Write program to: a. Perform + m (addition modulo) and xm (multiplication modulo)for a particular set. b. Check closure property for + m (addition modulo) and xm (multiplication modulo) for any set you have assumed. c. Find identity element in any given algebraic system if exist. Find inverse of all elements in a given group if identity element is given.	2

VII	Write program for various number systems: a. Decimal to binary, octal & hexadecimal b. Binary to decimal, octal and hexadecimal c. Octal to decimal, binary and hexadecimal d. Hexadecimal to decimal, binary and octal e. Logic gate simulation AND, OR, NOT, EXOR, NOR	2

Reference / Text Books:
1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology

	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Course Learning outcomes
Student will be able:
CO1.To implement basic discrete structures algorithms.
CO2.To analyze algebraic techniques and implement algebraic operations.
CO3.To implement logical problems like Boolean algebra, poker hand problem and birthday problem.
CO4.To implement closed formula of recursive sequence.
CO5.Implement the following operation: a) Is the given relation is reflexive? b) Is the given relation is symmetric c) Is the given relation is Transitive.
CO6.Implement various set operations union, intersection, difference, symmetric difference, Power set, cardinality.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG **Class: B.Tech CSE**	Year: III Semester: VI
Credits Theory:4 Practical:0	**Subject: Computer Networks**
Course Code: SECS-361	**Title: Computer Networks**

Course Objectives:
The Student will Learn:
- To explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission, Vulnerabilities in any computing system and security solution.
- To apply channel allocation, framing, error and flow control techniques.
- To describe the functions of Network Layer i.e. Logical addressing, sub netting & Routing Mechanism.
- To explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.
- To explain the functions offered by session and presentation layer and their Implementation.
- To explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.

Nature of Paper:Core

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introductory Concepts**: Goals, applications and categories of networks, Internet Organization, ISP, Network structure and architecture (layering principles, services, protocols and standards), Overview of OSI reference model, Overview of TCP/IP protocol suite, Network devices and components. **Physical Layer:** Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	**8L**
II	**Link layer:** Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	**8L**
III	**Network Layer:** Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing,Routing algorithms and protocols, Congestion control algorithms, IPv6.	**8L**

IV	**Transport Layer:** Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management, TCP Congestion control, Quality of service.	**8L**
V	**Application Layer:** DNS, WWW and HTTP, Electronic mail, FTP, Remote login, Network management, Data compression, Cryptography – basic concepts.	**8L**

Reference / Text Books:

1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Prentice Hall.
3. William Stallings, "Data and Computer Communication", Pearson
4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson.
5. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	10
5) ESE	100
Total:	150

Prerequisites for the course: NIL

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission

CO2.Apply channel allocation, framing, error and flow control techniques.

CO3.Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.

CO4.Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.

CO5.Explain the functions offered by session and presentation layer and their Implementation.

CO6.Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme:UG(R) **Class:B.Tech CSE**	Year: III Semester:VI
Credits Theory:4 Practical:0	**Subject: Compiler Design**
Course Code: SECS-362	**Title: Compiler Design**

Course Objectives:
The Student will Learn:

- To understand the concept of phases and passes of compiler and its tools like LEX and YAAC.
- To acquaint with knowledge of various parsers and parsing techniques.
- To analyze and implement compiler by Syntax-directed Translation schemes.
- To understand the concept of symbol table and error detection and recovery mechanism.
- To understand the concept of code generation and code optimization.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40$ Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Compiler:** Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**8L**
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	**8L**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements	**8L**
IV	**Symbol Tables:** Data structure for symbols tables, representing scope information. **Run-Time Administration:** Implementation of simple stack allocation scheme, storage allocation in block structured language. **Error**	**8L**

	Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	
V	**Code Generation**: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. **Code optimization:** Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**8L**

Reference / Text Books:

1. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill, 2003.
3. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools”, Pearson Education
5. V Raghvan, “ Principles of Compiler Design”, TMH
6. Kenneth Louden,” Compiler Construction”, Cengage Learning.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.To explain the different phases and passes of compiler and eventually recognize patterns, tokens and regular expressions.
CO2.To implement the concept of parsers and construct the parsing tables
CO3.To illustrate and create the intermediate code
CO4.To analyze and implement compiler by Syntax-directed Translation schemes.
CO5.To summarize the knowledge of various parsers and parsing techniques.
CO6.To integrate the concept of code generation and code optimization.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG **Class: B.Tech CSE**	Year: III Semester:VI
Credits Theory:4 Practical:0	**Subject: BIG DATA**
Course Code: SDCS-361	**Title: BIG DATA**
Course Objectives: **The Student will Learn:** • To demonstrate knowledge of Big Data Analytics concepts and its applications in business. • To demonstrate functions and components of Map Reduce Framework and HDFS. • To discuss Data Management concepts in NoSQL environment. • To explain process of developing Map Reduce based distributed processing applications. • To explain process of developing applications using HBASE, Hive, Pig etc. • To demonstrate knowledge of Big Data Analytics concepts and its applications in business.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Big Data**: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.	**8L**
II	**Hadoop:** History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. **Map Reduce:** Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce.	**8L**
III	**HDFS (Hadoop Distributed File System):** Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: compression, serialization, Avro and file-based data	**8L**

	structures. **Hadoop Environment:** Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud	
IV	**Hadoop Eco System and YARN**: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features - NameNode high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. **NoSQL Databases:** Introduction to NoSQL **MongoDB:** Introduction, data types, creating, updating and deleting documents, querying, introduction to indexing, capped collections **Spark:** Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN **SCALA:** Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.	**8L**
V	**Hadoop Eco System Frameworks**: Applications on Big Data using Pig, Hive and HBase **Pig** - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, **Hive** - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries. **HBase** – Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL.	**8L**

Reference / Text Books:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
2. Big-Data Black Book, DT Editorial Services, Wiley
3. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch,“Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill.
4. Thomas Erl, Wajid Khattak, Paul Buhler, “Big Data Fundamentals: Concepts, Drivers and Techniques”, Prentice Hall.
5. Bart Baesens “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons
6. ArshdeepBahga, Vijay Madisetti, “Big Data Science & Analytics: A HandsOn Approach “, VPT

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
3)Assignments 4)Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: DBMS
Course Learning Outcomes: **After completing the course, students should be able to:** CO1.Demonstrate knowledge of Big Data Analytics concepts and its applications in business. CO2.Demonstrate functions and components of Map Reduce Framework and HDFS CO3.Discuss Data Management concepts in NoSQL environment. CO4.Explain process of developing Map Reduce based distributed processing applications. CO5.Explain process of developing applications using HBASE, Hive, Pig etc. CO6.Explain demonstrate knowledge of Big Data Analytics concepts and its applications in business.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG **Class: B.Tech CSE**	Year: III Semester:VI
Credits Theory:4 Practical:0	**Subject: Image Processing**
Course Code: SDCS-362	**Title: Image Processing**

Course Objectives:
The Student will Learn:

- Student will be able to explain the basic concepts of two-dimensional signal acquisition, sampling, quantization and color model.
- Student will be able to apply image processing techniques for image enhancement in both the spatial and frequency domains.
- Student will be able to apply and compare image restoration techniques in both spatial and frequency domain
- Student will be able to compare edge based and region based segmentation algorithms for ROI extraction.
- Student will be able to explain compression techniques and descriptors for image processing.

Nature of Paper:Elective Paper

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models,Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	**8L**
II	**IMAGE ENHANCEMENT:** Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	**8L**
III	**IMAGE RESTORATION:** Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	**8L**

IV	**IMAGE SEGMENTATION:** Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	**8L**
V	**IMAGE COMPRESSION AND RECOGNITION:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.	**8L**

Reference / Text Books:

1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing Pearson, Third Edition, 2010
2. Anil K. Jain, Fundamentals of Digital Image Processing Pearson, 2002.
3. Kenneth R. Castleman, Digital Image Processing Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau,Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt,Digital Image Processing John Wiley, New York, 2002

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	10
5) ESE	100
Total:	150

Prerequisites for the course: NIL

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Explain the basic concepts of two-dimensional signal acquisition, sampling,quantization

CO2.Compare and contrast different color model.

CO3.Apply image processing techniques for image enhancement in both the spatial and frequency domains.

CO4.Apply and compare image restoration techniques in both spatial and frequency domain.

CO5.Compare edge based and region based segmentation algorithms for ROI extraction.

CO6.Explain compression techniques and descriptors for image processing.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG **Class: B.Tech CSE**	Year: III Semester:VI
Credits Theory:4 Practical:0	**Subject: Real Time Systems**
Course Code: SDCS-363	**Title: Real Time Systems**

Course Objectives:
The Student will Learn:
1. To illustrate the need and the challenges in the design of hard and soft real time systems.
2. To compare different scheduling algorithms and the schedule criteria.
3. To discuss resource sharing methods in real time environment.
4. To compare and contrast different real time communication and medium access control techniques.
5. To analyze real time Operating system and Commercial databases.

Nature of Paper:Elective Paper

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction** Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.	**8L**
II	**Real Time Scheduling** Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-DeadlineFirst (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm,Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.	**8L**
III	**Resources Sharing** Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.	**8L**

IV	**Real Time Communication** Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols	**8L**
V	**Real Time Operating Systems and Databases** Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases	**8L**

Reference / Text Books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	10
5) ESE	100
Total:	150

Prerequisites for the course:NIL

Course Learning Outcomes:
After completing the course, students should be able to:
CO1.Illustrate the need and the challenges in the design of hard and soft real time systems.
CO2.Compare different scheduling algorithms and the schedule criteria.
CO3.Discuss resource sharing methods in real time environment.
CO4.Compare and contrast different real time communication techniques
CO5.Compare different medium access control techniques.
CO6.Analyze real time Operating system and Commercial databases.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme:UG **Class:B.Tech CSE**	Year: III Semester:VI
Credits Theory:4 Practical:0	**Subject: Data Compression**
Course Code: SDCS-364	**Title: Data Compression**

Course Objectives:
The Student will Learn:

- Student will be able to explain the basic concepts of Compression Techniques.
- Student will be able to apply coding algorithm Techniques.
- Student will be able to apply Applications like Bi-level image compression, JBIG standard, JBIG2, Image compression and Dictionary Techniques.
- Student will be able to understand different Models and Scalar Quantization.
- Student will be able to compare Vector Quantization andScalar Quantization.

Nature of Paper:Elective Paper

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Overview of Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: Introduction to information theory, Description of Models: Physical models, Probability models, Markov models, composite source model, Overview of Coding: uniquely decodable codes and Prefix codes.	**8L**
II	Description of Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Huffman coding: Loss less image compression, Text compression, Audio Compression.	**8L**
III	Coding of sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Moveto- front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy	**8L**

	Compression.	
IV	Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.	**8L**
V	Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured Vector Quantizers.	**8L**

Reference / Text Books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers.
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition, Khalid Sayood,The Morgan aufmann Series
4. Data Compression: The Complete Reference 4th Edition by David Salomon, Springer
5. Text Compression1st Edition by Timothy C. Bell Prentice Hall.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	10
5) ESE	100
Total:	150

Prerequisites for the course: Image Processing

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Explain the basic concepts of Compression Techniques.
CO2.Explain different models.
CO3.Apply coding algorithm Techniques.
CO4.Apply Applications like Bi-level image compression, JBIG standard, JBIG2, Image compression and Dictionary Techniques.
CO5.Explain different Models and Scalar Quantization.
CO6.Compare Vector Quantization and Scalar Quantization.

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG **Class: B.Tech CSE**	Year: III Semester: VI
Credits Theory:4 Practical:0	**Subject: Universal Human Values & Professional Ethics**
Course Code: UVE-601	**Title: Universal Human Values & Professional Ethics**

Course Objectives:
The Student will Learn:

1. To reinstate the rich cultural legacy and human values of which we are the custodians.
2. To focus on professional ethics which are broader indicators of desirable actions vis-à-vis undesirable actions.
3. To lay down broader guidelines of values and ethics for internal and external stakeholders.
4. To suggest operational guidelines for value-based and ethical practices in the higher educational institutions leading to implementation and monitoring.
5. To indicate the outcomes of creating a value-based and ethical culture in HEIs.
6. To suggest indicative reinforcement programm for nurturing human values and ethics in HEIs.

Nature of Paper:Elective Paper

Minimum Passing Marks/Credits: 40% Marks/3

L:3 T:0 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Unit	Contents	No. of Lectures Allotted
I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:** Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	**8L**
II	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.	**8L**
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction,	**8L**

	Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!. Universal Human Values of truth (Satya), nonviolence, love (Prem), Peace (Shanti) and righteous conduct (dharma).	
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	**8L**
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definiteness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations. **Workshop on Life Skills**	**8L**

Reference / Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, a Foundation Course in Human Values and Professional Ethics.
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
6. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3 Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	10 05 35
Total:	50
Prerequisites for the course: NIL	

Course Learning Outcomes:
After completing the course, students should be able to:
CO1.Explain learning process for holistic development
CO2.Define Impeccable governance
CO3.Explain Effective institutional management
CO4.Use Well laid system of rewards and chastisement
CO5.Analyse Institutional climate where ‘rights’ enjoy and ‘wrongs’ are discouraged.
CO6.Development of Humanistic, Ethical, Constitutional and Universal Human Values.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG **Class: B.Tech CSE**	Year: III Semester: VI
Credits Theory:0 Practical:2	**Subject: Computer Networks lab**
Course Code: SECS-361P	**Title: Computer Networks lab**

Course Objectives:
The Student will Learn:
- To understand the Implementation of Stop and Wait Protocol and Sliding Window Protocol.
- To understand the concept of ARP/RARPprotocols.
- To understand creation ofa socketfor HTTPforweb page
- To understand subnetting and applications using TCPand UDP Sockets.

Nature of Paper:Core

Minimum Passing Marks/Credits: 50% Marks/2

L:0 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Implementation of Stop and Wait Protocol and Sliding Window Protocol.	1L
II	Study of Socket Programming and Client – Server model	1L
III	Write a code simulating ARP /RARP protocols.	1L
IV	Write a code simulating PING and TRACEROUTE commands	1L
V	Create a socket for HTTP for web page upload and download.	1L
VI	Write a program to implement RPC (Remote Procedure Call)	1L
VII	Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Link State routing ii. Flooding iii. Distance vector	1L
VIII	To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.	1L
IX	Configuration of router, hub, switch etc. (using real devices or simulators)	1L
X	Network packet analysis using tools like Wire shark, tcpdump, etc	1L
XI	Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.	1L
XII	Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)	1L

Reference / Text Books:

1. BehrouzForouzan,“DataCommunicationandNetworking”,McGrawHill
2. AndrewTanenbaum“ComputerNetworks”, Prentice Hall.
3.WilliamStallings,“DataandComputer Communication”,Pearson
4. KuroseandRoss,“Computer Networking-ATop-DownApproach”, Pearson.
5. PetersonandDavie,“ComputerNetworks:ASystems Approach”, MorganKaufmann

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:
After completing the course, students should be able to:
CO1.Simulate different network topologies.
CO2.Implement various farming methods of Data Link Layer.
CO3.Implement various Error and flow control techniques.
CO4.Implement network routing and addressing techniques.
CO5.Implement transport and security mechanisms
CO6.Implement Socket programming using UDP and TCP

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

<table>
<tr><td colspan="2">Programme:UG
Class:B.Tech CSE</td><td colspan="2">Year: III
Semester:VI</td></tr>
<tr><td colspan="2">Credits
Theory:0
Practical:2</td><td colspan="2">Subject: Compiler Design Lab</td></tr>
<tr><td colspan="2">Course Code: SECS-362P</td><td colspan="2">Title: Compiler Design Lab</td></tr>
<tr><td colspan="4">Course Objectives:
The Student will Learn:
• To understand the different phases and passes of compiler and eventually recognize patterns, tokens and regular expressions.
• To understand the concept of parsers and construct the parsing tables.
• To understand and create the intermediate code</td></tr>
<tr><td colspan="4">Nature of Paper:Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 50% Marks/1</td></tr>
<tr><td colspan="4">L: T: P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>Practical-1</td><td colspan="2">Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.</td><td>1L</td></tr>
<tr><td>Practical-2</td><td colspan="2">Implementation of Lexical Analyzer using Lex Tool</td><td>1L</td></tr>
<tr><td>Practical-3</td><td colspan="2">Generate YACC specification for a few syntactic categories.
a) Program to recognize a valid arithmetic expression that uses operator +, –, * and /.
b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
c) Implementation of Calculator using LEX and YACC
d) Convert the BNF rules into YACC form and write code to generate abstract syntax tree</td><td>1L</td></tr>
<tr><td>Practical-4</td><td colspan="2">Write program to find ε – closure of all states of any given NFA with ε transition.</td><td>1L</td></tr>
<tr><td>Practical-5</td><td colspan="2">Write program to convert NFA with ε transition to NFA without ε transition.</td><td>1L</td></tr>
<tr><td>Practical-6</td><td colspan="2">Write program to convert NFA to DFA</td><td>1L</td></tr>
<tr><td>Practical-7</td><td colspan="2">Write program to minimize any given DFA.</td><td>1L</td></tr>
<tr><td>Practical-8</td><td colspan="2">Develop an operator precedence parser for a given language.</td><td>1L</td></tr>
<tr><td>Practical-9</td><td colspan="2">Write program to find Simulate First and Follow of any given grammar.</td><td>1L</td></tr>
<tr><td>Practical-10</td><td colspan="2">Construct a recursive descent parser for an expression</td><td>1L</td></tr>
<tr><td colspan="4">Reference / Text Books:
1. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill, 2003.</td></tr>
</table>

3. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
5. V Raghvan, " Principles of Compiler Design", TMH
6. Kenneth Louden," Compiler Construction", Cengage Learning.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:
After completing the course, students should be able to:

CO1. Recognize patterns, tokens & regular expressions for lexical analysis.
CO2.Implement Lexical analyzer for source language using C and LEX or YACC tools
CO3.To analyze and construct top down and bottom up parsers.
CO4.To evaluate and create the intermediate code
CO5.To create machine code from the intermediate code format.
CO6.To Construct a recursive descent parser for an expression

Format-3

IIMTU-NEP IMPLEMENTATION
Year : IV/Semester : VII

Programme:UG **Class: B.Tech (CSE)**	Year: IV Semester: VII
Credits Theory: 4 Practical: 3	**Subject: Distributed System**
Course Code: SECS-471	**Title: Distributed System**

Course Objectives:

1. To understand theoretical concept of distributed system and message passing system.
2. To understand the concepts of Mutual Exclusion and classification of algorithm and Distributed deadlock.
3. To understand theoretical concepts of Agreement Protocol and distributed Resource Management.
4. To get knowledge failure recovery in distributed system and, fault tolerance services.
5. To understand the concepts of transaction and concurrency control and Replication Process and error recovery.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /3

L: 3
T: 1
P: 3 (In Hours/Week)
Theory - 3
Practical- 3

Unit	Contents	No. of Lectures Allotted
I	Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, and termination detection.	8
II	Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.	8
III	Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems,	8

	Mechanism for building distributed file systems, Design issues in Distributed Shared Memory.	
IV	Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Fault - tolerant services, Commit Protocols, Voting protocols, Dynamic voting protocols.	8
V	Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Transaction recovery. Replication: System model and group communication, highly available services, Transactions with replicated data.	8

Reference/ Text Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Computing , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Assignments	20
3) External Theory	100
Total:	150

Course Learning Outcomes:

CO1.Define the characterization of Distributed Systems, Theoretical Foundation for Distributed System and Concepts in Message Passing System

CO2.Explain the Distributed Mutual Exclusion and Distributed Deadlock Detection

CO3.To know about Shared Memory Techniques and have Sufficient knowledge about file access

CO4.Apply the Agreement Protocols and Distributed Resource Management

CO5.Analyze the Failure Recovery in Distributed Systems and Fault Tolerance

CO6.Evaluate the Transactions and Concurrency Control, Distributed Transactions and Replication

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV/Semester: VII

Programme: UG **Class: B.Tech (CSE)**	Year: IV Semester: VII
Credits Theory: Practical: 2	**Subject: Distributed System Lab**
Course Code: **SECS-471P**	**Title: Distributed System Lab**

Course Objectives:
1. To understand the principles & basic concepts of distributed systems.
2. To understand the concepts of Fault Tolerance and failure recovery of resources in distributed system.
3. To solve problems in distributed Mutual Exclusion using various algorithms and methods.
4. To analyze different Protocols in Distributed Systems.
5. To analyze different distributed system transactions and concurrency controls.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Program to implement non token based algorithm for Mutual Exclusion	2
II	Program to implement Lamport's Logical Clock	2
III	Program to implement edge chasing distributed deadlock detection algorithm.	2
IV	Program to implement locking algorithm.	2
V	Program to implement Remote Method Invocation.	2
VI	Program to implement Remote Procedure Call.	2
VII	Program to implement Chat Server.	2
VIII	Program to implement termination detection	2

Reference / Text Books:

Reference/ Text Books:
1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Computing , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI

If the course is available as Generic Elective then the students of following departments may opt it.
1.NA

Evaluation/Assessment Methodology	
	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Course Learning Outcomes:

CO1.Students will get the concepts of Inter-process communication

CO2.Students will get the concepts of Distributed Mutual Exclusion and Distributed Deadlock Detection algorithm.

CO3.To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.

CO4.Student will be able to implement Chat Server.

CO5.Student will be able to implement Lamport's Logical Clock

CO6.Student will be able to distributed deadlock detection algorithm.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : IV/Semester :VIII

Programme:UG **Class: B.Tech (CSE)**	Year: IV Semester: VIII
Credits Theory: 4 Practical: 0	**Subject: Mobile Computing**
Course Code: SDCS-481	**Title: Mobile Computing**

Course Objectives:

1. Students will be able to explain and discuss issues in mobile computing and illustrate overview of wireless telephony and channel allocation in cellular systems.
2. Students will be able to explore the concept of Wireless Networking and Wireless LAN.
3. Students will be able to analyze and comprehend Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and Disconnected operations.
4. Students will be able to Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment.
5. Students will be able to compare and contrast various routing protocols and will identify and interpret the performance of network systems using Adhoc networks.

Nature of Paper: Elective (Regular)

Minimum Passing Marks/Credits: 40% Marks/3

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 3
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Introduction and issues in mobile computing, Details of wireless telephony: details of cellular concept, GSM details, air-interface in GSM, channel structure in GSM, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, Review of CDMA and GPRS.	10
II	Overview of wireless networking, Overview of wireless LAN: Medium access control issues, Overview of IEEE802.11, Overview of Bluetooth technology, Overview of wireless multiple access protocols, Comparison of Transmission control protocol over wireless transmission control protocol, Explanation of wireless applications, data broadcasting, Overview of MobileIP. WAP: Architecture, protocol stack, application environment and applications.	10
III	Discussion of data management issues, Overview of data replication for mobile computers, Overview of adaptive clustering for mobile wireless networks: File system and Disconnected operations.	10
IV	Concept of mobile agents, Concept of security and fault tolerance and overview of transaction processing in mobile computing environment.	10
V	AdHoc networks: Issues of localization, overview of medium access control issues, discussion of Routing protocols, Understanding global state routing(GSR),Destination sequenced distance vector routing (DSDV), Dynamic	10

	source routing (DSR), Ad Hoc on demand distance vector routing(AODV), Temporary ordered routing algorithm(TORA), Explanation of quality of service in Ad-hoc networks, applications.	

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Assignments	20
5) External Theory	100
Total:	150

Course Learning Outcomes:

CO1.Discussion of issues in mobile computing and over view of wireless telephony and allocation of channel in cellular networks.
CO2.Walkthrough through the concept of Wireless Networking and Wireless local area networks.
CO3.Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and disconnected operations, analysis and comprehension.
CO4.Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment.
CO5.Compare and contrast various routing protocols and will identify and interpret the performance of network systems using Ad-hoc networks.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : IV/Semester :VIII

Programme: UG **Class: B-Tech CSE**	Year: IV Semester:VIII
Credits Theory: 4 Practical: 0	**Subject: INTERNET OF THINGS**
Course Code: SDCS-482	**Title: Internet of Things**
Course Objectives:	
Vision and introduction to IOT. Understand IOT market perspective. Data and knowledge management and use of devices in IOT technology. Understand the State of the art-IOT Architecture. Understand real world IoT design, constraints, IoT Automation and Comeercial building automation in IoT.	
Nature of Paper: Elective (Regular)	
Minimum Passing Marks/Credits: 40% Marks/ 3	
L: 3 T: 1 P: 0 (In Hours/Week) Theory - 3 Practical- 0	

Unit	Contents	No. of Lectures Allotted
I	Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, IoT sources, M2M Communication, Examples of IoT. Design Principles for Connected Devices: IoT/M2M systems layers, design standardization, communication technologies, data enrichment, consolidation, ease of designing, affordability.	10
III	Wireless Medium access issues, medium access protocol survey, Survey routing protocols, Sensor deployment, Node discovery, Data aggregation & dissemination.	10
IV	Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, IoT programming using Arduino.	10
V	Development Challenges, Security Challenges, Other challenges in IoT Applications: Overview of Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city using IoT.	10

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) External Theory	30 20 100
Total:	150
Course Learning Outcomes:	
CO1.Demonstrate basic concepts of IoT, and understand the principles and challenges in IoT implementation. CO2.Understand the functioning of hardware devices and sensors used in IoT. CO3.Network communication aspects and protocols used in IoTare part of analysis. CO4.Apply IoT for developing real life applications using Ardunio programming. CO5.Development of IoT infrastructure for popular applications.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year : IV/ Semester :VIII

<table>
<tr><td colspan="2">Programme:UG
Class: B-Tech (CSE)</td><td>Year: IV
Semester: VIII</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: CLOUD COMPUTING</td></tr>
<tr><td colspan="2">Course Code: SDCS-483</td><td>Title: CLOUD COMPUTING</td></tr>
<tr><td colspan="3">Course Objectives:</td></tr>
<tr><td colspan="3">1. Understand the basic principles of cloud computing.
2. To study the basic technologies that forms the foundations of Big Data.
3. To study the programming aspects of cloud computing with a view to rapid prototyping of complex applications.
4. To understand the specialized aspects of big data including big data application, and big data analytics.
5. To study different types Case studies on the current research and applications of the Hadoop and big data in industry</td></tr>
<tr><td colspan="3">Nature of Paper: Elective (Regular)</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/3</td></tr>
<tr><td colspan="3">L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 3
Practical- 0</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Overview of Cloud Computing, history, definition and evolution, Underlying concept of Parallel and Distributed computing, Cloud Architecture, and its types. Business models built around cloud technology, Case studies of major players in Cloud Computing. Discussion of issues in Clouds, Eucalyptus, Nimbus, Open Nebula, and CloudSim.</td><td>10</td></tr>
<tr><td>II</td><td>Overview of Cloud Services, Software as a Service Platform, Infrastructure as a Service, Database as a Service, Monitoring as a Service, communication as services. Discussion of service providers such as Google, Amazon, Microsoft Azure, IBM, Sales force.</td><td>10</td></tr>
<tr><td>III</td><td>Collaborating Using Cloud Services such as Email Communication over the Cloud, Project Management, Calendar, Schedules, Word Processing, Presentation, Spreadsheet, Databases, Desktop, Social Networks, customer relationship management and Groupware.</td><td>10</td></tr>
<tr><td>IV</td><td>Virtualization, Need, Pros and cons, Types of Virtualization in cloud, System and Process VM, Virtual Machine monitor, machine, Interpretation and binary translation, Overview of HLL VM supervisors, Xen, KVM, VMware, Virtual Box, Hyper-V.</td><td>10</td></tr>
</table>

V	Security in Clouds and challenges, Software as a Service Security, Overview of Common Standards in cloud i.e The Open Cloud Consortium ,The Distributed management Task Force , Standards for application Developers, Standards for Messaging, Standards for Security, End user access to cloud computing, Discussion on Mobile Internet devices and the cloud. Overview of Hadoop, Map Reduce, Virtual Box. Discussion on Google App Engine and Programming Environment for Google App Engine	10

Reference/ Text Book:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Assignments	20
3) External Theory	100
Total:	150

Course Learning Outcomes:

CO1.Student must be Able to understand the building blocks of Big Data.
CO2.Student must be able to articulate the programming aspects of cloud computing(map Reduce etc).
CO3.Student must be able to understand the specialized aspects of big data with the help of different big data applications.
CO4.Student must be able to represent the analytical aspects of Big Data.
CO5.Student must be know the recent research trends related to Hadoop File System, MapReduce and Google File System etc.
CO6.Student must be able to understand the Security in Clouds and challenges.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : IV/ Semester :VIII

Programme:UG **Class: B.Tech (CSE)**	Year: IV Semester:VIII
Credits Theory: 4 Practical: 0	**Subject: Block chain Architecture Design**
Course Code: SDCS-484	**Title: Block chain Architecture Design**
Course Objectives	
1. Understanding the core concepts of Blockchain in details. 2. Impart strong technical understanding of consensus protocols. 3. Develop familiarity of current technologies, tools, and implementation strategies of blockchain 4. Understand use of Hyperledger fabric tool and its implementation. 5. Introduce application areas, current practices, and research activity	
Nature of Paper: Elective (Regular)	
Minimum Passing Marks/Credits: 40% Marks/3	
L: 3 T: 1 P: 0 (In Hours/Week) Theory - 3 Practical- 0	

Unit	Contents	No. of Lectures Allotted
I	Overview of block chain, Journey of Digital Money to Distributed Ledgers, Design parameters: Protocols, Security, Consensus, Permissions, Privacy. Architecture and Design of Block chain: Discussion on crypto primitives: Signature and Hash, Journey of Hash chain to Blockchain, Primitive consensus mechanisms	10
II	Consensus protocol requirements, Proof of Work, Scalability aspects of Blockchain consensus protocols, Permissioned Blockchains Consensus protocols and their design goals.	10
III	Overview of Hyperledger Fabric and their components, Decomposing the consensus process , Chain code Design and Implementation Hyperledger Fabric, Beyond Chain code fabric SDK and Front End and working of Hyperledger composer tool	10
IV	Case study of Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance Case study of Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc	10
V	Case Study of Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain	10

Reference/ Text Book: 1. Mstering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos 2. Blockchain by Melanie Swa, O'Reilly 3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) External Theory	30 20 100
Total:	150
Course Learning Outcomes:	
CO1.Basic understanding of Blockchain architecture along with its primitive. CO2.Requirements for basic protocol along with scalability aspects. CO3.We design and deploy the consensus process using frontend and backend. CO4.Application of Block chain techniques for different cases like Finance, Trade/Supply and Government activities. CO5.Design and deploy the consensus process using frontend and backend. CO6.Apply Block chain techniques for different use cases like Finance, Trade/Supply and Government activities.	

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV
(ENGINEERING SCIENCE ELECTIVES)**

<table>
<tr><td colspan="2">Programme: UG
Class: B. Tech (CSE)</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical:</td><td>Subject: Basic Data Structure & Algorithm</td></tr>
<tr><td colspan="2">Course Code:SESB-235/245</td><td>Title: Basic Data Structure & Algorithm</td></tr>
<tr><td colspan="3">Course Objectives:
Acquire some basic mathematical tools and techniques of algorithm analysis.
To familiarise with basic data structures and to develop the ability to choose the appropriate data structure for designing efficient algorithms.
Learn some basic algorithms with their rigorous proofs of correctness and efficiency analysis of implementation using appropriate data structures</td></tr>
<tr><td colspan="3">Nature of Paper: Engineering Science Elective</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="3">L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction to data structure and Algorithms: Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and Multi dimensional arrays, spare matrices, Character storing in C, String operations.</td><td>8</td></tr>
<tr><td>II</td><td>Stack And Queue and Link List: Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue, Priority Queue, D-Queue, Singly and circularly linked list, List operations Lists implementations</td><td>8</td></tr>
<tr><td>III</td><td>Trees : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree.</td><td>8</td></tr>
<tr><td>IV</td><td>Graphs: Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths.</td><td>8</td></tr>
<tr><td>V</td><td>Searching and Sorting: Linear search, binary Search, Internal and External</td><td></td></tr>
</table>

	sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices: Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting.	**8**

Reference / Text Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Weiss, "Data Structure & Algorithm Analysis in C", Addision Wesley.
4. Basse, "computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
5. Lipschutz, "Data structure, "Schaum series.
6. Aho, hopcropt, Ullman, “Data Structure & Algorithm", Addision Wesley.
7. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Understand and analyze the time and space complexity of an algorithm

CO2.Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)

CO3.Discuss various algorithm design techniques for developing Algorithms

CO4.Discuss various searching, sorting and graph traversal Algorithms

CO5.Understand operation on Queue , Priority Queue , D-Queue.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV
(ENGINEERING SCIENCE ELECTIVES)**

Programme: UG **Class: B. Tech (CSE)**	Year: II Semester: IV	
Credits Theory: 4 Practical:	**Subject:** Introduction to Soft Computing	
Course Code: SESB-236/246	**Title:** Introduction to Soft Computing	
Course Objectives: NA		
Nature of Paper: Engineering Science Elective		
Minimum Passing Marks/Credits: 40% Marks/4		
L:3 T:1 P:3(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)		
Unit	**Contents**	**No. of Lectures Allotted**
I	Introduction to Soft Computing, ARTIFICIAL NEURAL NETWORKS Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network.	**8**
II	FUZZY SYSTEMS Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	**8**
III	NEURO - FUZZY MODELING Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation	**8**
IV	GENETIC ALGORITHMS Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method	**8**
V	APPLICATION OF SOFT COMPUTING Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques	**8**

Reference / Text Books:

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)

3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)
5. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
6. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
7. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
8. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
9. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
10. Wang, "Fuzzy Logic", Springer

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

CO1.Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.

CO2.Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning,fuzzy inference systems, and fuzzy logic

CO3.Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self learning situations.

CO4.Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.

CO5.Develop some familiarity with current research problems and research methods in Soft Computing Techniques

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV
(ENGINEERING SCIENCE ELECTIVES)**

Programme: UG **Class:** B.TECH (CSE)	Year: II Semester: IV
Credits Theory: 4 Practical: 0	**Subject:** Energy Science and Engineering
Course Code:SESB-233	**Title:** Energy Science and Engineering
Course Objectives: 1. To develop a strong foundation of concept of Energy and its units 2. To familiarize with Conventional & non-conventional energy source. 3. To introduce the various Systems and Synthesis.	
Nature of Paper: ESE	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Energy and its Usage: Units and scales of energy use, Mechanical energy and transport, Heat energy: Conversion between heat and mechanical energy, Electromagnetic energy: Storage, conversion, transmission and radiation, Introduction to the quantum, energy quantization, Energy in chemical systems and processes, flow of CO2, Entropy and temperature, carnot and Stirling heat engines, Phase change energy conversion, refrigeration and heat pumps, Internal combustion engines, Steam and gas power cycles, the physics of power plants. Solid-state phenomena including photo, thermal and electrical aspects	**8L**
II	**Nuclear Energy:** Fundamental forces in the universe, Quantum mechanics relevant for nuclear physics, Nuclear forces, energy scales and structure, Nuclear binding energy systematics, reactions and decays, Nuclear fusion, Nuclear fission and fission reactor physics, Nuclear fission reactor design, safety, operation and fuel cycles.	**8L**
III	**Solar Energy:** Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, Basic physics of semiconductors, Carrier transport, generation and recombination in semiconductors, Semiconductor junctions: metal-semiconductor junction & p-n junction, Essential characteristics of solar photovoltaic devices, First Generation Solar Cells, Second Generation Solar Cells, Third Generation Solar Cells	**8L**
IV	**Conventional & non-conventional energy source:** Biological energy sources and fossil fuels, Fluid dynamics and power in the wind, available resources, fluids, viscosity, types of fluid flow, lift, Wind turbine dynamics and design, wind farms, Geothermal power and ocean thermal energy conversion,	**8L**

	Tidal/wave/hydro power.	
V	**Systems and Synthesis:** Overview of World Energy Scenario, Nuclear radiation, fuel cycles, waste and proliferation, Climate change, Energy storage, Energy conservation. Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts, LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption	**8L**

Reference/Text Books

1. Energy and the Challenge of Sustainability, World Energy Assessment, UNDP, New York, (2000).
2. Perspective of Modern Physics, A. Beiser, McGraw-Hill International Editions (1968).
3. Introduction to Modern Physics, H.S. Mani and G.K.Mehta, East-West Press (1988).
4. Introduction to Electrodynamics, D. J. Griffiths, Fourth Edition, Prentice Hall (2013).
5. Introductory Nuclear Physics, R. K. Puri and V.K. Babbar, Narosa Publishing House (1996).
6. Physics of Solar Cells: From Basic Principles to Advanced Concepts by Peter Wurfel, John Wiley & Sons, 2016
7. Principles of Solar Engineering, D.Y. Goswami, F.Kreith and J.F. Kreider, Taylor and Francis, Philadelphia, 2000.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of Energy and its Usage
CO2 Understand the concept of Nuclear Energy**.**
CO3 Understand the concept of solar Energy
CO4 Understand the Principles of Conventional & non-conventional energy source
CO5 Principles of various Systems and Synthesis

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV
(ENGINEERING SCIENCE ELECTIVES)**

Programme:UG **Class: B.Tech (CSE)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject: Sensor and Instrumentation**
Course Code:	**SESB-234**

Course Objectives: The objectives of studying this course are,
1. Apply the use of sensors for measurement of displacement, force and pressure.
2. Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.

Nature of Paper: ESE

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, and Measurement of **pressure** using LVDT based diaphragm & piezoelectric sensor.	09
II	Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.	09
III	Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs, Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation.	09
IV	Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R Ladder type, Use of Data Sockets for Networked Communication.	09
V	Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.	09

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: After undergoing this course, the students will be able to:	
CO1.Apply the use of sensors for measurement of displacement, force and pressure. CO2.Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level. CO3.Demonstrate the use of virtual instrumentation in automation industries. CO4.Identify and use data acquisition methods. CO5.Comprehend intelligent instrumentation in industrial automation.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV
(ENGINEERING SCIENCE ELECTIVES)**

Programme: UG **Class: B.Tech (CSE)**	**Year:II** **Semester: IV**
Credits **Theory: 4** **Practical:**	**Subject: Electronics Engineering**
Course Code:SESB-238	**Title: Digital Electronics**

Course Objectives: The students will learn

- To develop a strong foundation in analysis, design and implementation of electronic circuits To present the electronics applications in diode systems
- learn Bipolar junction transistors and its applications
- Understand Operational amplifiers.
- Understand Electronic instrumentation and measurements.

Nature of Paper: ESE

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	PN junction diode: Introduction of semiconductor materials; Semiconductor diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, diode equivalent circuits, transition and diffusion capacitance, Zener diodes breakdown mechanism (Zener and	(L-9)
II	Diode application: Series, parallel and series, parallel diode configuration, half and full wave rectification, clippers, clampers, Zener diode as shunt regulator, voltage-multiplier circuits special purpose two terminal devices :	(L-9)
III	Bipolar junction transistors and field effect transistor: Bipolar junction transistor: Transistor construction, operation, amplification action, common base, common emitter, common collector configuration dc biasing BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration. Collector feedback, emitter-follower configuration. Bias	(L-9)
IV	Operational amplifiers: Introduction and block diagram of Op-Amp, ideal & practical characteristics of Op-Amp, differential amplifier circuits, practical Op-Amp circuits (inverting amplifier, non-inverting amplifier, unity gain amplifier, summing amplifier, integrator, And differentiator), Op- Amp parameters: input offset voltage, output offset voltage, input biased current, input offset current differential and common-mode operation.	(L-9)

V	Electronic instrumentation and measurements: Digital voltmeter: Introduction, RAMP techniques digital multimeters: Introduction Oscilloscope: introduction, basic principle, CRT, block diagram of oscilloscope, simple, measurement of voltage, current phase and frequency using CRO, introduction of digital storage oscilloscope and comparison of DSO with analog oscilloscope.	(L-9)

Reference / Text Books:

1. Robert L. Boylestand / Louis Nashelsky, "Electronic Devices and Circuit Theory," Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.
3. Meetidehran/ A.K. singh "fundamental of electronics Engineering", New age international publisher.

If the course is available as Generic Elective then the students of following departments may opt it.
- NA

Evaluation/Assessment Methodology

Max. Marks

1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

At the end of this course students will demonstrate the ability to:

CO1.Understand the concept of PN junction and special purpose diodes.
CO2.Study the application of conventional diode and semiconductor diode.
CO3.Analyse the I-V characteristics of BJT and FET.
CO4.Analyzethe of Op-Amp, amplifiers, integrator, and differentiator.
CO5.Understand the concept of digital storage oscilloscope and compare of DSO with analog oscillo scope.

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV
(ENGINEERING SCIENCE ELECTIVES)**

Programme: UG **Class: B.Tech (CSE)**	**Year:II** **Semester: IV**
Credits **Theory: 4** **Practical:00**	**Subject: Digital Electronics**
Course Code:SESB-239	**Title: Digital Electronics**
Course Objectives: The students will learn 1. To develop a strong foundation in analysis, design and implementation of digital electronic circuits 2. To present the Digital fundamentals, Boolean algebra and its applications in digital systems 3. To familiarize with the design of various combinational digital circuits using logic gates 4. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits 5. To introduce the fundamentals of digital logic families.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/ 4	
L: 3 T: 1 P: 0 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Digital System and Binary Numbers**: Number System and its arithmetic, Signed binary numbers, Binary codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc Clusky method (Tabular method).	(L-9)
II	Combinational Circuits: Analysis & Design procedure, Binary Adder, Subtractor, n-bit parallel Adder & Subtractor, Magnitude Comparator, Multiplexers, Demultiplexer, Decoders, Encoders.	(L-9)
III	Sequential Logic: Flip-flop and Latch, SR latch, JK flip-flop, T flip-flop, D flip-flop, Master-slave JK flip-flop, Flip Flop Conversion, Registers & Counters: Shift registers (SISO, SIPO, PISO, PIPO), Counters: Asynchronous/Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.	(L-9)
IV	Digital Logic Families: DTL, TTL, ECL & Metal Oxide Semiconductor logic families: N- MOS, P-MOS and CMOS logic circuits, Fan Out, Fan in, Noise Margin.	(L-9)
V	**Memory & Programmable Logic Devices:** RAM, ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Circuit Implementation using ROM, PLA and PAL.	(L-9)

Reference / Text Books:

1. *M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.*
2. *David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.*
3. *RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.*
4. *Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5th Edition, 2010.*

If the course is available as Generic Elective then the students of following departments may opt it.
- NA

Evaluation/Assessment Methodology

Max. Marks

1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Understand the concept of number system, Logic Gates, Boolean algebra, K-map and Quine Mclusky method

CO2.Design combinational and sequential logic circuits and their applications

CO3.Understand concepts of Synchronous & Asynchronous Sequential Circuits

CO4.Understand the idea of Digital Logic Families, memory and Programmable Logic Devices

CO5.To develops a strong foundation in analysis, design and implementation of digital electronic circuits.

CO6.To introduce the fundamentals of digital logic families.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV
(ENGINEERING SCIENCE ELECTIVES)**

<table>
<tr><td>Programme: UG
Class: B-Tech (CSE)</td><td colspan="2">Year: II
Semester: IV</td></tr>
<tr><td>Credits
Theory: 3
Practical: 0</td><td colspan="2">Subject: Material Science</td></tr>
<tr><td>Course Code:</td><td colspan="2">SEME-231</td></tr>
<tr><td colspan="3">Course Objectives: The objectives of studying this course are,
1. To reinstate the Solid solutions – Hume Rothery’s rules – the phase rule – single component system
2. To focus on iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels
3. To lay down Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip
4. To suggest Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials
5. To indicate Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics
6. To suggest shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy</td></tr>
<tr><td colspan="3">Nature of Paper: Engineering Science Elective</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="3">L: 3
T: 0
P: 0(In Hours/Week)
Theory - 0
Practical- NIL</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Phase Diagrams: Solid solutions – Hume Rothery’s rules – the phase rule – single component system – one-component system of iron – binary phase diagrams – isomorphous systems – the tie-line rule – the lever rule – application to isomorphous system – eutectic phase diagram – peritectic phase diagram – other invariant reactions – free energy composition curves for binary systems – microstructural change during cooling.</td><td>09</td></tr>
<tr><td>II</td><td>Ferrous Alloys: The iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels – eutectoid steel, hypo and hypereutectoid steels – effect of alloying elements on the Fe-C system – diffusion in solids – Fick’s laws – phase transformations – T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations – tempering of martensite – steels – stainless steels – cast irons.</td><td>09</td></tr>
<tr><td>III</td><td>Mechanical Properties: Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip – strengthening methods – strain hardening – refinement of the grain size – solid solution strengthening –</td><td>09</td></tr>
</table>

	precipitation hardening – creep resistance – creep curves – mechanisms of creep – creep-resistant materials – fracture – the Griffith criterion – critical stress intensity factor and its determination – fatigue failure – fatigue tests – methods of increasing fatigue life – hardness – Rockwell and Brinell hardness – Knoop and Vickers microhardness.	
IV	Magnetic, Dielectric & Superconducting Materials: Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites – dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization – dielectric breakdown – insulating materials – Ferroelectric materials – superconducting materials and their properties.	09
V	New Materials: Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications – shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
CO1.The learning process for holistic development
CO2.Impeccable governance
CO3.Effective institutional management
CO4.Well laid system of rewards and chastisement
CO5.Institutional climate where ‘rights’ enjoy and ‘wrongs’ are discouraged.
CO6.Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV
(ENGINEERING SCIENCE ELECTIVES)**

Programme: UG **Class: B. Tech (CSE)**	**Year: II** **Semester: IV**
Credits **Theory: 3** **Practical: 0**	**Subject: Engineering Mechanics**
Course Code:	**SESB-231/241**

Course Objectives: The objectives of studying this course are,

1. To reinstate Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel positionthe Solid solutions – Hume Rothery's rules – the phase rule – single component system
2. To focus on shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.
3. To lay down Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem.
4. To suggest plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.
5. To indicate normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants.

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 0
P: 0(In Hours/Week)
Theory - 0
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium. Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.	09
II	Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams. Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.	09
III	Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.	09

IV	Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity. Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.	09
V	Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy. Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections. Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
CO1. The learning process for holistic development
CO2.Impeccable governance
CO3.Effective institutional management
CO4.Well laid system of rewards and chastisement
CO5.Institutional climate where 'rights' enjoy and 'wrongs' are discouraged.
CO6.Understand Harmony in the Nature and Existence

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I

<table>
<tr><td>Programme: UG(R)
Class: B.TECH (CSE-AIML)</td><td colspan="2">Year: I
Semester: I</td></tr>
<tr><td>Credits
Theory: 4Practical: 0</td><td colspan="2">Subject: Engineering Mathematics-I</td></tr>
<tr><td>Course Code:SEAS-111</td><td colspan="2">Title: Engineering Mathematics-I</td></tr>
<tr><td colspan="3">Course Objectives:
1. To apply the knowledge of differential calculus in the field of engineering.
2. To deal with functions of several variables that is essential in optimizing the results of real life problems.
3. To understand the essential tools of matrices and linear algebra, Eigen values and diagonalization in a Comprehensive manner are required.
4. To understand Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc.
5. To deal with vector calculus that is required in different branches of Engineering to graduate engineers.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="3">L: 3
T:1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	**DIFFERENTIAL CALCULUS-I:** Successive Differentiation (nth order derivatives), Leibnitz theorem and its application. Curve tracing: Cartesian and Polar co-ordinates. Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions.	**8L**
II	**DIFFERENTIAL CALCULUS-II:** Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians.	**8L**
III	**MATRICES:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, System of linear equations, Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem and its application Diagonalisation of a Matrix	**8L**
IV	**INTEGRAL CALCULUS:** Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Application: Areas and volumes.	**8L**
V	**Vector Calculus:** Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem	**8L**

	(without proof) and their applications	

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project ReportSeminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of differentiability and apply in the study of Successive differentiation, Leibnitz theorems and Partial differentiation.

CO2 Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.

CO3 Remember the concept of matrices and apply for solving linear simultaneous equations

CO4 Illustrate the working methods of multiple integral and apply for finding area, volume.

CO5 Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

CO6 Apply the concept of calculus in solving engineering problems

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-II

Programme: UG(R) **Class:**B.TECH(CSE-AIML)	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-II
Course Code:SEAS-121	**Title:** Engineering Mathematics-II

Course Objectives:

1. To understand the effective mathematical tools for the solutions of differential equations that model physical processes
2. To get the idea of types of partial differential equations and their solutions.
3. To deal with applications of partial differential equations e.g. wave and heat equations.
4. To understand the concept of Laplace Transform and its application to solve differential and integral equations.
5. To be familiar with the concept and expansion of Fourier series.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**ORDINARY DIFFERENTIAL EQUATIONS:** Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation.	**8L**
II	**PARTIAL DIFFERENTIAL EQUATIONS:** Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.	**8L**
III	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**: Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension.	**8L**
IV	**LAPLACE TRANSFORM:** Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of	**8L**

	periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.	
V	**FOURIER SERIES:** Euler's Formulae, Functions having arbitrary periods,πPeriodic functions, Fourier series of period 2 Change of interval, Even and odd functions, Half range sine and cosine series.	**8L**

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to:

CO1 Understand the concept of differentiation and apply for solving differential equations.

CO2 Remember the concept of partial differential equation and to solve partial differential equations.

CO3 Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations.

CO4 Understand the concept of Laplace Transform and apply for solving differential equations.

CO5 Remember &Understand the concept of Fourier Series.

CO6 Apply the concept of calculus in solving engineering problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG(R) **Class:**B.TECH(CSE-AIML)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Physics
Course Code:SEAS-112/122	**Title:** Engineering Physics

Course Objectives:
1. To Understand the concept of Relativistic Mechanics
2. To know the significance of Maxwell's equations in the Engineering applications of electromagnetic waves.
3. Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore.
4. To know the concept of Interference and Diffraction.
5. To Understand the Phenomenon of Polarization and Laser.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Relativistic Mechanics:** Inertial and Non- Inertial Frames; Michelson-Morley Experiment; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Mass Energy Equivalence and Variation of Mass with Velocity.	**8L**
II	**Electromagnetic:** Gauss law Ampere's law and displacement current; Equation of continuity; Maxwell's equations in Integral and Differential Forms; Electromagnetic Wave Propagation in Free Space and Conducting Media; Poynting Theorem	**8L**
III	**Quantum Mechanics:** Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box.	**8L**
IV	**Wave Optics:** **Interference:** Basics of interference of light; Principle of superposition, coherent Sources, Conditions of Interference; Interference by division of wave front and amplitude (Fresnel's bi-prism, Interference due to thin film, Newton's Rings). **Diffraction:** Fraunhoffer Diffraction Due Single and N-slit; Diffraction Grating; Rayleigh's criterion of resolution; absent spectra,	**8L**

	dispersive Power of grating, Resolving power of Grating.	
V	**Polarization:** Phenomenon of double refraction; Ordinary and extra-ordinary rays; Nicol Prism; quarter wave plate and half wave plate; Production and analysis of Plane, Circularly and Elliptically Polarized Light; Optical Activity; Specific Rotation, Laurent half's half shade Polari meter.	**8L**

Reference / Text Books:

Text Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

Reference Books:

1. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
2. Engineering Physics-Malik HK and Singh AK (McGrawHill)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 To describe the classical relativity and wave mechanics problems.
CO2 To demonstrate the electromagnetic waves and their application in various processes
CO3 To calculate and solve the engineering problems of quantum mechanics.
CO4 To evaluate and grade the engineering problems of wave optics.
CO5 To prepare the classical physics & to prepare the ideas in solving the problems in their parent streams.
CO6 To prepare the Production and analysis of Plane

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG(R) **Class:**B.TECH(CSE-AIML)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Physics Lab
Course Code:SEAS-112P/ SEAS-122 P	**Title:** Engineering Physics Lab
Course Objectives: The objectives of studying this course are, 1. To understand the concept of wave length by the interference 2. To understand the concept of wave length by the diffraction. 3. To understand the concept of viscosity of liquid and flow of liquid. 4. To understand the energy band gap in the semiconductors. 5. To understand the concept of polarization.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks / 1	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Practical-1	To determine the wavelength of Sodium light by Newton's rings
Practical-2	To determine the wavelength of prominent lines of mercury by plane diffraction grating
Practical-3	To determine the focus length combination of two lenses separated by distance and verify the formula for the focal length of combination of lenses
Practical-4	To determine the wave length of sodium light with the help of Fresnel's bi-prism
Practical-5	To determine the coefficient of viscosity of a given liquid
Practical-6	To verify Stefan's law
Practical-7	Calibration of a volt meter with potentiometer
Practical-8	To determine the resistance per unit length and specific resistance of a given resistance using Carey Foster 's Bridge
Practical-9	To determine the energy bend gap of a given semiconductor material
Practical-10	To determine the Specific Rotation of the Cane sugar solution with the help of Polarimeter.

Reference / Text Books:

1. Practical Physics- K. K. Dey& B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics- Practical- Katiyar&Pandey (Wiley India)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** To determine the wavelength of sodium light by Newton's ring experiment. **CO2.** To determine the wavelength of sodium light with the help of Fresnel's bi-prism. **CO3.** Understand measurement technology, usage of new instruments and real time applications in engineering studies. **CO4.** To determine the viscosity of liquid. **CO5.** To determine the emission of energy with respect the temperature and verify Stefan's law. **CO6.** To determine the calibration of potential and draw the curve.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG(R) **Class:**B.TECH(CSE-AIML)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Chemistry
Course Code:SEAS-113/123	**Title:** Engineering Chemistry

Course Objectives:

1. Student will be able to apply fundamental concepts of chemistry in different fields of Engineering.
2. Student will be able to identify compounds using different spectroscopic techniques
3. Student will be able to understand the basic principles of electrochemistry for different engineering applications
4. Student will be able to illustrate different types of impurities in water and its softening techniques
5. Student will be able to apply the concepts of determination of calorific values and analyze the coal
6. Student will be able to recall the basic knowledge of polymerization & and applications

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	**Contents**	**No. of Lectures Allotted**
I	**Atomic and Molecular Structure:** Molecular orbitals of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application	**8L**
II	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	**8L**
III	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system.	**8L**
IV	**Water Analysis:** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulon'smethos).	**8L**
V	**Polymers:** Basic concepts of Polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.	**8L**

BOS

Reference / Text Books: **Text Books:** 1. University Chemistry ByB.H.Mahan 2. University Chemistry ByC.N.R.Rao 3. Organic Chemistry By I.L.Finar 4. Physical Chemistry By S.Glasstone 5. Engineering Chemistry By S.S.Dara 6. Polymer Chemistry By FreW.Billmeyer **Reference Books:** 1. Elementary Organic Spectroscopy ByY.R.Sharma 2. Principles of Physical Chemistry By Puri, Sharma,Pathania 3. Principles of Inorganic Chemistry By Puri, Sharma,Kalia 4. Concise Inorganic Chemistry ByJ.D.Lee	
If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: **CO1** Apply fundamental concepts of chemistry in different fields of Engineering. **CO2** Identify compounds using different spectroscopic techniques. **CO3** Understand the basic principles of electrochemistry for different engineering applications. **CO4** Illustrate different types of impurities in water and its softening techniques. **CO5** Apply the concepts of determination of calorific values and analyze the coal. **CO6** Recall the basic knowledge of polymerization and its applications.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

<table>
<tr><td colspan="2">Programme: UG(R)
Class:B.TECH(CSE-AIML)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 0
Practical: 2</td><td colspan="2">Subject: Engineering Chemistry Lab</td></tr>
<tr><td>Course Code:
SEAS-113P/SEAS-123P</td><td colspan="2">Title: Engineering Chemistry Lab</td></tr>
<tr><td colspan="3">Course Objectives: The objectives of studying this course are,
1. Student will be able to Estimate different impurities present in water sample.
2. Student will be able to Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution
3. Student will be able to Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks / 1</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><th>Practical</th><th colspan="2">Contents</th></tr>
<tr><td>Practical-1</td><td colspan="2">To determine total alkalinity in the given water sample.</td></tr>
<tr><td>Practical-2</td><td colspan="2">To determine the temporary and permanent hardness in water sample using EDTA as standard solution.</td></tr>
<tr><td>Practical-3</td><td colspan="2">To determine the available chlorine in bleaching powder solution.</td></tr>
<tr><td>Practical-4</td><td colspan="2">To determine the chloride content in the given water sample by Mohr's method.</td></tr>
<tr><td>Practical-5</td><td colspan="2">To determine the pH of the given solution using pH meter and pH-metric titration.</td></tr>
<tr><td>Practical-6</td><td colspan="2">To determine the Equivalent weight of Iron by the chemical displacement method.</td></tr>
<tr><td>Practical-7</td><td colspan="2">To determine the Viscosity of an addition polymer like polyester by Viscometer.</td></tr>
<tr><td>Practical-8</td><td colspan="2">To find chemical oxygen demand of waste water sample by potassium dichromate</td></tr>
<tr><td>Practical-9</td><td colspan="2">To determine the iron content in the given sample using external indicator</td></tr>
<tr><td>Practical-10</td><td colspan="2">To determine the strength of given HCL solution by titrating against N/10 Standard Sodium hydroxide solution</td></tr>
<tr><td colspan="3">Reference / Text Books:
1. Practical Chemistry B.Tech. Text Book, Dr. Usha Nakra and Laxmi Kant Sharma Dr. Vivek Pandey, Dr. T. L. Rajawat, Dr. Sama Jain, Dr. Monika Sharma, Dr. Virendra Singh (Neelkanth Publishers(P) Ltd.)</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective then the students of following departments may opt it.
NO</td></tr>
</table>

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Analyze the need, design and perform a set of experiments.

CO2. Identify the structure of unknown/new compounds with the help of spectroscopy

CO3. Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.

CO4. Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution

CO5. Equipped with basic knowledge of polymer reinforced composites, applications of semiconductor photochemistry in energy harnessing and optical sensors.

CO6. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG(R) **Class:**B.TECH(CSE-AIML)		Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Learning Computers with Thinking and Programming in C	
Course Code:SECS-111/121	**Title:** Learning Computers with Thinking and Programming in C	

Course Objectives:

1. After studying this course students will be able to develop simple algorithms for arithmetic and logical problems.
2. After studying this course students will be able to translate the algorithms to programs &finally execution in C language.
3. After studying this course students will be able to implement conditional branching, iteration and recursion in C language.
4. After studying this course student will be able to decompose a problem into functions and synthesize a complete program using divide and conquer approach using C language.
5. After studying this course students will be able to use arrays, pointers and structures to develop algorithms and programs for implementation in C language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Programming basics.** Conceptual Introduction to components of a computer system i.e. Memory, processor, I/O Devices, storage, operating system. Understanding assembler, compiler, interpreter, loader and linker. Understanding Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics of C language**. Core Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.	**8L**
II	**Arithmetic expressions & Conditional Branching in C language**: Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively. Conditional Branching: Applying if and switch	**8L**

	statements, nesting of if and else, use of break and default with switch	
III	**Loops & Functions in C language:** Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.	**8L**
IV	**Arrays & Basic Algorithms in C language**: Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.	**8L**
V	**Pointer& File Handling in C language**: Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.	**8L**

Reference / Text Books:

Text Books:

1. Let Us C By Yashwant P. Kanetkar.
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.

Reference Books:

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Programming in C by Kochan Stephen G. Pearson Education – 2015.
3. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
4. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
CO1 To understand the basic computer concepts and programming principles of C language.
CO2 To develop simple algorithms for arithmetic and logical problems.
CO3 To translate the algorithms to programs & execution (in C language).
CO4 To implement conditional branching, iteration and recursion.
CO5 To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO6 To use arrays, pointers and structures to develop algorithms and programs

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG(R) **Class:**B.TECH(CSE-AIML)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Learning Computers with Thinking and Programming in C Lab
Course Code:SECS-111 P/SECS-121P	**Title:** Learning Computers with Thinking and Programming in C Lab

Course Objectives: The objectives of studying this course are,

1. After studying the above course the student will be able to implement algorithms and draw flowcharts for solving easy and complex Mathematical as well as engineering problems..
2. After studying the above course the student will be able to, understand and demonstrate programming language concepts by implementing programs in C language.
3. After studying the above course the student will be able to, design and develop programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage in computer language C.
4. After studying the above course the student will be able to, able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures in C language which will be latter helpful in understanding the concept of object oriented programming in C++.
5. After studying the above course the student will be able to, develop confidence for self-learning and ability for life-long learning needed for learning any computer language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 1

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Write a program to calculate the area of triangle using formula Area=$\sqrt{s(s- a)(s-b)(s-c)}$ where s=(a+b+c)/2.
Practical-2	We input the basic salary of an employee through the keyboard. The Dearness allowance (DA)is25% of the basic salary while the house rent allowance (HRA) is 15% of the basic salary. While the provident fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA).Write a program in C to calculate the Net Salary.
Practical-3	Write a program in C to determine the roots of quadratic equation.
Practical-4	Write a program in C to find the largest of three numbers using the nested if else construct.
Practical-5	Write a program in Ctoreceive marks of history, geography &civics from user& check its eligibility for course if a) Marks of history>40 b) Marks of geography>50 c) Marks of civics>60

BOS

	d) Total of history & civics marks>150 or Total of three subjects marks>200
Practical-6	Write a program in C to find the value of y for a particular value of n. The a, x, b, n is input by user if n=1 y=ax%b if n=2 y=ax2+b2 if n=3 y=a-bx ifn=4 y=a+x/b
Practical-7	Write a program in C to construct a Fibonacci series up to n terms.
Practical-8	Writeaprogram in CtofindwhetherthenumberisArmstrongnumber or not.
Practical-9	Write aprogramin C togeneratesumofseries1!+2!+3!+ n!
Practical-10	Writea program in Ctofind the sumoffollowingseries1-X1/1!+X2/2!-…………Xn/n!.
Practical-11	Writeaprogram in Ctoprinttheentireprimenobetween1and 500.
Practical-12	Writeaprogramin C toprintoutalltheArmstrongnumberbetween 50and 600.
Practical-13	Writeaprogramin C todrawthefollowing figure: 4 3 2 1 321 2 1 1
Practical-14	Writeaprogram in Ctoreceiveafive-digit no anddisplayas like12345: 1 2 3 4 5
Practical-15	Writea function in Cthatreturnsumofalltheevendigitsofagivenpositiveno entered through keyboard.
Practical-16	Writeaprogram in C toprintareaofa trapezium using function&returnitsvalue to main function.
Practical-17	Writeaprogram in Cto calculate the factorial for givennumberusingfunction.
Practical-18	Writea program in CtofindsumofFibonacciseriesusingfunction.
Practical-19	Writeaprogramin C to findthefactorialofgivennumberusingrecursion.
Practical-20	Writeaprogram in Ctofindthesumofdigitsofa5digit number using recursion.
Practical-21	Writeaprogramin C tocalculatetheGCDofgivennumbersusingrecursion.
Practical-22	Writeaprogram in Ctoconvertdecimalnumberintobinarynumber.
Practical-23	Writeaprogramin C toconvertbinarynumberintodecimalnumber.
Practical-24	Writeaprogramin C todeleteduplicateelementina listof20elements& display it on screen.
Practical-25	Writeaprogram in Ctomergetwosortedarray&no element isrepeatedduringmerging.
Practical-26	Writeaprogram in C to evaluatetheadditionofdiagonalelementsoftwo square matrixes.
Practical-27	Writeaprogram in Ctofindthetransposeofagivenmatrix&checkwhether it is symmetric or not.

Practical-28	Writeaprogram in Cto print themultiplicationoftwoN*N (Square) matrix.
Practical-29	WriteaprograminCtocheckwhetherthegivenstringisapalindromeor not.
Practical-30	Writeprogram in Ctosortthearrayofcharacter (String) inalphabeticalorder like STRING in GNIRTS.
Practical-31	Writeaprogram in Ctoremovealltheblankspacefromthestring&print it, also count the no of characters.
Practical-32	Writeaprogram in Ctostorethefollowingstring“zero”,“one”----------“five”. Printthenoinwords,given in figureas 3205.
Practical-33	Write a program in C to compare two given dates. To store a date use a structurethatcontainsthreemembersnamelyday, monthandyear.Ifthe dates are equal then display message equal otherwise unequal.
Practical-34	WriteaCprogramtocopy&countthecharactercontentofonefilesays c.txt to another file d.txt.
Practical-35	Writeaprogram in Ctoprint alltheprimenumber,between2to 200ina file nameprime.txt.
Practical-36	WritethefollowingCprogramusingpointer: a) Tosortthelistofnumbersthroughpointer b) Toreversethestringthroughpointer.
Practical-37	Writeaprogram in Ctofindthe largest no among30 integersarrayusing dynamic memory allocation.
Practical-38	UsingDynamicMemoryAllocation, Writeaprogramin C to findthetranspose of given matrix.
Practical-39	Writeaprogram in Ctofindthefactorialofgivennumberusingcommand line argument.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Implementation of algorithms and drawing flowcharts for solving easy and complex Mathematical as well as Engineering problems.

CO2. Computer programming language concepts understanding and demonstration.

CO3. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

CO4. Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures.

CO5. Development of confidence for self-education and ability for life-long learning needed for Computer language.

CO6. Understand the basics of file handling mechanisms

Format-3

IIMTU-NEP IMPLEMENTATION
Year I / Semester I

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: I Semester: I
Credits Theory: 0 Practical:2	**Subject:** HTML WITH CSS LAB
Course Code: **SEAIML-111P**	**Title:** HTML WITH CSS LAB

Course Objectives:

- Familiarizing students with the basics of web design, including HTML, CSS, and JavaScript.

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 50% Marks/2

L:0 T:0 P:3(In Hours/Week)
Theory - 0 Hr. = 0 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
I	Design a page having suitable background colour and text colour with title “My First Web Page” using all the attributes of the Font tag.	**2**
II	Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag.	**2**
III	Write HTML code to design a page containing some text in a paragraph by giving suitable heading style.	**2**
IV	Create a page to show different character formatting (B, I, U, SUB, SUP) tags. *viz :* $\log b^{m^p} = p \, log b^m$	**2**
V	Write HTML code to create a Web Page that contains an Image at its centre.	**2**
VI	Create a web page with an appropriate image towards the left hand side of the page, when user clicks on the image another web page should open.	**2**
VII	Create web Pages using Anchor tag with its attributes for external links.	**2**
VIII	Create a web page for internal links; when the user clicks on different links on the web page it should go to the appropriate locations/sections in the same page.	**2**
IX	Write a HTML code to create a web page with pink color background and display moving message in red color.	**2**
X	Create a web page, showing an ordered list of all second semester	**2**

	courses.	

Reference / Text Books:

Text books:

1. "Web Design with HTML, CSS, JavaScript and jQuery Set" by Jon Duckett
2. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins
3. "HTML and CSS: Design and Build Websites" by Jon Duckett
4. "Responsive Web Design with HTML5 and CSS3" by Ben Frain

Reference Books:

1. "The Principles of Beautiful Web Design" by Jason Beaird
2. "Web Standards Solutions: The MarkUP and Style Handbook" by Dan Cederholm
3. "CSS Mastery: Advanced Web Standards Solutions" by Andy Budd
4. "JavaScript: The Definitive Guide" by David Flanagan

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Practical Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1 Familiarizing students with the basics of web design, including HTML, CSS, and JavaScript.

CO2 Teaching students how to create visually appealing and user-friendly websites that are optimized for different devices and screen sizes.

CO3 Providing students with hands-on experience in designing, developing, and publishing websites using industry-standard tools and technologies.

CO4 Encouraging students to think critically about the design and usability of websites, as well as the ethical and legal implications of web design.

CO5 Helping students understand how to work collaboratively in a team environment, manage projects, and communicate effectively with clients and stakeholders.

CO6 Encouraging students to stay up-to-date with the latest trends and technologies in web design and development, and to continue learning and improving their skills beyond the classroom.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG(R) **Class:** B.TECH (CSE-AIML)	Year: I Semester: I/II
Credits Theory: 2 Practical: 0	**Subject:** Professional Communication
Course Code:PCE-111/121	**Title:** Professional Communication

Course Objectives:

1. To enhance one's ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2. Toincreaseone'sknowledgeandawarenessofemotionalcompetencyandemotionalintelligenceatplaceo fstudy/work.
3. To provide opportunity for realizing one's potential through practical experience.

Nature of Paper: AECC

Minimum Passing Marks/Credits: 40% Marks /2

L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	**Contents**	**No. of Lectures Allotted**
I	**Listening** • Techniques of effective listening • Listening and comprehension • Probing questions • Barriers to listening **Speaking** • Pronunciation • Enunciation • Vocabulary • Fluency • Common Errors ***Reading*** • Techniques of effective reading • Gathering ideas and information from a given text a. Identify the main claim of the text b. Identifythepurposeofthetext c. Identifythecontextofthetext d. Identify the concepts mentioned • Evaluating these ideas and information a. Identify the arguments employed in the text	**8L**

	b. Identify the theories employed or assumed in the text • Interpretthetext a. To understand what a text says b. To understand what a text does c. To understand what a text means	
II	***Writing and different modes of writing*** • Clearly state the claims • Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues • Provide background information • Effectively argue the claim • Provide evidence for the claims • Use examples to explain concepts • Follow convention • Be properly sequenced • Use proper signposting techniques	**8L**
III	• Be well structured a. Well-knit logical sequence b. Narrative sequence c. Category groupings • Different modes of Writing - a. E-mails b. Proposal writing for Higher Studies c. Recording the proceedings of meetings d. Any other mode of writing relevant for learners ***Effective use of Social Media*** • Introduction to social media websites • Advantages of social media • Ethics and etiquettes of social media • How to use Google search better • Effective ways of using Social Media • Introduction to Digital Marketing ***Non-verbal communication*** • Meaning of non-verbal communication • Introduction to modes of non-verbal communication • Breaking the misbeliefs • Open and Closed Body language • Eye Contact and Facial Expression • Hand Gestures • Do's and Don'ts • Learning from experts • Activities-Based Learning	**8L**
IV	***Resume Skills*** • Resume Skills : Preparation and Presentation a. Introduction of resume and its importance	**8L**

	b. Difference between a CV, Resume and Bio data c. Essential components of a good resume • Resume skills : common errors a. Common errors people generally make in preparing their resume b. Prepare a good resume of her/his considering all essential components ***Interview Skills*** • Interview Skills : Preparation and Presentation a. Meaning and types of interview (F2F, telephonic, video, etc.) b. Dress Code, Background Research, Do's and Don'ts c. Situation, Task, Approach and Response (STAR Approach) for facing an d. interview e. Interview procedure (opening, listening skills, closure, etc.) f. Important questions generally asked in a job interview (open and closed g. ended questions) • Interview Skills : Simulation a. Observation of exemplary interviews b. Comment critically on simulated interviews	
V	• Interview Skills : Common Errors a. Discuss the common errors generally candidates make in interview b. Demonstrate an ideal interview	**8L**

Reference / Text Books:

1. Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.
2. Brown, Michele & GylesBrandreth. How to Interview and be Interviewed. London: Sheldon Press1994.
3. Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977.
4. Collins, Patrick. Speak with Power and Confidence. New York: Sterling, 2009.
5. Hughes, Shirley. Professional Presentations: A Practical Guide to the Preparation and Performance ofSuccessful Business Presentations. Sydney: McGraw-Hill, 1990.
6. Kratz, Abby Robinson. Effective Listening Skills. Toronto: ON: Irwin Professional Publishing, 1995.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	10 05 35
Total:	50

Prerequisites for the course:

BOS

Course Learning Outcomes:
CO1 The students will Gain Self Competency and Confidence.
CO2 They will be fluent speaker and proficient writer and enhance their LSRW Skills.
CO3 The students will demonstrate a fuller and deeper understanding of all the facets of Professional communication.
CO4 They will be able to enrich their vocabulary and their correct usage.
CO5 They will develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation.
CO6 The students will Gain Knowledge about the world of work**.**

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG(R) **Class:**B.TECH(CSE-AIML)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Professional Communication Lab
Course Code: PCE-111P/121P	**Title:** Professional Communication Lab

Course Objectives: The objectives of studying this course are,
1. Improve the dynamics of professional presentations.
2. Develop the ability to compeer professional occasions.
3. Enable to read newspaper for their communicative competence.
4. Equip with effective business correspondence.
5. Develop in them communication and social graces necessary for functioning.

Nature of Paper: Core/DSE/SEC/GE/AECC

Minimum Passing Marks/Credits: 50% Marks / 1

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical 1	Group Discussion: Practice Based on Accurate and Current Grammatical Patterns
Practical 2	Intonation Pattern Practice: Rising, Falling, and Level Tones.
Practical 3	Communication Skills /Conversational Skills for Interviews/ Seminars/ Workshops with Emphasis on Kinesics/Para linguistics along with Promotion of Phonetic Script Skills.
Practical 4	Presentation Skills for Technical Paper / Project Reports / Professional Report based on Proper Stress and Intonation Mechanics.
Practical 5	Theme Presentation Practices Based on Linguistic Patterns
Practical 6	***Digital Literacy*** • Role of Digital literacy in professional life • Trends and opportunities in using digital technology in workplace • Internet Basics • Introduction to MS Office tools 1. Paint 2. Office 3. Excel 4. Powerpoint

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.

3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons.

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Develop all-round personalities with a mature outlook to function effectively in different circumstances.

CO2. Develop effective communication and presentation skills

CO3. Learn corporate etiquette - organizing and managing professional events and will understand how reading enhances their communicative competency

CO4. Conduct effective correspondence and prepare reports which produce results.

CO5. Write logical sentences and paragraphs, use appropriate diction, grammar and punctuation.

CO6. Produce business documents for mailing to external recipients or intra-organizational circulation

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td colspan="2">Programme: UG(R)
Class: B.TECH(CSE-AIML)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 2
Practical: 0</td><td colspan="2">Subject: Environment Studies</td></tr>
<tr><td>Course Code:SEHU-111/122</td><td colspan="2">Title: Environment Studies</td></tr>
<tr><td colspan="3">Course Objectives:
1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
3. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
6. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.</td></tr>
<tr><td colspan="3">Nature of Paper: AECC</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks /2</td></tr>
<tr><td colspan="3">L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	**Introduction to environmental studies** • Multidisciplinary nature of environmental studies; • Scope and importance; Concept of sustainability and sustainable development.	**4L**
II	**Ecosystems** • What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**4L**

III	**Natural Resources: Renewable and Non-renewable Resources** • Land resources and land use change; Land degradation, soil erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & interstate). • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	**4L**
IV	**Biodiversity and Conservation** • Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots • India as a mega--biodiversity nation; Endangered and endemic species of India • Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	**4L**
V	**Environmental Pollution** • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies.	**4L**
VI	**Environmental Policies & Practices** • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.	**4L**
VII	**Human Communities and the Environment** • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. • Environmental ethics: Role of Indian and other religions and	**4L**

	cultures in environmental conservation. • Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	
VIII	**Field work** visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site---Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems---pond, river, Delhi Ridge, etc.	**4L**

Reference / Text Books:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., &Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	10
4) Research Project Report Seminar On Research Project Report	05
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1. Gain in-depth knowledge on natural processes that sustain life, and govern economy.
CO2. Estimate and predict the consequences of human actions on the web of life, global economy and quality of human life.
CO3. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
CO4. Acquire values and attitudes towards understanding complex environmental economic social challenges, and participate actively in solving current environmental problems and preventing the future ones.
CO5. Adopt sustainability as a practice in life, society and industry.
CO6. Develop real field experience.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I/Semester-II

Programme: UG(R) **Class:** B.TECH(CSE-AIML)	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:** Python For Beginners
Course Code:STCS-129	**Title:** Python For Beginners

Course Objectives:

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Write home grown Python functions
5. Use many of the standard Python modules such as os, sys, math, and time

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**INTRODUCTION TO PYTHON** Python Introduction: The Python Language, The Python Standard Library and Extension Modules, Python Implementation, Python Development and Versions, installing Python; basic syntax, interactive shell, editing, saving, and running a script	**8L**
II	**DATA, EXPRESSIONS, STATEMENTS CONTROL FLOW** The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages; Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass.	**8L**
III	**STRINGS** Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated). String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers.	**8L**
IV	**LISTS, TUPLES, DICTIONARIES** Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing	**8L**

	dictionaries.	
V	**FUNCTION, MODULES, PACKAGES** Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions. Modules: Importing module, Math module, Random module, Packages Composition.	**8L**

Reference / Text Books:

1. By Wesley J. Chun "CORE PYTHON PROGRAMMING" PRINTICE HALL
2. Dr. Kent D. Lee "Python Programming Fundamentals" SPRINGER

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand Python Development and Versions.
CO2 Remember the concept of data types; variables, assignments; immutablevariables; numerical types; arithmetic operators and expressions.
CO3 Understand text files: reading/writing text and numbers from/to a file
CO4 Illustrate the working of basic list operators.
CO5 Apply the Program structure and design.
CO6 Able to design python based applications.

Format-3

IIMTU-NEP IMPLEMENTATION
Year I/ Semester II

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: I Semester: II
Credits Theory: 0 Practical:4	**Subject:** Python lab for beginners
Course Code: **STCS-129 P**	**Title:** Python lab for beginners
Nature of Paper: Engineering Courses (Core)	
Minimum Passing Marks/Credits: 40% Marks/4	
L:0 T:0 P:4 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
I	Python program to print "Hello Python"	**2**
II	Python program to do arithmetical operations	**2**
III	Python program to find the area of a triangle	**2**
IV	Python program to solve quadratic equation	**2**
V	Python program to left rotate the elements of an array	**2**
VI	Python program to print the duplicate elements of an array	**2**
VII	Python program to print the elements of an array	**2**
VIII	Python program to print the elements of an array in reverse order	**2**
IX	Python program to print the elements of an array present on even position	**2**

Reference / Text Books:

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming by Eric Matthes.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course: NA

BOS

Course Learning Outcomes:
After completing the course, students should be able to
CO1. Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
CO2. Express proficiency in the handling of strings and functions.
CO3. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.
CO4. Identify the commonly used operations involving file systems and regular expressions.
CO5. Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.
CO6. Debugging of Python Programs.

IIMTU-NEP IMPLEMENTATION
Year – I/Semester-I

Programme: UG(R) **Class:** B.TECH(CSE-AIML)		Year: I Semester: I
Credits Theory: 4 Practical: 0	**Subject: Overview of AI, Data Science, Ethics and Foundation of Data Analysis**	
Course Code:SEAIML-111	**Title: Overview of AI, Data Science, Ethics and Foundation of Data Analysis**	
Course Objectives: The objective of this course is to teach students the concepts of current main conceptual frameworks at use in AI Business Intelligence and Data Analytics.		
Nature of Paper: Core		
Minimum Passing Marks/Credits: 40% Marks/4		
L: 3 T: 1 P: 0 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)		

Unit	Contents	No. of Lectures Allotted
I	Introduction to Data Science: Defining Data Science and Big Data, Benefits and Uses of Data Science and Big Data, Facets of Data, Structured Data, Unstructured Data, Natural Language, Machine generated Data, Graph based or Network Data, Audio, Image, Video, Streaming data, Data Science Process, Big data ecosystem and data science, distributed file systems, Distributed programming framework, data integration framework, machine learning framework, No SQL Databases,scheduling tools, benchmarking tools, system deployments	**8L**
II	Data Science Processes: Six steps of data science processes, define research goals, data retrieval,cleansing data, correct errors as early as possible, integrating – combine data from different sources,transforming data, exploratory data analysis, Data modelling, model and variable selection, model execution, model diagnostic and model comparison, presentation and automation.	**8L**
III	Introduction to Machine Learning: What is Machine Learning, Learning from Data, History of Machine Learning, Big Data for Machine Learning, Leveraging Machine Learning, Descriptive vs Predictive Analytics, Machine Learning and Statistics, Artificial Intelligence and Machine Learning,Types of Machine Learning – Supervised, Unsupervised, Semi-supervised, Reinforcement Learning,Types of Machine Learning Algorithms, Classification vs Regression Problem, Bayesian, Clustering, Decision Tree, Dimensionality Reduction, Neural Network and Deep Learning, Training machine learning systems.	**8L**

IV	Introduction to AI: What is AI, Turing test, cognitive modelling approach, law of thoughts, the relational agent approach, the underlying assumptions about intelligence, techniques required to solve AI problems, level of details required to model human intelligence, successfully building an intelligent problem, history of AI.	**8L**
V	Introduction to Data Analytics: Working with Formula and Functions, Introduction to Power BI & Charts, Logical functions using Excel, Analysing Data with Excel.	**8L**

Reference / Text Books:

1. Artificial Intelligence 3e: A Modern Approach Paperback – By Stuart J Russell & Peter Norvig; Publisher –Pearson.
2. Artificial Intelligence Third Edition By Kevin Knight, Elaine Rich, B. Nair – McGrawHill
3. Artificial Intelligence Third Edition By Patrick Henry Winston – Addison-Wesley Publishing Company.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After completing the course, students should be able to:

CO1. Explain the uses of AI, Ethics present and future.
CO2. Explain Introduction to Machine Learning.
CO3. Explain Application of AI by domain, Role of AI in society.
CO4. Understand Machine Learning.
CO5. Understand Data Science Processes.
CO6. Learn Data Analytics.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I/Semester-II

Programme: UG(R) **Class:** B.TECH(CSE-AIML)	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:** Data Analysis using Python, Numpy, Pandas, Matplotlib, and Seaborn
Course Code: SEAIML-121	**Title:** Data Analysis using Python, Numpy, Pandas, Matplotlib, and Seaborn
Course Objectives: The objective of this course is to teach students the concepts of data Analysis using Python, Numpy, Pandas, Matplotlib, and Seaborn..	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Python programming Basic:** Python interpreter, I Python Basics, Tab completion, Introspection, %run command, magic commands, matplotlib integration, python programming, language semantics, scalar types. Control flow.	**8L**
II	**Data Structure, functions, files:** tuple, list, built-in sequence function, dict, set, functions, namescape, scope, local function, returning multiple values, functions are objects, lambda functions, error and exception handling, file and operation systems	**8L**
III	**NumPy: Array and vectorized computation:** Multidimensional array object. Creating ndarrays, arithmetic with numpy array, basic indexing and slicing, Boolean indexing, transposing array and swapping axes, universal functions, array-oriented programming with arrays, conditional logic as arrays operations, file input and output with array	**8L**
IV	**Pandas:** Pandas data structure, series, Data Frame, Index Object, Reindexing, dropping entities from an axis, indexing, selection and filtering, integer indexes, arithmetic and data alignment, function application and mapping, scoring and ranking, correlation and covariance, unique values, values controls and membership, reading and writing data in text format	**8L**
V	**Visualization with Matplotlib:** Figures and subplots, colors, markers, line style, ticks, labels, legends, annotation and drawing on sublots, matplotlib configuration **Plotting with pandas and seaborn:** line plots, bar plots, histogram, density plots, scatter and point plots, facet grids and categorical data.	**8L**

BOS

Reference / Text Books:
1. Artificial Intelligence 3e: A Modern Approach Paperback- By Stuart J Russell &PetrNorvig: Publisher-Pearson.
2. Artificial Intelligence Third Edition By Kelvin Knight,ElaineRich, B Nair- McGrawHill .
3. Artificial Intelligence Third Edition By Patrick Henry Winston-Addison Wesley Publishing Company

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes: After completing the course, students should be able to:
CO1. Uses of AI, Ethics present and future.
CO2. Introduction to Machine Learning.
CO3. Application of AI by domain, Role of AI in Society.
CO4. Understand Pandas data structure
CO5. Understand density plots
CO6. Analyze correlation and covariance

Format-3

IIMTU-NEP IMPLEMENTATION
Year I/ Semester II

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: I Semester: II
Credits Theory: 0 Practical:4	**Subject:** Data analysis using python, numpy, pandas, matplotlib and seaborn Lab
Course Code: **SEAIML-121 P**	**Title:** Data analysis using python, numpy, pandas, matplotlib and seaborn Lab
Nature of Paper: Engineering Courses (Core)	
Minimum Passing Marks/Credits: 40% Marks/ 4	
L:0 T:0 P:4 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
I	Study of Python programming Basic	2
II	Study of %run command	2
III	Study of matplotlib integration	2
IV	Study of Data Structure, functions, files: tuple, list, built-in sequence function,	2
V	Study of dict, set, functions, namescape, scope.	2
VI	Study of Numpy: Array and vectorized computation	2
VII	Study of Pandas	2
VIII	Study of Visualization with Matplotlib	2
IX	Study of Plotting with pandas and seaborn	2

Reference / Text Books:

1. Python: The Complete Reference Paperback – 20 March 2018 by Martin C. Brown.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course: NA

Course Learning Outcomes:
After completing the course, students should be able to
CO1. Student will be able to Python programming Basic
CO2 Student will be able to matplotlib integration
CO3. Student will be able to Clean and Process
CO4. Student will be able to Data Structure, functions, files
CO5. Student will be able to Numpy: Array and vectorized computation
CO6. Student will be able to Visualization with Matplotlib

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG(R) **Class:** B.TECH(CSE-AIML)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Engineering Workshop Lab
Course Code: SEME-112P/ SEME-122P	**Title:** Engineering Workshop Lab
Course Objectives: The objectives of studying this course are, 1. To understand the importance of tools used in workshop. 2. To prepare various joints used in workshop. 3. To identify & apply the most appropriate tools for various applications. 4. To perform the various types of black smithy and sheet metal shop operations. 5. To prepare core and mould in foundry shop.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks / 1	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Module -1	Carpentry Shop: Practical-1: To prepare half-lap corner joint. Practical-2: To prepare mortise &Tenon joint. Practical-3: To prepare a cylindrical pattern on woodworking lathe
Module -2	Fitting Bench Working Shop: Practical-1: To prepare a V-joint fitting Practical-2: To prepare a U-joint fitting Practical-3: To make a perfect square job
Module -3	Black Smithy Shop: Practical-1: To prepare a square rod from given circular rod Practical-2: To prepare a square S- shape from given circular rod Practical-3: To prepare a nail from given circular rod.
Module -4	Welding Shop: Practical-1: To prepare a butt welded joints using arc welding machine. Practical-2: To prepare a Lap welded joints using arc welding machine. Practical-3: To prepare a Lap welded joint using spot welding machine.
Module -5	Sheet-metal Shop: Practical-1: To make round duct of GI sheet using ‘soldering’ process. Practical-2: To prepare a tray of GI by fabrication
Module -6	Machine Shop: Practical-1: To prepare a bolt on the lathe machine as per given. Diagram. Practical-2: To prepare a job on the lathe machine as per given diagram.

Module -7	Foundry Shop: Practical-1: To prepare core as per given size. Practical-2: To prepare a mould for given casting.
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. G. B. Hart, “Cambridge English Business Bench Mark: Upper Intermediate’, 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

Reference Books:

1. Business Communication, II Ed, OUP, by Meenakshi Raman & Prakash Singh, 2012.
2. Speak well----- orient black swan.
3. Everyday dialogues in English----- Robert J.Dixon.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Understand the tools used in workshop & their applications.

CO2. Prepare various joints used in carpentry, fitting and welding shop.

CO3. Identify & apply the most appropriate tools for various manufacturing operations like turning, facing and threading.

CO4. Perform the various types of black smithy and sheet metal shop operations.

CO5. Prepare core and mould in foundry shop.

CO6. Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

<table>
<tr><td colspan="2">Programme: UG(R)
Class: B. Tech (CSE-AIML)</td><td colspan="2">Year: II
Semester: III</td></tr>
<tr><td>Credits 4
Theory: 3
Tutorial: 1
Practical:0</td><td colspan="3">Subject: Engineering Mathematics-III</td></tr>
<tr><td>Course Code:
SEAS-231</td><td colspan="3">Title: Engineering Mathematics-III</td></tr>
<tr><td colspan="4">Course Objectives:
• To make the students familiar with complex functions and its calculus.
• To deal with applications, residues and conformal mapping.
• To understand the concept and applications of integral transforms.
• To deal with numerical solutions of algebraic equations and differential equations.
• To understand the statistical aspect of functions.</td></tr>
<tr><td colspan="4">Nature of Paper: Applied Science Courses(Core)</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="4">L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Functions of a Complex Variable I: Analytic functions; C-R equations and harmonic functions;Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.</td><td>8</td></tr>
<tr><td>II</td><td colspan="2">Functions of a Complex Variable II: Representation of a function by power series; Taylor's andLaurent’s series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilinear transformations.</td><td>8</td></tr>
<tr><td>III</td><td colspan="2">Integral Transforms: Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations.</td><td>8</td></tr>
<tr><td>IV</td><td colspan="2">Numerical Techniques: Solution of polynomial and transcendental equations Bisection method, RegulaR – Falsi method, Newton - Raphson method.
Interpolation: Finite difference, Newton’s forward and backward interpolation, Lagrange’s and Newton’s divided difference formula for unequal intervals;
Numerical Differentiation, Numerical Integration; Trapezoidal, Simpson’s 1/3 and 3/8 rules.
Numerical solutions of first order differential equations by Euler's method and 4th order Runge-Kutta method.</td><td>8</td></tr>
</table>

BOS

V	**Statistical Techniques:** Moments, Moment generating functions, Skewness, Kurtosis, CurveFitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	**8**

Reference / Text Books:

Text books:

1. *B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.*
2. *B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.*
3. *Dass H.K., Engineering Mathematics Vol-I, S. Chand.*
4. *E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.*
5. *R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002.*
6. *Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.*

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: **Engineering Mathematics-I(SEAS-111) & Engineering Mathematics-II (SEAS-121)**

Course Learning Outcomes:

CO1. Understand and check the Analyticity of a complex function.
CO2. To apply the concept of Analytic functions in residue and conformal mappings.
CO3. To solve and apply the concepts of transforms in the area of engineering.
CO4. To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.
CO5. To understand and use the concept of statistical tools to analyze the different data.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: II Semester: III	
Credits Theory: 4 Practical:2	**Subject:** Data Structures	
Course Code: SECS-231	**Title:** Data Structures	
Course Objectives: • Student will be able to describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications. • Student will be able to discuss the computational efficiency of the sorting and searching algorithms. • Student will be able to implement trees and Graphs and perform various operations on these data structure. • Student will be able to understand the concept of recursion, application of recursion and its implementation and removal of recursion. • Student will be able to identify the alternative implementations of data structures with respect to its performance to solve a real world problems.		
Nature of Paper: Engineering Courses (Core)		
Minimum Passing Marks/Credits: 40% Marks/4		
L:3 T:1 P:3(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)		
Unit	**Contents**	**No. of Lectures Allotted**
I	**Introduction:** Basic Terminology, Elementary Data Organization, Built in Data Types available in C. Overview of Algorithms, Efficiency of an Algorithms and its time and space complexity. Asymptotic notations: Big Oh, Big Theta and Big Omega, Discussion on Time-Space trade-off, Introduction to Abstract Data Types (ADT). **Arrays**: Definition and types: Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Arrays, Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Subtraction & Multiplications of Single variable & Two variables polynomial.	**10**
II	**Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration	**10**

	and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. **Queues:** Operationson Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue	
III	**Searching:** Concept of Searching and types of searching: Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. **Sorting:** Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	**10**
IV	**Graphs:** Terminology used with Graph, Data Structure for Graph representations by using C: Adjacency Matrices and Adjacency List. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.	**10**
V	**Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Strictly Binary Tree, Complete Binary tree. Extended Binary Trees, Tree Traversal algorithms: In order, Preorder and Post order, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search. Threaded Binary trees, Traversing Threaded Binary trees, Huffman coding using Binary Tree, Concept & Basic Operations for AVL Tree, B Tree & Binary Heaps.	**10**

Reference / Text Books:
Text books:

1. Lipschutz,“DataStructures”Schaum’sOutlineSeries,TataMcGraw-hillEducation(India)Pvt.Ltd
2. A K Sharma,“Data Structure Using C”, Pearson Education India.
3. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J.Augenstein, “Data Structures Using C and C++”,PHI Learning Private Limited, Delhi India.
4. HorowitzandSahani,“FundamentalsofDataStructures”,GalgotiaPublicationsPvtLtdDelhiIndia.
5. Thareja,“Data Structure Using C”Oxford Higher Education.
6. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

BOS

Course Learning Outcomes:
CO1. Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.
CO2. Discuss the computational efficiency of the sorting and searching algorithms.
CO3. Implementation of Trees and Graphs and perform various operations on these data structure.
CO4. Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.
CO5. Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.
CO6. Student will be able to implement trees.

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

<table>
<tr><td colspan="2">Programme: UG(R)
Class: B. Tech (CSE-AIML)</td><td colspan="2">Year: II
Semester: III</td></tr>
<tr><td>Credits
Theory: 4
Practical:2</td><td colspan="3">Subject: Computer Organization and Architecture</td></tr>
<tr><td>Course Code:
SECS-232</td><td colspan="3">Title: Computer Organization and Architecture</td></tr>
<tr><td colspan="4">Course Objectives:
Student will be able to study basic structure and operation of a digital computer system.
Student will be able to analyze the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.
Student will be able to implement control unit techniques and the concept of Pipelining.
Student will be able to understand the hierarchical memory system, cache memories and virtual memory
Student will be able to understand the different ways of communicating with I/O devices and standard I/O interfaces.</td></tr>
<tr><td colspan="4">Nature of Paper: Engineering Courses (Core)</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="4">L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Introduction: Functional units of digital system and their interconnections, Overview of bus their architecture, types of buses and bus arbitration.
Details of Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes and their types</td><td>10</td></tr>
<tr><td>II</td><td colspan="2">Arithmetic and logic unit: Look ahead carries adders, Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations, Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers.</td><td>10</td></tr>
<tr><td>III</td><td colspan="2">Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc.), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programming sequencing, concept of horizontal and vertical micro programming.</td><td>10</td></tr>
<tr><td>IV</td><td colspan="2">Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization, ROM memories, Cache memories: concept, design issues & performance, address</td><td>10</td></tr>
</table>

	mapping, Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory: concept and implementation.	
V	**Input / Output**: Overview of peripheral devices, I/O interface, I/O ports. Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access, I/O channels and processors. Serial Communication: Synchronous & asynchronous communication and standard communication interfaces.	**10**

Reference / Text Books:

Text books:

1. Computer System Architecture-M.Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012

Reference Books:

1. John P. Hayes, Computer Architecture and Organization, Tata Mc Graw Hill, Third Edition,1998.Reference books
2. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
3. Behrooz Parahami, “Computer Architecture”,Oxford University Press, Eighth Impression,2011.
4. David A. Patterson and John L. Hennessy, “Computer Architecture-A Quantitative Approach”, Elsevier, a division of reed India Private Limited, Fifth edition, 2012

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1. Study of the basic structure and operation of a digital computer system.

CO2.Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.

CO3.Implementation of control unit techniques and the concept of Pipelining

CO4.Understanding the hierarchical memory system, cache memories and virtual memory

CO5.Understanding the different ways of communicating with I/O devices and standard I/O interfaces

CO6.Student will be able to explain the concept of Pipelining.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II /Semester III

<table>
<tr><td colspan="2">Programme:UG(R)
Class:B.Tech (CSE-AIML)</td><td colspan="2">Year: II
Semester: III</td></tr>
<tr><td>Credits
Theory:4
Practical:2</td><td colspan="3">Subject: Probabilistic Modelling and Reasoning with Python Programming</td></tr>
<tr><td>Course Code:
SEAIML-231</td><td colspan="3">Title: Probabilistic Modelling and Reasoning with Python Programming</td></tr>
<tr><td colspan="4">Course Objectives: The objective of this course is to teach students the basic concepts of Statistics, Probability and Probability distribution and other statistical methods to solve various engineering problems.</td></tr>
<tr><td colspan="4">Nature of Paper: Core Paper</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="4">L:3 T:1 P:4(In Hours/Week)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Introduction and implementation of Statistics: Introduction to Statistics. Role of statistics in scientific methods, current applications of statistics.
Scientific data gathering process: Sampling techniques, scientific studies, observational studies, data management.
Data description of reasoning : Displaying data on a single variable (graphical methods, measure of central tendency, measure of spread), displaying relationship between two or more variables, measure of association between two or more variables.</td><td>8</td></tr>
<tr><td>II</td><td colspan="2">Probability Theory: Sample space and events, probability, axioms of probability, independent events, conditional probability, Bayes' theorem.
Random Variables Distribution: Discrete and continuous random variables. Probability distribution of discrete random variables, binomial distribution, poisson distribution. Probability distribution of continuous random variables, The uniform distribution, normal (gaussian) distribution, exponential distribution, gamma distribution, beta distribution, t-distribution, χ" distribution. Expectations, variance and covariance. Probability Inequalities. Bivariate distributions</td><td>8</td></tr>
<tr><td>III</td><td colspan="2">Point Estimations methods: Methods of finding estimators, method of moments, maximum likelihood estimators, bayes estimators. Methods of evaluating estimators, mean squared error, best unbiased estimator, sufficiency and unbiasedness
Interval Estimations and means: Confidence interval of means and proportions, Distribution free confidence interval of percentiles</td><td>8</td></tr>
</table>

IV	**Test of Statistical Hypothesis and p-values Tests** : Tests about one mean, tests of equality of two means, test about proportions, p-values, likelihood ratio test, Bayesian tests **Bayesian Statistics inference:** Bayesian inference of discrete random variable, Bayesian inference of binomial proportion, comparing Bayesian and frequentist inferences of proportion, comparing Bayesian and frequentist inferences of mean	**8**
V	**Univariate Statistics means using Python:** Mean, Mode. Median, Variance, Standard Deviation, Normal Distribution, t-distribution, interval estimation, Hypothesis Testing, Pearson correlation test, ANOVA F-test	**8**

Reference / Text Books:

1. Achim Klenke, (2014), Probability Theory A Comprehensive Course Second Edition, Springer, ISBN 978-1-4471-5360-3
2. Christian Heumann, Michael Schomaker Shalabh (2016), Introduction to Statistics and Data Analysis With Exercises, Solutions and Applications in R, Springer International Publishing, ISBN 978-3-319-46160-1
3. Douglas C. Montgomery, (2012), Applied Statistics and Probability for Engineers, 5th Edition, Wiley India, ISBN: 978-8-126-53719-8.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: Probabilistic Modeling and Reasoning with Python Programming basics

Course Learning Outcomes:
After completing the course, students should be able to:
On completion of this course, the students are expected to learn
CO1.Explain the basics of Statistics and Probability distributions.
CO2.Solve problems on Sampling theory and Theory of Estimation.
CO3.Perform Various tests of Hypothesis.
CO4.Apply point estimation methods.
CO5.Test Statistical Hypothesis and perform p-values tests.
CO6.Implement Univariate Statistics means using Python.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II/ Semester III

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: II Semester: III
Credits Theory: 0 Practical:4	**Subject:** Probabilistic Modelling and Reasoning with Python Programming Lab
Course Code: SEAIML-231P	**Title**: Probabilistic Modelling and Reasoning with Python Programming Lab

Course Objectives:

- Help student understand the importance and implementation of various random sampling techniques
- Describe probability and various probability distributions such as normal distribution, beta, gamma, students -t, and bivariate distributions
- Introduce the concepts of estimation techniques that covers both point and interval estimation
- Teach the concepts of hypothesis testing, p value, and Bayesian statistics

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 40% Marks/2

L:0 T:0 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
I	To investigate the pattern of the tip received by the restaurant staff	**2**
II	To analyze various parameters that effects the sales.	**2**
III	to conduct EDA on several parameters of the wine quality data	**2**
IV	To conduct the probability distributions.	**2**
V	To conduct the Q-Q plot on a particular sample	**2**
VI	to understand the driving force behind each one of the currencies on Cryptocurrency Financial Data	**2**
VII	To conduct an adhesion test on an alloy specimen	**2**
VIII	To determine the revenue on given percentage of tax on annual cost of lease data	**2**
IX	To conduct test to find cheapest catalyst between two in the pilot plant on given mean yield of each catalyst.	**2**

Reference / Text Books:

Text books:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Python Deep Learning by Daniel Slater,

Reference Books:

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Practical Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course: NA	

Learning Outcomes:
After completion of the course students would be able to :
CO1.Explain the data gathering techniques
CO2.Inspect the data using descriptive statistics
CO3.Illustrate the probability and conditional probability concepts
CO4.Distinguish between various probability distributions and analyze the data following different probability distributions
CO5.Solve the inferential statistics problems using point and interval estimation techniques
Infer the statistical problems using hypothesis testing and p value.
CO6.Conduct test to find cheapest catalyst between two in the pilot plant on given mean yield of each catalyst.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II /Semester III

Programme: UG(R) **Class:B.Tech (CSE-AIML)**	Year: II Semester: III
Credits Theory:2 Practical:0	**Subject:** R PROGRAMMING
Course Code: **SEAIML-232**	**Title:** R PROGRAMMING
Course Objectives: R is a programming language for statistical computing and graphics that you can use to clean, analyze, and graph your data. It is widely used by researchers from diverse disciplines to estimate and display results and by teachers of statistics and research methods	
Nature of Paper: Core Paper	
Minimum Passing Marks/Credits: 40% Marks/2	
L:3 T:0 P:0(In Hours/Week)	

Unit	Contents	No. of Lectures Allotted
I	**Getting Started with R and R Language Workspace**: Introducing R, R as a programming Language, the need of R, Installing R, R Studio, R Studio's user interface, console, editor, environment pane, history pane, file pane, plots pane, package pane, help and viewer pane R Workspace, R's working directory, R Project in R Studio, absolute and relative path, Inspecting an Environment.	**8**
II	**Inspect existing Symbols-** View the structure of object, Removing symbols, Modifying Global Options, Modifying warning level, Library of Packages, Getting to know a package, Installing a Package from CRAN, Updating Package from CRAN, Installing package from online repository, Package Function, Masking and name conflicts. **Basic Objects and Basic Expressions Matrix**: Vectors, Numeric Vectors, Logical Vectors, Character Vectors, subset vectors, Named Vectors, extracting element, converting vector, Arithmetic operators, create Matrix.	**8**
III	**Naming row and columns-** subsetting matrix, matrix operators, creating and subsetting an Array, Creating a List, extracting element from list, subsetting a list, setting value, creating a value of data frame, subsetting a data frame, setting values, factors, useful functions of a data frame, loading. **Writing data on disk creating a function-** calling a function, dynamic typing, generalizing a function. Assignment Operators, Conditional Expression, using if as expression and statement, using if with vectors, vectorized if: if else, using switch, using for loop, nested for loop, while loop	**8**
IV	**Working with Basic Objects and Strings data structure**: Working with object function, getting data dimensions, reshaping data structures, iterating over one dimension, logical operators, logical functions, dealing with missing values, logical coercion, math function, number rounding functions, trigonometric functions, hyperbolic functions, extreme functions, finding	**8**

	roots, derivatives and integration, Statistical function, sampling from a vector, Working with random distributions, computing summary statistics, covariance and correlation matrix, printing string, concatenating string, transforming text, Formatting text, formatting date and time, formatting date and time to string, finding string pattern, using group to extract data, reading data	
V	**Working with Data – Visualize and Analyze Data Frame**: Reading and Writing Data, importing data using built-infunction, READR package, export a data frame to file, reading and writing Excel worksheets, reading and writing native data files, loading built-in data sets, create scatter plot, bar chart, pie chart, histogram and density plots, box plot, fitting linear model and regression tree.	**8**

Reference / Text Books:

1. Hands-On Programming with R by Garrett Grolemund
2. R for Data Science by Hadley Wickham & Garrett Grolemund

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course: Not required.

Course Learning Outcomes:

After completing the course, students should be able to:

CO1. Learn R and R Language Workspace.
CO2.Learn and Inspect existing Symbols.
CO3.Learn and implement Basic Objects and Basic Expressions Matrix.
CO4.Learn and implement Naming row and columns.
CO5.Lear and implement writing data on disk by creating a function.
CO6.Learn and implement working with Basic Objects and Strings data structures.
CO7.Lear and implement working with Data Visualization and Analyze Data Frames.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: II Semester: III
Credits Theory: 0 Practical:2	**Subject:** Data Structures using C Lab
Course Code: **SECS-231P**	**Title:** Data Structures using C Lab

Course Objectives:
1. To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues.
2. To write and execute programs in C to solve problems using data¬ structures such as trees, graphs, hash tables and search trees.
3. To write and execute write programs in C to implement various¬ sorting and searching methods.

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 50% Marks/2

L:0 P:3(In Hours/Week)
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
1	Write C Programs to illustrate the concept of the following:	**2L**
2	Sorting Algorithms-Non-Recursive.	**2L**
3	Sorting Algorithms-Recursive.	**2L**
4	Searching Algorithm.	**2L**
5	Implementation of Stack using Array.	**2L**
6	Implementation of Queue using Array.	**2L**
7	Implementation of Circular Queue using Array.	**2L**
8	Implementation of Stack using Linked List.	**2L**
9	Implementation of Queue using Linked List.	**2L**
10	Implementation of Circular Queue using Linked List.	**2L**
11	Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search BST Tree, Insertion and Deletion in BST.	**2L**
12	Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.	**2L**

Reference / Text Books:

Text books:

1. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education.
2. Berztiss, AT: Data structures, Theory and Practice, Academic Press.

Reference Books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, “Data Structures Using C and C++”, PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publications Pvt Ltd Delhi India.
3. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Practical Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

At the end of this lab session, the student will

CO1.Be able to design and analyze the time and space efficiency of the data structure

CO2.Be capable to identity the appropriate data structure for given problem

CO3.Have practical knowledge on the applications of data structures.

CO4.Be able to Implement Stack using Array.

CO5.Be able to Implement Tree Structures, Binary Tree, Tree Traversal, Binary Search BST Tree, Insertion and Deletion in BST.

CO6.Be able to do Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

BOS

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG(R) **Class:B.Tech (CSE-AIML)**	Year: II Semester: III
Credits Practical:2	**Subject:** Computer Organization and Architecture Lab
Course Code: **SECS-232P**	**Title:** Computer Organization and Architecture Lab

Course Objectives:
1. Understand the theory and architecture of central processing unit.
2. Analyze some of the design issues in terms of speed, technology, cost, performance.
3. Design a simple CPU with applying the theory concepts.
4. Use appropriate tools to design verify and test the CPU architecture.
5. Learn the concepts of parallel processing, pipelining and inter processor communication.
6. Understand the architecture and functionality of central processing unit.
7. Exemplify in a better way the I/O and memory organization. 8. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

Nature of Paper: Engineering Courses: Core

Minimum Passing Marks/Credits: 50% Marks/2

L:0 T:0 P:3(In Hours/Week)
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	**Name of the Practical**	**No. of Lectures Allotted for practical**
1	Implementing HALF ADDER, FULL ADDER using basic logic gates	**2L**
2	Implementing Binary -to -Gray, Gray -to -Binary code conversions.	**2L**
3	Implementing 3-8 line DECODER.	**2L**
4	Implementing 4x1 and 8x1 MULTIPLEXERS.	**2L**
5	Verify the excitation tables of various FLIP-FLOPS.	**2L**
6	Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.	**2L**
7	Design of an 8-bit ARITHMETIC LOGIC UNIT.	**2L**
8	Design the data path of a computer from its register transfer language	**2L**
9	Design the control unit of a computer using either hardwiring	**2L**
10	microprogramming based on its register transfer language description. transfer language description.	**2L**
11	Implement a simple instruction set computer with a control unit and a data path.	**2L**

Reference / Text Books:

Text books:

1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books

Reference Books:

1. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
2. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Practical Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course: NA

Course Learning Outcomes:

Student will be able to:

CO1.Analyze the behaviour of logic gates

CO2.Design combinational circuits for basic components of computer system and applications.

CO3.Analyze the operational behaviour and applications of various flip-flop

CO4.Design Arithmetic logic units and different types of memory blocks.

CO5.Design the control unit of a computer using either hardwiring.

CO6.Implement a simple instruction set computer with a control unit and a data path

Format-3

IIMTU-NEP IMPLEMENTATION
Year II /Semester IV

Programme:UG(R) **Class:B.Tech (CSE-AIML)**	Year: II Semester: IV	
Credits Theory: 4 Practical:0	**Subject:** Machine Learning and Pattern Recognition	
Course code: SEAIML-241	**Title:** Machine Learning and Pattern Recognition	
Course Objectives: The objective of this course is to teach students the basic concepts of machine learning, supervised learning, unsupervised learning, and reinforcement learning.		
Nature of Paper: Core Paper		
Minimum Passing Marks/Credits: 40% Marks /4		
L:3 T:1 P:0 (In Hours/Week)		

Unit	Contents	No.of Lectures Allotted
I	**Introduction and implementation :** Learning systems, real world applications of machine learning, why machine learning, variable types and terminology, function approximation	**8**
II	**Types of machine learning techniques:** Supervised learning, unsupervised learning, reinforcement learning Parametric vs non-parametric models, the trade-off between prediction ccuracy and model interpretability.	**8**
III	**Important concepts of machine learning Bias:** the curse of dimensionality, measuring the quality of fit, bias variance trade off, over fitting, model selection, no free lunch theorem	**8**
IV	**Linear Regression:** Linear regression, estimating the coefficients, accessing the accuracy of coefficient estimates, accessing the accuracy of the model, multiple linear regression, qualitative predictors	**8**
V	**Classification:** Logistic regression, estimating regression coefficients, making predictions, multiple logistic regressions, linear discriminant analysis, bayes' theorem of classification, LDA for p=1, LDA for p>1, quadratic discriminant analysis	**8**

Reference / Text Books:

1. Machine Learning by Tom M. Mitchell - McGraw Hill Education; First edition.
2. Pattern Recognition and Machine Learning (Information Science and Statistics) by Christopher M. Bishop - Springer; 1st ed. 2006. Corr. 2nd printing 2011 edition.
3. The Elements of Statistical Learning: Data Mining, Inference, and Prediction by Trevor Hastie, Robert Tibshirani, Jerome Friedman - Springer; 2nd ed. 2009, Corr. 9th printing 2017 edition.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course: Machine Learning and Pattern Recognition basics	
Course Learning Outcomes: **After completing the course, students should be able to** CO1.Explain basic algorithms of Machine Learning and implement them. CO2.Explain and classify Supervised and Unsupervised Learning. CO3.Explain Linear Regression and classification. CO4.Explain the machine learning bias. CO5.Implement quadratic discriminant analysis. CO6.Explain multiple linear regressions.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year II /Semester IV

<table>
<tr><td colspan="2">Programme:UG(R)
Class:B.Tech (CSE-AIML)</td><td colspan="2">Year: II
Semester: IV</td></tr>
<tr><td>Credits
Theory: 4
Practical:0</td><td colspan="3">Subject: Machine Learning Practical with Python, Scikit-learn, Matplotlib, Tensor Flow</td></tr>
<tr><td>Course Code:
SEAIML-242</td><td colspan="3">Title: Machine Learning Practical with Python, Scikit-learn, Matplotlib, TensorFlow</td></tr>
<tr><td colspan="4">Course Objectives: The objective of this course is to teach students the basic concepts of machine learning, supervised learning, unsupervised learning, and reinforcement learning</td></tr>
<tr><td colspan="4">Nature of Paper: Core Paper</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="4">L:3 T:1 P:0(In Hours/Week)</td></tr>
<tr><th>Unit</th><th colspan="2">Contents</th><th>No. of Lectures Allotted</th></tr>
<tr><td>I</td><td colspan="2">Resampling Methods, Model Selection and Regularization selection: Cross-validation,leave-one-out cross- validation, k-fold cross-validation, the bootstrap, subset selection, shrinkage methods</td><td>8</td></tr>
<tr><td>II</td><td colspan="2">Ridge and lasso regression: dimension reduction methods, principal components regression, partial least square</td><td>8</td></tr>
<tr><td>III</td><td colspan="2">Tree Based Methods: Advantages and disadvantages of trees, regression Trees, classification trees, bagging, random forest, boosting</td><td>8</td></tr>
<tr><td>IV</td><td colspan="2">Support Vector Machine and classifier: Maximum margin classifier, classification using a separating hyper plane, the maximal margin classifier, support vector classifier, support vector machines, classification with non-linear decision boundaries, support vector machine, one-versus-one classification, one-versus- many classification</td><td>8</td></tr>
<tr><td>V</td><td colspan="2">Unsupervised Learning Models: Principle component analysis, what are principal components, clustering methods, k-means clustering, hierarchical clustering, Independent component analysis, latent semantic indexing, Markov Models, Hidden Markov Models</td><td>8</td></tr>
<tr><td colspan="4">Reference / Text Books:
1. Machine Learning by Tom M. Mitchell - McGraw Hill Education; First edition
2. Pattern Recognition and Machine Learning (Information Science and Statistics) by Christopher M. Bishop -Springer; 1st ed. 2006. Corr. 2nd printing 2011 edition
3. The Elements of Statistical Learning: Data Mining, Inference, and Prediction by Trevor Hastie,
4. Robert Tibshirani, Jerome Friedman - Springer; 2nd ed. 2009, Corr. 9th printing 2017 edition</td></tr>
</table>

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course: Machine Learning Practical with Python, Scikit-learn, Matplotlib, Tensor Flow basics.
Course Learning Outcomes: **After completing the course, students should be able to:** CO1. Implement basic Algorithms of Machine Learning. CO2.Explain and implement Supervised and Unsupervised Learning. CO3.Explain and implement Linear Regression, Classification. CO4.Explain Tree Based Methods. CO5.Explain and implement Unsupervised Learning Models. CO6.Implement Support Vector Machine and classifiers and using them to solve the problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG(R) **Class: B. Tech(CSE-AIML)**	Year: II Semester: IV
Credits Theory: 4 Practical:0	**Subject:** Operating System
Course Code: SECS-243	**Title:** Operating System

Course Objectives:

- Student will be able to understand the structure and functions of OS
- Student will be able to learn about Processes, Threads and Scheduling algorithms.
- Student will be able to study and understand the principles of concurrency and Deadlocks
- Student will be able to study and learn various memory management scheme
- Student will be able to study I/O management and File systems.

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	**Contents**	**No. of Lectures Allotted**
I	Introduction of Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems, Multithreaded Systems. Details of Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	**10**
II	Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation. Classical Problem in Concurrency i.e Dining Philosopher Problem and Sleeping Barber Problem. Overview of Inter Process Communication models and Schemes, Process generation.	**10**
III	CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	**10**
IV	Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged	**10**

	segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	
V	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	**10**

Reference / Text Books:
Text books:
1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education

Reference Books:
1. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
2.William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
CO1.Understand the structure and functions of OS
CO2.Learn about Processes, Threads and Scheduling algorithms.
CO3.Understand the principles of concurrency and Deadlocks
CO4.Learn various memory management scheme
CO5.Study I/O management
CO6.Learn and implement File systems.

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG(R) **Class: B. Tech (CSE-AIML)**		Year: II Semester: IV
Credits Theory: 4 Practical:0	**Subject:** Data Analytics	
Course Code: SDAIML-241	**Title:** Data Analytics	
Course Objectives: • Student will be able to describe the life cycle phases of Data Analytics through discovery, planning and building. • Student will be able to understand and apply Data Analysis Techniques. • Student will be able to implement various Data streams • Student will be able to understand item sets, Clustering, frame works & Visualizations. • Student will be able to apply R tool for developing and evaluating real time applications		
Nature of Paper: Discipline Specific Electives		
Minimum Passing Marks/Credits: 40% Marks/4		
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)		

Unit	Contents	No. of Lectures Allotted
I	Introduction to Data Analytics: Sources and nature of data, classification of data, characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. Data Analytics Lifecycle: Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, and operationalization.	**8**
II	Data Analysis: Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, neural networks: learning and generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.	**8**
III	Mining Data Streams: Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – real time sentiment analysis, stock market predictions	**8**

IV	Frequent Itemsets and Clustering: Mining frequent itemsets, market based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism.	**8**
V	Frame Works and Visualization: MapReduce, Hadoop, Pig, Hive, HBase, MapR, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. Introduction to R - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.	**8**

Reference / Text Books:

Text books:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press

Reference Books:

1. Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.
2. John Garrett, Data Analytics for IT Networks : Developing Innovative Use Cases, Pearson Education
3. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
4. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big Data Analytics”, EMC Education Series, John Wiley

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Describe the life cycle phases of Data Analytics through discovery, planning and building.
CO2.Understand and apply Data Analysis Techniques.
CO3.Implement various Data streams.
CO4.Understand item sets, Clustering, frame works & Visualizations.
CO5.Apply R tool for developing and evaluating real time applications.
CO6.Learn Frame Works and Visualization.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: II Semester: IV
Credits Theory: 4 Practical:0	**Subject:** Web Designing
Course Code: SDAIML-242	**Title:** Web Designing

Course Objectives:

- Student will be able to understand principle of Web page design and about types of websites
- Student will be able to visualize and Recognize the basic concept of HTML and application in web designing.
- Student will be able to recognize and apply the elements of Creating Style Sheet (CSS).
- Student will be able to understand the basic concept of Java Script and its application.
- Student will be able to introduce basics concept of Web Hosting and apply the concept of SEO.

Nature of Paper: Discipline Specific Electives

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction : Basic principles involved in developing a web site, Planning process, Domains and Hosting, Responsive Web Designing, Types of Websites (Static and Dynamic Websites), Web Standards and W3C recommendations, Introduction to HTML: What is HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags , Heading-Paragraphs , Line Breaks	**8**
II	Elements of HTML: HTML Tags., Working with Text , Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls	**8**
III	Concept of CSS: Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts) , Working with block elements and objects , Working with Lists and Tables , CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties) CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) , CSS Color , Creating page Layout and Site Designs.	**8**
IV	Introduction to Client Side Scripting , Introduction to Java Script , Java script Types , Variables in JS, Operators in JS , Conditions Statements , Java Script Loops, JS Popup Boxes, JS Events , JS Arrays, Working with Arrays, JS Objects ,JS Functions, Using Java Script in Real time, Validation of Forms, Related Examples	**8**

V	Web Hosting: Web Hosting Basics, Types of Hosting Packages, Registering domains, Defining Name Servers , Using Control Panel, Creating Emails in Cpanel, Using FTP Client, Maintaining a Website Concepts of SEO : Basics of SEO, Importance of SEO, Onpage Optimization Basics	**8**

Reference / Text Books:

Text books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible, 5ed", Wiley India
2. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design", Wiley India

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1.Understand principle of Web page design and about types of websites
CO2.Visualize and Recognize the basic concept of HTML and application in web designing
CO3.Recognize and apply the elements of Creating Style Sheet (CSS)
CO4.Understand the basic concept of Java Script and its application
CO5.Introduce basics concept of Web Hosting.
CO6.Learn and apply the concept of SEO.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG(R) **Class: B. Tech (CSE-AIML)**		Year: II Semester: IV
Credits Theory: 4 Practical:0	**Subject:** Computer Graphics	
Course Code: SDAIML-243	**Title:** Computer Graphics	

Course Objectives:

- Student will be able to understand the graphics hardware used in field of computer graphics.
- Student will be able to understand the concept of graphics primitives such as lines and circle based on different algorithms.
- Student will be able to apply the 2D graphics transformations, composite transformation and Clipping concepts.
- Student will be able to apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.
- Student will be able to perform the concept of projections, curve and hidden surfaces in real life.

Nature of Paper: Discipline Specific Electives

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	**8**
II	Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithmsLine clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping	**8**
III	Three Dimensional: 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3- D viewing, projections, 3-D Clipping.	**8**
IV	Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	**8**

BOS

V	Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	**8**

Reference / Text Books:

Text books:

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education

Reference Books:

1. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
2. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – McGraw Hill.
3. Amrendra N Sinha and Arun D Udai," Computer Graphics", McGraw Hill.
4. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
5. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

CO1.Understand the graphics hardware used in field of computer graphics.

CO2.Understand the concept of graphics primitives such as lines and circle based on different algorithms.

CO3.Apply the 2D graphics transformations, composite transformation and Clipping concepts.

CO4.Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations.

CO5.Perform the concept of projections.

CO6.Learn and apply the concepts of curve and hidden surfaces in real life.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: II Semester: IV
Credits Theory: 4 Practical:0	**Subject:** Object Oriented System Design using Java
Course Code: SDAIML-244	**Title:** Object Oriented System Design using Java

Course Objectives:
- Student will be able to develop Applications for Range of Problems Using Object-Oriented Programming Techniques.
- Student will be able to design Simple Graphical User Interface Applications.

Nature of Paper: Discipline Specific Electives

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Object Oriented Thinking and Java Basics:** Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.	**8**
II	**Inheritance, Packages and Interfaces:** Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes. The Object Class Defining, Creating and Accessing a Package, Understanding Class path, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.	**8**

III	**Exception Handling and Multithreading:** Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes. String Handling, Exploring Java.Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread communication, Thread Groups, Daemon Threads, Enumerations, Auto boxing, Annotations, Generics.	**8**
IV	**Event Handling:** Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes. The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scroll pane, Dialogs, Menu bar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.	**8**
V	**Applets:** Concepts f Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets. **Swing:** Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- J applet, J frame and J component, Icons and Labels, Text Fields, Buttons – The J button Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.	**8**

Reference / Text Books:

Text books:

1. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.

Reference Books:

1. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
2. An Introduction to Java Programming and Object-Oriented Application Development, R.A. Johnson- Thomson.
3. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Eighth Edition, Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, eighth Edition, Pearson Education

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course: NA	

Course Learning Outcomes:

CO1.Develop Applications for Range of Problems Using Object-Oriented Programming Techniques
CO2.Design Simple Graphical User Interface Applications.
CO3.Learn and apply Inheritance, Packages and Interfaces.
CO4.Learn and apply Exception Handling and Multithreading.
CO5.Learn and apply Event Handling.
CO6.Learn and apply Applets.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG (R) **Class: B.Tech(CSE-AIML)**	Year: II Semester: IV
Credits Theory: 0 Practical: 2	**Subject: Operating System Lab**
Course Code: SECS-243P	**Title: Operating System Lab**

Course Objectives:
1. To learn shell programming and the use of filters in the LINUX environment.
2. To practice multithreaded programming.
3. To implement CPU Scheduling Algorithms and memory management algorithms.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L:
T:
P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Write a C programs to implement UNIX system calls and file management.	2
II	Write C programs to demonstrate various process related concepts.	2
III	Write C programs to demonstrate various thread related concepts.	2
IV	Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, and Round Robin.	2
V	Write C programs to simulate Intra & Inter – Process Communication (IPC) techniques: Pipes, Messages Queues, and Shared Memory.	2
VI	Write C programs to simulate solutions to Classical Process Synchronization Problems.	2
VII	Dining Philosophers, Producer – Consumer, Readers – Writers.	2
VIII	Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.	2

Reference / Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition, Wiley India Private Limited, New Delhi.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Coures Learning Outcomes:

Student will be able to :

CO1.Ensure the development of students applied skills in operating systems related areas.

CO2.Students will gain knowledge in writing software routines modules or implementing various concepts of operating system.

CO3.Implement Dining Philosophers, Producer – Consumer, Readers – Writers.

CO4.Write C programs to simulate solutions to Classical Process Synchronization Problems.

CO5.Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.

CO6.Write C programs to simulate solutions to Classical Process Synchronization Problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: II Semester: IV
Credits Theory: 0 Practical:2	**Subject:** Machine Learning & Pattern Recognition Lab
Course Code: SEAIML-241P	**Title:** Machine Learning & Pattern Recognition Lab

Course Objectives:

- Help student understand what machine learning is. How business can use machine learning in different domains to gain competitive advantage.
- Student is able to differentiate between different learning algorithms.
- Gain a fundamental understanding of the concepts and techniques that underpin machine learning algorithms
- Learn how to choose the appropriate regression and classification algorithms, how to prepare data for machine learning models, and how to evaluate model performance

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 2

L:0 T:0 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
I	To determine the libraries of python used in project analysis.	**2**
II	To determine the splitting of data and model selection in an appropriate project.	**2**
III	To detect whether a transaction is a normal payment or a fraud.	**2**
IV	To Analyze the confusion matrix for the best appropriate model.	**2**
V	To predict whether a patient has diabetes.	**2**
VI	To determine the fluctuations on size and demand for a spare part manufactured by a company.	**2**
VII	To find estimates for which the sum of squared deviation is minimum for a manufacturing company.	**2**
VIII	To Infer relationship between sales and the three media budgets: TV, Radio and Newspaper.	**2**
IX	To predict whether a credit card user will default on monthly credit card payment based on annual income and monthly credit card balance.	**2**
X	To predict the Baseball major league player salary based on career and previous season statistics	**2**

Reference / Text Books:
Text books:
1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Python Deep Learning by Daniel Slater.

Reference Books:
1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Practical Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:
CO1.To determines the libraries of python used in project analysis.
CO2.To determines the splitting of data and model selection in an appropriate project.
CO3.To Analyze the confusion matrix for the best appropriate model
CO4.Learn how to choose the appropriate regression and classification algorithms.
CO5.How to prepare data for machine learning models.
CO6.How to evaluate model performance.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: III Semester: IV
Credits Theory: 0 Practical:2	**Subject:** Machine learning Practical with Python, Scikit-learn, Tensorflow Lab
Course Code: SEAIML-242P	**Title:** Machine learning Practical with Python, Scikit-learn, Tensorflow Lab

Course Objectives:

- Help student understand what machine learning is. How business can use machine learning in different domains to gain competitive advantage
- Student is able to differentiate between different learning algorithms.
- Gain a fundamental understanding of the concepts and techniques that underpin machine learning algorithms
- Learn how to choose the appropriate regression and classification algorithms, how to prepare data for machine learning models, and how to evaluate model performance

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 50% Marks/2

L:0 T:0 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
I	To determine the implementation , installation and use of tensorflow and keras libraries with python	**2**
II	To determine the tensorflow estimators encapsulate training, evaluation, prediction, and exporting for your model.	**2**
III	To determine how to prepare a dataset and also to feed it to machine learning model.	**2**
IV	To build a simple TensorFlow estimator for a multiple regression problem.	**2**
V	To build a regression model using a real dataset, the Boston Housing Price data set.	**2**
VI	To build a Classification model using a real dataset, the Titanic data set.	**2**
VII	To predict fuel efficiency in miles per gallon for the late 1970s and early 1980s automobiles.	**2**
VIII	To recognize the handwritten digits	**2**
IX	To recognize whether it’s a dog or a cat using CNN	**2**
X	To implement a convolutional neural network.	**2**

Reference / Text Books: **Text books:** 1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016. 2. Python Deep Learning by Daniel Slater. **Reference Books:** 1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009. 2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013. 3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Practical Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: CO1.To determine the libraries of python used in project analysis. CO2.To determine the tensorflow estimators encapsulate training, evaluation, prediction, and exporting for your model. CO3.To determine the splitting of data and model selection in an appropriate project. CO4.To Analyze the confusion matrix for the best appropriate model CO5.Learn how to choose the appropriate regression and classification algorithms. CO6.To recognize whether it’s a dog or a cat using CNN.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG(R) **Class: B.Tech (CSE-AIML)**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Design and Analysis of Algorithm
Course Code: SECS-351	**Title:** Design and Analysis of Algorithm

Course Objectives:
The Student will Learn:

1. To analyze performance of algorithms & Understanding the growth of function.
2. To choose the appropriate data sorting algorithm for performing sorting in data structure.
3. To choose the appropriate data structure and algorithm design method for a specified application.
4. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
5. To analyze performance of string matching and randomized algorithms. To introduce P and NP classes.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/ 4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Asymptotic Notations Performance Measurements, Recurrence Relation, Method of Solving recurrence function **Sorting and Order Statistics** – Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	**8L**
II	**Advanced Data Structures:** Red-Black Trees, B – Trees, Binomial Heaps, and Fibonacci Heaps.	**8L**
III	**Divide and Conquer:** Matrix Multiplication, Convex Hull and Searching. Longest Common Subsequence (LCS) Problem **Greedy Methods**: Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths – Dijkstra's and Bellman Ford Algorithms.	**8L**
IV	**Dynamic Programming:** Knapsack, All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Branch and Bound : Travelling Salesman Problem, **Backtracking:** Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	**8L**
V	**String Matching:** Algorithm for string matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms.	**8L**

BOS

Reference / Text Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms", 3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
3. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
6. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: Data Structures

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.

CO2.Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).

CO3.Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.

CO4.Apply classical sorting, searching, optimization and graph algorithms.

CO5.Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.

CO6.Understand string matching algorithms, approximation algorithms and randomized algorithms.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

<table>
<tr><td colspan="2">Programme:UG(R)
Class: B.Tech (CSE-AIML)</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical: 0</td><td colspan="2">Subject: Deep Learning Lab with Python, Tensor Flow and Keras</td></tr>
<tr><td colspan="2">Course Code:
SEAIML-351</td><td colspan="2">Title: Deep Learning Lab with Python, Tensor Flow and Keras</td></tr>
<tr><td colspan="4">Course Objectives: The objective of this course is to teach students the basic concepts of neural networks, neurons, and deep learning.</td></tr>
<tr><td colspan="4">Nature of Paper: Core Paper</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="4">L:3 T:1 P:4(In Hours/Week)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Moving beyond gradient descent Models: Local minima vs global minima vs saddle, model identifiability, correcting gradient points in wrong directions, Momentum based optimization.</td><td>8</td></tr>
<tr><td>II</td><td colspan="2">Second order: methods, learning rate adaption, adagrad, rmsprop.
Convolution Neural Network implementation: Convolution operation, filters and feature maps</td><td>8</td></tr>
<tr><td>III</td><td colspan="2">Motivation, sparse interactions: parameter sharing and equivariant representation, padding and stride, max pooling, full architectural description of convolution network, build cnn using data augmentation, using pretrained convnet, visualize what convnet learn.</td><td>8</td></tr>
<tr><td>IV</td><td colspan="2">Embedding and Representation Learning analysis: Principle component analysis, working with text data, one-hot encoding of words and characters, word embedding, autoencoder architecture, denoising, sparsity, Word2vec framework, Skip-Gram Architecture.</td><td>8</td></tr>
<tr><td>V</td><td colspan="2">Models for Sequence Analysis networks: Analysing Variable-length inputs, Seq2seq with neural n-gram, part of speech tagger, dependency parse, syntaxnet, recurrent neural network, challenges with vanishing gradients, long short term memory units</td><td>8</td></tr>
<tr><td colspan="4">Reference / Text Books:
1. Deep Learning with TensorFlow and Keras: Build and deploy supervised, unsupervised, deep, and reinforcement learning models Paperback – Import, 4 November 2022 by Amita Kapoor , Antonio Gullir, Sujit Pal, Francois Chollet .</td></tr>
</table>

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course: Deep Learning Lab with Python, Tensor Flow and Keras basics	

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Learn Neural Network, Feed Forward and Back propogation and implement them in neural networks.

CO2.Learn and implement various problem solutions using Tensorflow and Keras.

CO3.Learn and implement RNN, CNN, Auto encoders.

CO4.Learn and implement Models for Sequence Analysis networks.

CO5.Learn Convolution Neural Networks.

CO6.Learn Embedding and Representation Learning analysis and using them for problem solving.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG(R) **Class:B.Tech (CSE -AIML)**	Year: III Semester: V
Credits Theory: 4 Practical: 0	**Subject:** Neural Networks and Deep Learning Computer Networks
Course Code: SEAIML-352	**Title:** Neural Networks and Deep Learning Computer Networks

Course Objectives: The objective of this course is to teach students the basic concepts of neural Networks, neurons, and deep learning.

Nature of Paper: Core Paper

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0 (In Hours/Week)

Unit	Contents	No. of Lectures Allotted
I	**The neural network neurons**: The neuron, linear perceptron, feed-forward neural network, limitations of linear neurons, sigmoid, tanh, relu neurons.	**8**
II	**Soft max output layer** –information theory, cross entropy, Kullback-Leibler divergence.Training feed-forward neural network: Gradient Descent, delta rules and learning rates,gradient descent with sigmoid neurons.	**8**
III	**The back propagation algorithms**: stochastic and mini batch gradient descent, test sets, validation sets and over fitting, preventing over fitting.	**8**
IV	**Tensor Flow: Computation graphs:** graphs, sessions and fetches, constructing and managing graph, flowing tensors, sessions, data types, tensor arrays and shapes, names, variables, placeholders and simple optimization, linear regression and logistic regression using tensorflow	**8**
V	**Implement Neural Network and keras:** Introduction to Keras, Build neural network using Keras, Evaluating models, data preprocessing, feature engineering, feature learning, overfitting.	**8**

Reference / Text Books:

1. Deep Learning with Python by Francois Chollet - Manning Publications; 1 edition, Deep Learning by Ian Goodfellow, Yoshua Bengio, Aaron Courville, Francis Bach – MIT Press (3 January 2017)

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

BOS

Prerequisites for the course: Neural Networks and Deep Learning Computer Networks fundamentals
Course Learning Outcomes: **After completing the course, students should be able to:** CO1.Explain the concept of neural networks and neurons. CO2.Explain the concept of Soft max output layer. CO3.Learn the back propagation algorithms and use them to solve problems. CO4.Learn and use Tensor flow. CO5.Implement Neural Network CO6.Learn and Implement keras.

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG(R) **Class: B.Tech (CSE-AIML)**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Discrete Structures & Theory of Logic
Course Code: SDAIML-351	**Title:** Discrete Structures & Theory of Logic

Course Objectives:
The Student will Learn:
- To acquaint the concept of set theory, relations and functions.
- To understand the concepts related to algebraic structures.
- To introduce the fundamentals of Boolean algebra and its properties.
- To acquaint the concept of Propositional Logic and Predicate Logic
- To use concept of trees and graph theory for solving practical problems.

Nature of Paper: Department Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.	**8L**
II	Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.	**8L**
III	Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.	**8L**
IV	Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic	**8L**
V	Trees: Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs,	**8L**

	Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle	

Reference / Text Books:

1. Hari Krishan, Discrete Mathematics, Pragati Edition
2. Lipchitz, S. & Lipson S., Discrete Mathematics, Outline series Tata McGraw Hill.
3. Kumar, S.S., Discrete Mathematics, S. Chand.
4. Dean, N., Essence of Discrete Mathematics, Prentice Hall Liu, C.L., Elements of Discrete Mathematics, McGraw Hill.
5. Rosen, Kenneth H., Discrete Mathematics and Its Applications, McGraw Hill.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	30 20
5) ESE	100
Total:	150

Prerequisites for the course: Set Theory

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.To memorize and understand the concept of set theory, relation and function.
CO2.To understand the fundamentals of algebraic structures
CO3.To understand the fundamentals of Boolean algebra and illustrate their properties
CO4.To understand the concept of Propositional Logic and Predicate Logic and illustrate their properties.
CO5.To memorize and understand the concept of trees & graphs and exhibit their properties effectively.
CO6.To memorize and understand the concept of Recurrence Relation, Generating function and Combinatorics.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG(R) **Class: B.Tech (CSE-AIML)**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Database Management System
Course Code: SDAIML-352	**Title:** Database Management System

Course Objectives:
The Student will Learn:

- To understand the basic concepts and the applications of database systems. To apply channel allocation, framing, error and flow control techniques.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles and implementations.
- To understand the transaction processing
- To implement the concurrency techniques in transaction processing

Nature of Paper: Department Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	**8L**
II	Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	**8L**
III	Data Base Design & Normalization: Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**8L**

IV	Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.	**8L**
V	Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**8L**

Reference / Text Books:

1. "Data base System Concepts", A. Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition
2. "Fundamental of Database systems " by Elsmasri &Navathe , 6th edition, Addison-Wesley
3. "Data base Concepts" by CJ. Date, 7th edition
4. "Database Management Concepts" by Raghu Ramakrishnan & Johannes Gehrke, 2nd edition.
5. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2nd ed., ELSEVIER.
6. Database Management Systems, G.K. Gupta, TMH.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course: Nil

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.To memorize the basic concept of database systems and to understand the database modeling concept using ER modeling.
CO2.To understand and apply the concept of relational data model and SQL for database management.
CO3.To understand and apply the concept of normalization using FD, MVD & JD's for designing database effectively.
CO4.To understand the Transaction processing fundamentals and transaction management.
CO5.To understand the concept of deadlock and distributed database.
CO6.To understand various protocols for maintaining concurrency in transactions of real world scenarios.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG(R) **Class: B.Tech (CSE-AIML)**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Application of Soft Computing
Course Code: SDAIML- 353	**Title:** Application of Soft Computing

Course Objectives:
The Student will Learn:
1. To introduce the concept of soft computing.
2. To acquaint the concept of Fuzzy System.
3. To understand the concepts of Neuro-fuzzy Modeling.
4. To introduce the concept of genetic algorithms.
5. To understand the applications of soft computing and to introduction MATLAB Environment.

Nature of Paper: Department Elective

Minimum Passing Marks/Credits:4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction to Soft Computing, ARTIFICIAL NEURAL NETWORKS Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network.	**8L**
II	FUZZY SYSTEMS Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	**8L**
III	NEURO - FUZZY MODELING Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation	**8L**
IV	GENETIC ALGORITHMS Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method	**8L**
V	APPLICATION OF SOFT COMPUTING Optimization of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques.	**8L**

Reference / Text Books:

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)
5. Sivanandam, Deepa, " Principles of Soft Computing", Wiley

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Fuzzy Logic

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.To memorize and understand the concept of soft computing.
CO2.To understand the fundamentals of Fuzzy System.
CO3.To understand the fundamentals of Neuro-fuzzy Modeling
CO4.To understand the concept of genetic algorithms.
CO5.To understand the concept of genetic algorithm based Internet Search Techniques.
CO6.To memorize and understand the concept of applications of soft computing.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester V

Programme: UG(R) **Class: B.Tech (CSE-AIML)**	Year: III Semester: V
Credits Theory:4 Practical:0	**Subject:** Augmented & Virtual Reality
Course Code: SDAIML-354	**Title:** Augmented & Virtual Reality

Course Objectives:
The Student will Learn:

- To introduce the concept of Virtual reality and virtual environments.
- To acquaint the concept of 3D user interface input hardware.
- To understand the concepts of Software technologies and VR environment.
- To introduce the concept of 3D Interaction Techniques.
- To understand the applications of Augmented and Mixed Reality.

Nature of Paper: Department elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1
P:0 (In Hours/Week)
Theory - 1
Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS: The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces	8L
II	3D USER INTERFACE INPUT HARDWARE: Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces.	8L
III	SOFTWARE TECHNOLOGIES: Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market	8L
IV	3D INTERACTION TECHNIQUES: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation,	8L

	Deign Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry . DESIGNING AND DEVELOPING 3D USER INTERFACES: Strategies for Designing and Developing Guidelines and Evaluation. VIRTUAL REALITY APPLICATIONS: Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.	
V	Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems	**8L**

Reference / Text Books:

1. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.
4. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.
5. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: Computer Graphics

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.To memorize and understand the concept of Virtual reality and virtual environments.

CO2.To understand the fundamentals of 3D user interface input hardware.

CO3.To understand the fundamentals of Software technologies and VR environment.

CO4.To understand the concept of 3D Interaction Techniques.

CO5.To understand the concept of designing and developing 3D user interface and Virtual reality applications.

CO6.To memorize and understand the concept of Augmented and Mixed Reality.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III / Semester V

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: III Semester: V
Credits: Theory: 0 Practical:2	**Subject:** Deep learning Lab with Python using Tensorflow and keras
Course Code: SEAIML-351P	**Title:** Deep learning Lab with Python using Tensorflow and keras

Course Objectives:

- Help student understand what machine learning is. How business can use machine learning in different domains to gain competitive advantage
- Student is able to differentiate between different learning algorithms.
- Gain a fundamental understanding of the concepts and techniques that underpin machine learning algorithms
- Learn how to choose the appropriate regression and classification algorithms, how to prepare data for machine learning models, and how to evaluate model performance

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
I	To determine the implementation , installation and use of tensorflow and keras libraries with python	**2**
II	To determine the tensorflow estimators encapsulate training, evaluation, prediction, and exporting for your model.	**2**
III	To determine how to prepare a dataset and also to feed it to machine learning model.	**2**
IV	To build a simple TensorFlow estimator for a multiple regression problem.	**2**
V	To build a regression model using a real dataset, the Boston Housing Price data set.	**2**
VI	To build a Classification model using a real dataset, the Titanic data set.	**2**
VII	To predict fuel efficiency in miles per gallon for the late 1970s and early 1980s automobiles.	**2**
VIII	To recognize the handwritten digits	**2**
IX	To recognize whether it's a dog or a cat using CNN	**2**
X	To implement a convolutional neural network.	**2**

Reference / Text Books: 1. Deep Learning with TensorFlow and Keras: Build and deploy supervised, unsupervised, deep, and reinforcement learning models Paperback – Import, 4 November 2022 by Amita Kapoor, Antonio Gulli, Sujit Pal, Francois Chollet.	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Practical Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: **After completion of the course students would be able to :** CO1.Explain the use of Machine Learning Models in business and understand machine learning models can be used to solve business problems CO2.Compare machine learning algorithms such as supervised, unsupervised, and reinforcement learning models CO3.Identify the performance of different machine learning models and compare them to optimize the results CO4.Make use continuous and discrete data set to fit regression and classification models. CO5.Implementation of CNN. CO6.To recognize whether it's a dog or a cat using CNN.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year III / Semester V

<table>
<tr><td colspan="2">Programme: UG(R)
Class:B.Tech (CSE-AIML)</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td colspan="2">Credits
Theory: 0
Practical:2</td><td colspan="2">Subject: Neural Networks and Deep Learning Computer Network Lab</td></tr>
<tr><td colspan="2">Course Code:
SEAIML-352P</td><td colspan="2">Title: Neural Networks and Deep Learning Computer network Lab</td></tr>
<tr><td colspan="4">Course Objectives:
• Students will be able to identify the deep learning algorithms which are more appropriate for various types of problems or learning tasks in various domains.
• Students will be able to Implement deep learning algorithms and solve real-world problems.
• This will help students in developing skills required to gain experience of doing independent research and study in the field of AI.
• Students will be able to build, train and apply CNN or RNN and fully connected deep neural networks</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 50% Marks/ 2</td></tr>
<tr><td colspan="4">L:0 T:0 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Practical No.</td><td colspan="2">Name of the Practical</td><td>No. of Lectures Allotted for practical</td></tr>
<tr><td>I</td><td colspan="2">Set up a development environment and implement tensorflow version 1 and tensorflow version 2 operations.</td><td>2</td></tr>
<tr><td>II</td><td colspan="2">Build simple Neural Network using TensorFlow and keras</td><td>2</td></tr>
<tr><td>III</td><td colspan="2">Implementation of neural network and addressing the learning problem using python and tensorflow</td><td>2</td></tr>
<tr><td>IV</td><td colspan="2">Implementation of estimator, Pipeline</td><td>2</td></tr>
<tr><td>V</td><td colspan="2">Training simple neural network</td><td>2</td></tr>
<tr><td>VI</td><td colspan="2">Implementation of RNN DL Model</td><td>2</td></tr>
<tr><td>VII</td><td colspan="2">Implementing of CNN DL Model</td><td>2</td></tr>
<tr><td>VIII</td><td colspan="2">Project:-Linear Regression - Predict Price of the House</td><td>2</td></tr>
<tr><td>IX</td><td colspan="2">Project:-Classification – Predict survival from a Ship Passengers</td><td>2</td></tr>
<tr><td colspan="4">Reference / Text Books:
Text books:
1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Python Deep Learning by Daniel Slater.
Reference Books:
1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.</td></tr>
</table>

BOS

3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Practical Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

CO1.Students will be able to identify the deep learning algorithms which are more appropriate for various types of problems or learning tasks in various domains.

CO2.Students will be able to Implement deep learning algorithms and solve real-world problems.

CO3.This will help students in developing skills required to gain experience of doing independent research and study in the field of AI.

CO4.Students will be able to build, train and apply CNN or RNN and fully connected deep neural networks

CO5.Student will be able to implementation of RNN DL Model

CO6.Student will be able to Implementing of CNN DL Model

IIMTU-NEP IMPLEMENTATION
Year III/ Semester V

<table>
<tr><td colspan="2">Programme: UG
Class:B.Tech-CSE(AIML)</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td>Credits
Theory: 0
Practical: 2</td><td colspan="3">Subject: Design Analysis and Algorithm lab</td></tr>
<tr><td>Course Code:
SECS-351P</td><td colspan="3">Title: Design Analysis and Algorithm lab</td></tr>
<tr><td colspan="4">Course Objectives:
1. The principle objective of this course is to build solid foundation in algorithms and their applications.
2. To implement various divide and conquer techniques examples.
3. To implement various Greedy techniques examples.
4. To implement various Dynamic Programming techniques examples.
5. To provide a practical exposure of all algorithms.
6. To understand the importance of algorithm and its complexities</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 50% Marks/2</td></tr>
<tr><td colspan="4">L:0 T:0 P:3(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Write a program to perform operation count for a given pseudo code</td><td>2</td></tr>
<tr><td>II</td><td colspan="2">Write a program to perform Bubble sort for any given list of numbers.</td><td>2</td></tr>
<tr><td>III</td><td colspan="2">Write a program to perform Insertion sort for any given list of numbers.</td><td>2</td></tr>
<tr><td>IV</td><td colspan="2">Write a program to perform Quick Sort for the given list of integer values.</td><td>2</td></tr>
<tr><td>V</td><td colspan="2">Write a program to find Maximum and Minimum of the given set of integer values.</td><td>2</td></tr>
<tr><td>VI</td><td colspan="2">Write a Program to perform Merge Sort on the given two lists of integer values.</td><td>2</td></tr>
<tr><td>VII</td><td colspan="2">Write a Program to perform Binary Search for a given set of integer values recursively and nonrecursively.</td><td>2</td></tr>
<tr><td>VIII</td><td colspan="2">Write a program to find solution for knapsack problem using greedy method.</td><td>2</td></tr>
<tr><td>IX</td><td colspan="2">Write a program to find minimum cost spanning tree using Prim's Algorithm.</td><td>2</td></tr>
<tr><td>X</td><td colspan="2">Write a program to find minimum cost spanning tree using Kruskal's Algorithm</td><td>2</td></tr>
</table>

Reference / Text Books: 1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India. 2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms".	
If the course is available as Generic Elective then the students of following departments may opt it. 1.NA	
Evaluation/Assessment Methodology	
	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Course Learning Outcomes: Student will be able to : CO1.To learn the importance of designing an algorithm in an effective way by considering space and time complexity CO2.To learn divide and conquer strategy based algorithms CO3.To learn greedy method based algorithms CO4.To learn the dynamic programming design techniques CO5.To develop Recursive backtracking algorithms CO6.To learn graph search and network flow algorithms	

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

<table>
<tr><td colspan="2">Programme: UG(R)
Class:B.Tech (CSE-AIML)</td><td colspan="2">Year: III
Semester: VI</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:2</td><td colspan="2">Subject: Data Science - Tools and Techniques</td></tr>
<tr><td colspan="2">Course Code: SEAIML-361</td><td colspan="2">Title: Data Science - Tools and Techniques</td></tr>
<tr><td colspan="4">Course Objectives: The student learns the architecture of HDFS and Map Reduce along with other tools such as pig, hive, spark, Zookeeper, HBase.</td></tr>
<tr><td colspan="4">Nature of Paper: Core Paper</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="4">L:3 T:1 P:0 (In Hours/Week)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Big Data fundamentals: Fundamentals of Big Data, defining big data, building successful big data management architecture, big data journey
Big Data Types and structured: Structured and unstructured data types, real time and non-real time requirements</td><td>8</td></tr>
<tr><td>II</td><td colspan="2">Distributed Computing Basics: History of distributed computing, basics of distributed computing
Big Data Technology Foundation and infrastructure: Big Data stack, redundant physical infrastructure, security infrastructure, operational databases, organising data services and tools, analytical data warehouse, big data analytics
Virtualization: Basics of virtualization, hypervisor, abstraction and virtualization, implementing virtualization with big data Cloud and Big Data: Defining cloud, cloud deployment and delivery models, cloud as an imperative for big data, use the cloud for big data</td><td>8</td></tr>
<tr><td>III</td><td colspan="2">Operational Databases: Relational database, nonrelational database, key-value pair databases, document databases, columnar databases, graph databases, spatial databases.
MapReduce Fundamentals: Origin of MapReduce, map function, reduce function, putting map and reduce together, optimizing map reduce
Hadoop map reduce: Discovering Hadoop, Hadoop distributed file system, Hadoop MapReduce, Hadoop file system, dataflow, Hadoop I/O, data integrity, compression, serialization, file-based data structure</td><td>8</td></tr>
<tr><td>IV</td><td colspan="2">Avro: Avro data types and schemas, in-memory serialization and de-serialization, avro data files, schema resolution
Pig: Comparison with databases, pig latin, user defined functions, data processing Operators</td><td>8</td></tr>
<tr><td>V</td><td colspan="2">Hive: Running hive, comparison with traditional databases, HiveQL, tables, querying data, user- defined functions.
Spark: Resilient distributed datasets, shared variables, anatomy of a spark</td><td>8</td></tr>
</table>

	job run, executors and cluster managers. **HBase:** HBasics, concepts, clients, HBase vs RDBMS, Praxis **ZooKeeper:** ZooKeeper services, building application with ZooKeeper	

Reference / Text Books:

1. Hadoop: The Definitive Guide, 4th Edition by Tom White - Shroff Publishers & Distributers Private Limited - Mumbai; Fourth edition (2015)
2. Big Data: Principles and Best Practices of Scalable Real-time Data Systems by James Warren and Nathan Marz, Manning Publications (2015)

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: Data Science - Tools and Techniques fundamentals

Course Learning Outcomes:

After completing the course, students should be able to:

On completion of this course, the student will be able to

CO1.Explain the concept of Big Data, its structures and its types.

CO2.Explain the concepts of distributed computing, big data and cloud data virtualization.

CO3.Explain the concept of MapReduce and Hadoop map reduce.

CO4.To find solution of big data problems using Big data tools such as Pig and avro.

CO5.Learn Big data tools such as hive.

CO6.Learn Big data tools such as Zookeeper and HBase.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG(R) **Class:B.Tech (CSE-AIML)**	Year: III Semester: VI
Credits Theory:4 Practical:	**Subject:** Natural Language Processing
Course Code: SEAIML-362	**Title:** Natural Language Processing

Course Objectives: The ultimate objective of NLP is to read, decipher, understand, and make sense of the human languages in a manner that is valuable.

Nature of Paper: CORE Paper

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0 (In Hours/Week)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to NLP Language:** Natural Language Processing in real world, What is language, Approached to NLP. **Build NLP model:** Eights Steps for building NLP Model, Web Scrapping	**8**
II	**Text Representation:** Basic Vectorization, One-Hot Encoding, Bag of Words, Bag of N Grams, TF-IDF, Pertained Word Embedding, Custom Word Embeddings, Vector Representations via averaging, Doc2Vec Model,Visualizing Embeddings using TSNW and Tensorboard.	**8**
III	**Text Classification and SVM:** Application of Text Classification, Steps for building text classification system, Text classification using Naïve Bayes Classifier, Logistic Regression, and Support Vector Machine, Neural embedding for Text Classification, text classification using deep learning, interpret text classification model.	**8**
IV	**Information Extraction Entity:** Applications of Information Extraction, Processes for Information Extraction. Key phrase Extraction, Named Entity Recognition, Disambiguation and linking of named entity, Relationship extraction **Chatbot:** Real life applications of chatbot, Chatbot Taxonomy, Dialog Systems, Process of building a dialog, Components of Dialog System, End to End Approach, Rasa NLU,	**8**
V	**NLP for social media:** Application of NLP in social media, challenges with social media, Natural Language Processing for Social Data, Understanding Twitter Sentiments, Identifying memes and Fake News **NLP for E-Commerce**: E-commerce catalog, Search in E-Commerce, How to build an e-commerce catalog, Review and Sentiment Analysis, Recommendations for E-Commerce.	**8**

Reference / Text Books:

1. Natural Language Processing with Python by Steven Bird, Ewan Klein and Edward Loper.
2. Foundations of Statistical Natural Language Processing by Christopher Manning and Hinrich Schütze.

BOS

Evaluation/Assessment Methodology	
	Max. Marks:100
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	50 100
Total:	150
Prerequisites for the course: Natural Language Processing basics.	

Course Learning Outcomes:
After completing the course, students should be able to:
CO1.Define NLP, to resolve ambiguity in language and can build NLP models.
CO2.To represents the text in different models.
CO3.Classify the text using support vector machine.
CO4.Extract information using different methods.
CO5.Develop chatbot applications.
CO6.Use NLP in e-commerce and social media.

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme:UG(R) **Class:B.Tech (CSE-AIML)**	Year: III Semester:VI
Credits Theory:4 Practical:0	**Subject: Computer Networks**
Course Code: SDAIML-361	**Title: Computer Networks**

Course Objectives:
The Student will Learn:

- To explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission, Vulnerabilities in any computing system and security solution.
- To apply channel allocation, framing, error and flow control techniques.
- To describe the functions of Network Layer i.e. Logical addressing, sub netting & Routing Mechanism.
- To explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.
- To explain the functions offered by session and presentation layer and their Implementation.
- To explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN.

Nature of Paper: Department Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introductory Concepts**: Goals, applications and categories of networks, Internet Organization, ISP, Network structure and architecture (layering principles, services, protocols and standards), Overview of OSI reference model, Overview of TCP/IP protocol suite, Network devices and components. **Physical Layer:** Network topology design, Types of connections, Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	**8L**
II	**Link layer:** Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges (learning bridge and spanning tree algorithms).	**8L**
III	**Network Layer:** Point-to-point networks, Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic	**8L**

	routing,Routing algorithms and protocols, Congestion control algorithms, IPv6.	
IV	**Transport Layer:** Process-to-process delivery, Transport layer protocols (UDP and TCP), Multiplexing, Connection management, Flow control and retransmission, Window management,TCP Congestion control, Quality of service.	**8L**
V	**Application Layer:** DNS, WWW and HTTP,Electronic mail, FTP, Remote login, Network management, Data compression, Cryptography – basic concepts.	**8L**

Reference / Text Books:

1.Behrouz Forouzan, “Data Communication and Networking”, McGraw Hill
2. Andrew Tanenbaum “Computer Networks”, Prentice Hall.
3.William Stallings, “Data and Computer Communication”, Pearson
4. Kurose and Ross, “Computer Networking- A Top-Down Approach”, Pearson.
5. Peterson and Davie, “Computer Networks: A Systems Approach”, Morgan Kaufmann

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: NIL

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission
CO2.Apply channel allocation, framing, error and flow control techniques.
CO3.Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism.
CO4.Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.
CO5.Explain the functions offered by session and presentation layer and their Implementation.
CO6.Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme:UG(R) **Class:B.Tech (CSE-AIML)**	Year: III Semester:VI
Credits Theory:4 Practical:0	**Subject: Compiler Design**
Course Code: SDAIML-362	**Title: Compiler Design**

Course Objectives:
The Student will Learn:

- To understand the concept of phases and passes of compiler and its tools like LEX and YAAC.
- To acquaint with knowledge of various parsers and parsing techniques.
- To analyze and implement compiler by Syntax-directed Translation schemes.
- To understand the concept of symbol table and error detection and recovery mechanism.
- To understand the concept of code generation and code optimization.

Nature of Paper: Department Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Compiler:** Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**8L**
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	**8L**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements	**8L**

BOS

IV	**Symbol Tables:** Data structure for symbols tables, representing scope information. **Run-Time Administration:** Implementation of simple stack allocation scheme, storage allocation in block structured language. **Error Detection & Recovery:** Lexical Phase errors, syntactic phase errors semantic errors.	**8L**
V	**Code Generation**: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. **Code optimization:** Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**8L**

Reference / Text Books:

1. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.
3. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
5. V Raghvan, " Principles of Compiler Design", TMH
6. Kenneth Louden," Compiler Construction", Cengage Learning.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: Theory of Formal Languages and Automata

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.To explains the different phases and passes of compiler and eventually recognize patterns, tokens and regular expressions.
CO2.To implement the concept of parsers and construct the parsing tables
CO3.To illustrate and create the intermediate code
CO4.To analyze and implement compiler by Syntax-directed Translation schemes.
CO5.To summarize the knowledge of various parsers and parsing techniques.
CO6.To intregate the concept of code generation and code optimization.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG(R) **Class: B.Tech (CSE-AIML)**	Year: III Semester: VI
Credits Theory:4 Practical:0	**Subject:** Human Computer Interface
Course Code: SDAIML-363	**Title:** Human Computer Interface

Course Objectives:
The Student will Learn:
1. To introduce the concept of user interface and graphical user interface.
2. To acquaint the concept of design process.
3. To understand the concepts of screen designing.
4. To introduce the concept of windows and multimedia.
5. To understand the applications of software tools and interaction tools.

Nature of Paper: Department Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Importance of user Interface its definition, importance and benefits of good design, Overview history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	**8L**
II	Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing: Design goals of screen designing.	**8L**
III	Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	**8L**
IV	Windows: New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors	**8L**
V	Software tools: Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image	**8L**

	and video displays – drivers.	

Reference / Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.
3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: Nil

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Understanding user interface good design.
CO2.Analyzing the design process and understanding human interaction with computers.
CO3.Analyzing the screen design process and understanding human interaction with computers.
CO4.Understand the technological consideration in interface design.
CO5.Understanding windows, components and multimedia.
CO6.Understanding software tools and interaction devices.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG(R) **Class: B.Tech (CSE-AIML)**	Year: III Semester: VI
Credits Theory:4 Practical:0	**Subject: BIG DATA**
Course Code: SDAIML-364	**Title: BIG DATA**

Course Objectives:
The Student will Learn:

- To demonstrate knowledge of Big Data Analytics concepts and its applications in business.
- To demonstrate functions and components of Map Reduce Framework and HDFS.
- To discuss Data Management concepts in NoSQL environment.
- To explain process of developing Map Reduce based distributed processing applications.
- To explain process of developing applications using HBASE, Hive, Pig etc.
- To demonstrate knowledge of Big Data Analytics concepts and its applications in business.

Nature of Paper: Department Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Big Data**: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.	**8L**
II	**Hadoop:** History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. **Map Reduce:** Map Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce	**8L**
III	**HDFS (Hadoop Distributed File System):** Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop	**8L**

	archives, Hadoop I/O: compression, serialization, Avro and file-based data structures. **Hadoop Environment:** Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud	
IV	**Hadoop Eco System and YARN**: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features - NameNode high availability, HDFS federation,MRv2, YARN, Running MRv1 in YARN. **NoSQL Databases:** Introduction to NoSQL **MongoDB:** Introduction, data types, creating, updating and deleting documents, querying,introduction to indexing, capped collections **Spark:** Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN **SCALA:** Introduction, classes and objects, basic types and operators, built-in controlstructures, functions and closures, inheritance.	**8L**
V	**Hadoop Eco System Frameworks**: Applications on Big Data using Pig, Hive and HBase **Pig** - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, **Hive** - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries. **HBase** – Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL.	**8L**

Reference / Text Books:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging BusinessIntelligence and Analytic Trends for Today's Businesses", Wiley
2. Big-Data Black Book, DT Editorial Services, Wiley
3. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch,“Understanding Big Data Analytics forEnterprise Class Hadoop and Streaming Data”, McGrawHill.
4. Thomas Erl, Wajid Khattak, Paul Buhler, “Big Data Fundamentals: Concepts, Drivers and Techniques”, PrenticeHall.
5. Bart Baesens “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEYBig Data Series)”, John Wiley & Sons
6. ArshdeepBahga, Vijay Madisetti, “Big Data Science & Analytics: A HandsOn Approach “, VPT

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150
Prerequisites for the course: DBMS	

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Demonstrate knowledge of Big Data Analytics concepts and its applications in business.
CO2.Demonstrate functions and components of Map Reduce Framework and HDFS
CO3.Discuss Data Management concepts in NoSQL environment.
CO4.Explain process of developing Map Reduce based distributed processing applications.
CO5.Explain process of developing applications using HBASE, Hive, Pig etc.
CO6.Explain demonstrate knowledge of Big Data Analytics concepts and its applications in business.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme:UG(R) **Class:B.Tech (CSE-AIML)**	Year: III Semester:VI
Credits Theory:3 Practical: 0	**Subject: Universal Human Values & Professional Ethics**
Course Code: UVE-601	**Title: Universal Human Values & Professional Ethics**

Course Objectives:
The Student will Learn:

1. To reinstate the rich cultural legacy and human values of which we are thecustodians.
2. To focus on professional ethics which are broader indicators of desirable actions vis-à-vis undesirable actions.
3. To lay down broader guidelines of values and ethics for internal and externalstakeholders.
4. To suggest operational guidelines for value-based and ethical practices in the higher educational institutions leading to implementation and monitoring.
5. To indicate the outcomes of creating a value-based and ethical culture inHEIs.
6. To suggest indicative reinforcement programm for nurturing humanvalues and ethics in HEIs.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/3

L:3 T:0 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Unit	Contents	No. of Lectures Allotted
I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:**Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	**8L**
II	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in	**8L**

	detail, Programs to ensure Sanyam and Swasthya.	
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!. Universal Human Values of truth (Satya), nonviolence, love (Prem), Peace (Shanti) and righteous conduct (dharma).	**8L**
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	**8L**
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definiteness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations. **Workshop on Life Skills**	**8L**

Reference / Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, a Foundation Course in Human Values and Professional Ethics.
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
6. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	10 05 35
Total:	50
Prerequisites for the course: NIL	
Course Learning Outcomes: **After completing the course, students should be able to:** CO1.Explain learning process for holistic development CO2.Define Impeccable governance CO3.Explain Effective institutional management CO4.Use Well laid system of rewards and chastisement CO5.Analyse Institutional climate where 'rights' enjoy and 'wrongs' are discouraged. CO6.Development of Humanistic, Ethical, Constitutional and Universal Human Values.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year III/ Semester VI

Programme: UG(R) **Class: B. Tech (CSE-AIML)**		Year: III Semester: VI	
Credits Theory: 0 Practical:4	**Subject:** Data Science Tools and Techniques Lab		
Course Code: SEAIML-361P	**Title:** Data Science Tools and Techniques Lab		
Nature of Paper: Engineering Courses (Core)			
Minimum Passing Marks/Credits: 50% Marks/4			
L:0 T:0 P:4 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)			

Practical No.	Name of the Practical	No. of Lectures Allotted for practical
I	Installation of Hadoop	**2**
II	Work with Mango DB, Get / Post method in Mango DB	**2**
III	Implement various graphs on different data using matplotlib & Seaborn.	**2**
IV	understand Hadoop I/O	**2**
V	Understand map reduce Fundamentals, putting map reduce together, optimization in map reduce.	**2**
VI	Use big data tools pig, spark, hive, zookeeper, Hbase	**2**
VII	Understand dataflow in Hadoop	**2**
VIII	Load balancing in Hadoop.	**2**
IX	Manage security credential, compression, serialization in Hadoop.	**2**

Reference / Text Books:

1. J. Janssens, Data science at the command line, First edition. Sebastopol, CA: O'Reilly, 2014.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course: NA

Course Learning Outcomes: **After completing the course, students should be able** CO1.To understand the various concepts in Data Science process. CO2.To study the applications of Data Science. CO3.To learn to setup the data science tools environment and implement in Python and R. CO4.To learn to write programs in Python and R for data science projects. CO5.To know the process of data visualization. CO6.Data manipulation w.r.to data science.

Format-3

IIMTU-NEP IMPLEMENTATION
Year III /Semester VI

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: III Semester: VI	
Credits Theory: 0 Practical:4	**Subject:** Natural Language Processing Lab	
Course Code: SEAIML-362 P	**Title:** Natural Language Processing Lab	
Nature of Paper: Engineering Courses (Core)		
Minimum Passing Marks/Credits: 50% Marks/4		
L:0 T:0 P:4 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)		
Practical No.	**Name of the Practical**	**No. of Lectures Allotted for practical**
I	NLP Implementation	**2**
II	Use open source NLP library (NLTK)	**2**
III	Tokenization	**2**
IV	Statical word frequency – text processing , use python NLTK library to count the frequency distribution of the token	**2**
V	Word analysis and word generation	**2**
VI	Morphology	**2**
VII	N – grams and n-grams smoothing	**2**
VIII	POS tagging: hidden Markov model	**2**
IX	POS tagging: Viterbi decoding	**2**
X	Chunking , building chunker	**2**
Reference / Text Books:		
1. NA		
Evaluation/Assessment Methodology		
		Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30	
Total:	50	
Prerequisites for the course: NA		

Course Learning Outcomes:
After completing the course, students should be able to
CO1.Understand the Introduction to Natural Language Toolkit (NLTK).
CO2.Understand Python quick overview.
CO3.Apply Lexical analysis: Word and text tokenizer.
CO4.Apply n-gram and collocations.
CO5.Understand NLTK corpora.
CO6.Apply Naive Bayes classifier with NLTK.

Format-3

IIMTU-NEP IMPLEMENTATION
Year IV /Semester VII

Programme: UG(R) **Class: B. Tech (CSE-AIML)**	Year: IV Semester: VII
Credits Theory: 0 Practical:2	**Subject:** Data Visualization Lab
Course Code: **SEAIML-471P**	**Title:** Data Visualization Lab

Course Objectives:

- Student will be able to develop proficiency in using data visualization tools, such as Tableau, Power BI, or other software, to create charts, graphs, and other visualizations.
- Student will be able to gain an understanding of best practices in data visualization, including the principles of good design, effective use of color, and appropriate choice of chart types.
- Student will be able to analyze and interpret data using visualizations, and identify patterns, trends, and relationships within the data.
- Student will be able to develop proficiency in using various chart types, such as bar charts, line charts, scatter plots, heat maps, and tree maps, to visualize different types of data and relationships.

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 50% Marks/4

L:0 T:0 P:4 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical No.	**Name of the Practical**	**No. of Lectures Allotted for practical**
I	Create a scatter plot in Excel using a data set of your choice, and adjust the chart's axis labels, titles, and colors.	
II	Use Tableau to create a bar chart that compares sales by product category for a given time period, and apply filters to show sales by region or other variables.	
III	Create a bubble chart in Power BI that visualizes the relationship between three variables, such as sales, profit, and customer satisfaction.	
IV	Create a line chart that shows changes in temperature over time, and add markers to highlight extreme temperatures or other events.	
V	Create a heat map in Tableau that shows the distribution of crime incidents by neighborhood, and use color to indicate the severity of the incidents.	
VI	Use Power BI to create a tree map that visualizes the distribution of sales by product category and sub-category, and use tooltips to show additional details.	
VII	Create a scatter plot matrix that visualizes the pairwise relationships between multiple variables in a data set.	

VIII	Use Tableau to create a stacked bar chart that shows the breakdown of sales by product category and sub-category, and apply filters to show sales by region or other variables.	
IX	Create a funnel chart in Power BI that shows the conversion rates at various stages of a sales funnel, and use annotations to highlight key points.	
X	Create a Pareto chart that shows the relative frequency and cumulative percentage of defects or other quality metrics in a process	

Learning Outcomes:
After completion of the course students would be able to :
CO1.Build data models and manage and manipulate data to extract useful information and insights
CO2.Apply functions to manipulate and analyze data
CO3.Discover customer preference, purchasing habits, and other behaviors
CO4.Analyze internal and external factors by understanding "Mind and Market Factors" component of MIMI
CO5.Make use of Tableau software for data visualization

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester: VIII

Programme: Under Graduate **Class: B-Tech (CSE-AIML)**	Year: IV Semester: VIII	
Credits Theory: 4 Practical: 0	**Subject: Mobile Computing**	
Course Code: SDAIML-481	**Title: Mobile Computing**	

Course Objectives:

1. Students will be able to explain and discuss issues in mobile computing and illustrate overview of wireless telephony and channel allocation in cellular systems.
2. Students will be able to explore the concept of Wireless Networking and Wireless LAN.
3. Students will be able to analyze and comprehend Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and Disconnected operations.
4. Students will be able to Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment.
5. Students will be able to compare and contrast various routing protocols and will identify and interpret the performance of network systems using Adhoc networks.

Nature of Paper: Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3 T: 1 P: 0 (In Hours/Week)
Theory – 3, Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Introduction and issues in mobile computing, Details of wireless telephony: details of cellular concept, GSM details, air-interface in GSM, channel structure in GSM, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, Review of CDMA and GPRS.	10
II	Overview of wireless networking, Overview of wireless LAN: Medium access control issues, Overview of IEEE802.11, Overview of Bluetooth technology, Overview of wireless multiple access protocols, Comparison of Transmission control protocol over wireless transmission control protocol, Explanation of wireless applications, data broadcasting, Overview of Mobile IP. WAP: Architecture, protocol stack, application environment and applications.	10
III	Discussion of data management issues, Overview of data replication for mobile computers, Overview of adaptive clustering for mobile wireless networks: File system and Disconnected operations.	10
IV	Concept of mobile agents, Concept of security and fault tolerance and overview of transaction processing in mobile computing environment.	10
V	AdHoc networks: Issues of localization, overview of medium access control issues, discussion of Routing protocols, Understanding global state routing(GSR),Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing(AODV),	10

	Temporary ordered routing algorithm(TORA), Explanation of quality of service in Ad-hoc networks, applications.	

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Assignments	20
3) External Theory	100
Total:	150

Course Learning Outcomes: Student will be able to

CO1.Discuss the issues in mobile computing and overview of wireless telephony and allocation of channel in cellular networks.
CO2.Walkthrough through the concept of Wireless Networking and Wireless local area networks.
CO3.Learn Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and disconnected operations, analysis and comprehension.
CO4.Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment.
CO5.Compare and contrast various routing protocols and will identify and interpret the performance of network systems using Ad-hoc networks.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV/ Semester: VIII

Programme: UG(R) **Class: B-Tech (CSE-AIML)**	Year: IV Semester: VIII
Credits Theory: 4 Practical: 0	**Subject: INTERNET OF THINGS**
Course Code: SDAIML-482	**Title: INTERNET OF THINGS**

Course Objectives:
1. Vision and introduction to IOT.
2. Understand IOT market perspective.
3. Data and knowledge management and use of devices in IOT technology.
4. Understand the State of the art-IOT Architecture.
5. Understand real world IoT design, constraints, IoT Automation and Comeercial building automation in IoT.

Nature of Paper: Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3, T: 1,P: 0 (In Hours/Week)
Theory – 3, Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Internet of Things (IoT): Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, IoT sources, M2M Communication, Examples of IoT. Design Principles for Connected Devices: IoT/M2M systems layers, design standardization, communication technologies, data enrichment, consolidation, ease of designing, affordability.	10
II	Wireless Medium access issues, medium access protocol survey, Survey routing protocols, Sensor deployment, Node discovery, Data aggregation & dissemination.	10
III	Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, IoT programming using Arduino.	10
IV	Development Challenges, Security Challenges, Other challenges in IoT Applications: Overview of Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city using IoT.	10

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) External Theory	30 20 100
Total:	150

Course Learning Outcomes: Student will be able to

CO1.Demonstrate basic concepts of IoT, and understand the principles and challenges in IoT implementation.
CO2.Understand the functioning of hardware devices and sensors used in IoT.
CO3.Network communication aspects and protocols used in IoT are part of analysis.
CO4.Apply IoT for developing real life applications using Ardunio programming.
CO5.Development of IoT infrastructure for popular applications.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV/Semester: VIII

<table>
<tr><td colspan="2">Programme: UG (R)
Class: B-Tech (CSE-AIML)</td><td colspan="2">Year: IV
Semester: VIII</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td colspan="2">Subject: CLOUD COMPUTING</td></tr>
<tr><td colspan="2">Course Code: SDAIML-483</td><td colspan="2">Title: CLOUD COMPUTING</td></tr>
<tr><td colspan="4">Course Objectives:</td></tr>
<tr><td colspan="4">1. Understand the basic principles of cloud computing.
2. To study the basic technologies that forms the foundations of Big Data.
3. To study the programming aspects of cloud computing with a view to rapid prototyping of complex applications.
4. To understand the specialized aspects of big data including big data application, and big data analytics.
5. To study different types Case studies on the current research and applications of the Hadoop and big data in industry</td></tr>
<tr><td colspan="4">Nature of Paper: Elective</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks/3</td></tr>
<tr><td colspan="4">L: 3, T: 1,P: 0 (In Hours/Week)
Theory – 3,Practical- 0</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Overview of Cloud Computing, history, definition and evolution, Underlying concept of Parallel and Distributed computing, Cloud Architecture, and its types. Business models built around cloud technology, Case studies of major players in Cloud Computing. Discussion of issues in Clouds, Eucalyptus, Nimbus, Open Nebula, and CloudSim.</td><td>10</td></tr>
<tr><td>II</td><td colspan="2">Overview of Cloud Services, Software as a Service Platform, Infrastructure as a Service, Database as a Service, Monitoring as a Service, communication as services. Discussion of service providers such as Google, Amazon, Microsoft Azure, IBM, Sales force.</td><td>10</td></tr>
<tr><td>III</td><td colspan="2">Collaborating Using Cloud Services such as Email Communication over the Cloud, Project Management, Calendar, Schedules, Word Processing, Presentation, Spreadsheet, Databases, Desktop, Social Networks, customer relationship management and Groupware.</td><td>10</td></tr>
<tr><td>IV</td><td colspan="2">Virtualization, Need, Pros and cons, Types of Virtualization in cloud, System and Process VM, Virtual Machine monitor, machine, Interpretation and binary translation, Overview of HLL VM supervisors, Xen, KVM, VMware, Virtual Box, Hyper-V.</td><td>10</td></tr>
</table>

V	Security in Clouds and challenges, Software as a Service Security, Overview of Common Standards in cloud i.e The Open Cloud Consortium ,The Distributed management Task Force , Standards for application Developers, Standards for Messaging, Standards for Security, End user access to cloud computing, Discussion on Mobile Internet devices and the cloud. Overview of Hadoop, MapReduce, Virtual Box.Discussion on Google App Engine and Programming Environment for Google App Engine	10

Reference/ Text Book:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Assignments	20
3) External Theory	100
Total:	150

Course Learning Outcomes:

CO1.Student must be able to understand the building blocks of Big Data
CO2.Student must be able to articulate the programming aspects of cloud computing(map Reduce etc)
CO3.Student must be able to understand the specialized aspects of big data with the help of different big data applications
CO4.Student must be able to represent the analytical aspects of Big Data
CO5.Student must be know the recent research trends related to Hadoop File System, MapReduce and Google File System etc
CO6.Student must be able to understand the Security in Clouds and challenges.

IIMTU-NEP IMPLEMENTATION
Year: IV /Semester: VIII

Programme: UG (R) **Class: B.Tech (CSE-AIML)**	Year: IV Semester: VIII	
Credits Theory: 4 Practical: 0	**Subject: Blockchain Architecture Design**	
Course Code: **SDAIML-484**	**Title: Blockchain Architecture Design**	
Course Objectives:		
1. Understanding the core concepts of Blockchain in details. 2. Impart strong technical understanding of consensus protocols. 3. Develop familiarity of current technologies, tools, and implementation strategies of blockchain 4. Understand use of Hyperledger fabric tool and its implementation. 5. Introduce application areas, current practices, and research activity		
Nature of Paper: Elective		
Minimum Passing Marks/Credits: 40% Marks/4		
L: 3,T:1,P:0(Hours/Week) Theory – 3, Practical- 0		
Unit	**Contents**	**No. of Lectures Allotted**
I	Overview of block chain, Journey of Digital Money to Distributed Ledgers, Design parameters: Protocols, Security, Consensus, Permissions, Privacy. Architecture and Design of Block chain: Discussion on crypto primitives: Signature and Hash, Journey of Hash chain to Blockchain, Primitive consensus mechanisms.	10
II	Consensus protocol requirements, Proof of Work, Scalability aspects of Blockchain consensus protocols, Permissioned Blockchains Consensus protocols and their design goals.	10
III	Overview of Hyperledger Fabric and their components, Decomposing the consensus process , Chain code Design and Implementation Hyperledger Fabric, Beyond Chain code fabric SDK and Front End and working of Hyperledger composer tool.	10
IV	Case study of Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance. Case study of Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc	10
V	Case Study of Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain	10
Reference/ Text Book: 1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos.		

2. Blockchain by Melanie Swa, O'Reilly. 3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric.	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) External Theory	30 20 100
Total:	150

Course Learning Outcomes: Student will be able to learn

CO1.Basic understanding of Blockchain architecture along with its primitive.

CO2.Requirements for basic protocol along with scalability aspects.

CO3.Design and deploy the consensus process using frontend and backend.

CO4.Application of Blockchain techniques for different cases like Finance, Trade/Supply and Government activities.

CO5.Design and deploy the consensus process using frontend and backend.

CO6.Apply Block chain techniques for different use cases like Finance, Trade/Supply and Government activities.

Evaluation Scheme

Bachelor of Technology (B.Tech.)
Civil Engineering 1st Semester

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-111	Engineering Mathematics-I	3	1	0	30	20	0	100	0	150	4
2	SEAS-113 / SEAS-112	Engineering Chemistry /Engineering Physics	3	1	0	30	20	0	100	0	150	4
3	SEEE-111 / SEEC-111	Basic Electrical Engineering / Fundamentals of Electronics Engineering	3	1	0	30	20	0	100	0	150	4
4	SECS-111 / SEME-111	Learning computers with thinking & Programming in C/ Concepts of Mechanical Engineering & Mechatronics	3	1	0	30	20	0	100	0	150	4
5	PCE-111/ SEHU-112	Professional Communication/ Environmental Studies	3	0	0	10	5	0	35	0	50	2
6	SEAS-113P / SEAS-112P	Engineering Chemistry (Lab)/Engineering Physics (Lab)	0	0	3	0	0	20	0	30	50	2
7	PCE-111P/ SEME-112P	Professional communication Lab/Workshop Lab	0	0	3	0	0	20	0	30	50	2
8	SECS-111P / SEME-111P	Learning computers with thinking & Programming in C Lab/Graphics Lab	0	0	3	0	0	20	0	30	50	2
9	SEEE-111P / SEEC-111P	Basic Electrical Engineering Lab/ Fundamentals of Electronics Engineering Lab	0	0	3	0	0	20	0	30	50	2
10	NECC -112*	University Social Responsibility - Community Outreach	0	0	0	0	0	25*	0	25*	0	NC*
11	SPT-111*	SPORTS	0	0	0	0	0	25*	0	25*	0	NC*
		Grand Total	**15**	**4**	**12**	**130**	**85**	**80**	**435**	**120**	**850**	**26**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-112 is Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Students need to qualify it but the marks will not be added in total marks. SPT-111 is also an audit qualifying course only.	
Applied Science Courses(Core)	Engineering Mathematics-I, Engineering Chemistry / Engineering Physics
Common Engineering Courses(Core)	Computer Basics & 'C' Programming, Engineering Graphics & Design(Lab)/ Workshop Practice (Lab)
Skill Enhancement Courses	University Social Responsibility.
Ability Enhancement Courses	Professional Communication

Bachelor of Technology (B.Tech.)
Civil Engineering 2nd Semester

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-121	Engineering Mathematics-II	3	1	0	30	20	0	100	0	150	4
2	SEAS-122 / SEAS-123	Engineering Physics / Engineering Chemistry	3	1	0	30	20	0	100	0	150	4
3	SEEC-121 / SEEE-121	Fundamentals of Electronics Engineering / Basic Electrical Engineering	3	1	0	30	20	0	100	0	150	4
4	SEME-121 / SECS-121	Concepts of Mechanical Engineering & Mechatronics / Computer Basics & 'C' Programming	3	1	0	30	20	0	100	0	150	4
5	SEHU-122/ PCE-121	Environmental Studies/ Professional Communication	3	0	0	10	5	0	35	0	50	2
6	SEAS-122P / SEAS-123P	Engineering Physics (Lab)/ Engineering Chemistry (Lab)	0	0	3	0	0	20	0	30	50	2
7	SEEC-121P / SEEE-121P	Fundamentals of Electronics Engineering Lab / Basic Electrical Engineering Lab	0	0	3	0	0	20	0	30	50	2
8	SEME-121P / SECS-121 P	Engineering Graphics & Design Lab / Computer Basics & 'C' Programming Lab	0	0	3	0	0	20	0	30	50	2
9	SEME-122P/ PCE-121P	Engineering Workshop Lab/ Professional Communication Lab	0	0	3	0	0	20	0	30	50	2
10	NECC -125	MOOCS (SWAYAM/NPTEL)	0	0	2	0	0	50	0	0	50	2
11	NECC-121*	Industrial Visit/Seminar on the report of visit	0	0	0	0	0	25*	0	0	0	NC*
12	NECC -122*	University Social Responsibility - Community Outreach	0	0	0	0	0	25*	0	0	0	NC*
13	SPT-121*	SPORTS	0	0	0	0	0	50*	0	0	0	NC*
		Grand Total	**14**	**4**	**14**	**130**	**85**	**130**	**435**	**120**	**900**	**28**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments,Tutorials), IP- Internal Practical, ET- External Theory, EP- External Practical, NC- Non Credit Course	
***Note:** NECC-121 &NECC-122 are Noncredit courses (Audit Courses) and will be evaluated on the basis of reportpresented by the student of his/her industrial visits and social visits respectively during the semester. Student need to Qualify it but the marks will not be added in total marks.SPT-121 is also an audit qualifying course only.	
Applied Science Courses(Core)	Engineering Mathematics-II, Engineering Physics/ Engineering Chemistry
Common Engineering Courses (Core)	Concepts and Programming in C ,Basic Electrical Engineering, Workshop Practice (Lab)/ Engineering Graphics & Design (Lab)
Skill Enhancement Courses	Industrial Visit/Seminar on the report of visit, University SocialResponsibility.

Most Important regarding Internship: A minimum of 4-5 weeks internship is too completed during summer break & its assessment will be done in 3rd Semester.

Bachelor of Technology (B.Tech.)
Civil Engineering 3rd Semester

S. No	SubjectCode	Subject Name	Evaluation Scheme									
			Periods			InternalMarks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-231/ SESB-231-9	Engineering Mathematics-III/ Engineering Science Electives**	3	1	0	30	20	0	100	0	150	4
2	SECE-231	Mechanics of Solids	3	1	0	30	20	0	100	0	150	4
3	SECE-232	Building Construction and MaintenanceEngineering	3	1	0	30	20	0	100	0	150	4
4	SECE-233	Surveying	3	1	0	30	20	0	100	0	150	4
5	STCS-239	Python Programming	3	0	0	10	5	0	35	0	50	2
6	SECE-232P	Building Construction and MaintenanceEngineering Lab	0	0	3	0	0	20	0	30	50	2
7	SECE-233P	Surveying Lab	0	0	3	0	0	20	0	30	50	2
8	SECE-231P	Mechanics of Solids Lab	0	0	3	0	0	20	0	30	50	2
9	*NECC-232	University Social Responsibility	0	0	0	0	0	25*	0	0	0	NC*
10	*SPT-231	SPORTS	0	0	0	0	0	50*	0	0	0	NC*
		Grand Total	**15**	**4**	**09**	**130**	**85**	**60**	**435**	**90**	**800**	**24**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-231 &NECC-232 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student needs to qualify it but the marks will not be added in total marks. *SPT-231 is also an audit qualifying course only.	
Applied Science Courses(Core)	Mathematics-III
Skill Enhancement Courses	Industrial Visit/Seminar on the report of visit, University Social Responsibility.

Bachelor of Technology (B.Tech.)
Civil Engineering 4th Semester

S. No	SubjectCode	Subject Name	Evaluation Scheme									
			Periods			InternalMarks			ExternalMarks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-241-9 / SEAS-241	Engineering Science Electives**/ Mathematics-III	3	1	0	30	20	0	100	0	150	4
2	SECE-241	Fluid Mechanics	3	1	0	30	20	0	100	0	150	4
3	SECE-242	Transportation Engineering andintroduction to ITS	3	1	0	30	20	0	100	0	150	4
4	SDCE-241 /SDCE-244	Discipline Specific Elective -I	3	1	0	30	20	0	100	0	150	4
5	GE-1	Generic Elective-i	4	0	0	30	20	0	100	0	150	4
6	SECE-243P	CAD Lab-I	0	0	3	0	0	20	0	30	50	2
7	SECE-241P	Fluid mechanics lab	0	0	3	0	0	20	0	30	50	2
8	SECE-242P	Transportation Engineering Lab	0	0	3	0	0	20	0	30	50	2
9	NECC-245	MOOC/ SWAYAM	0	0	2	0	0	50	0	0	50	2
10	NECC-241	Industrial Visit/ Seminar/Presentationon the report of visits	0	0	0	0	0	25*	0	0	0	NC
11	NECC-242	University Social Responsibility	0	0	0	0	0	25*	0	0	0	NC
12	*SPT-241	SPORTS	0	0	0	0	0	50*	0	0	0	NC
		Grand Total	**16**	**4**	**11**	**150**	**100**	**110**	**500**	**90**	**950**	**28**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-241 &NECC-242 are Non-credit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student needs to qualify it but the marks will not be added in total marks. *SPT-241 is also an audit qualifying course only.	
Skill Enhancement Courses	Industrial Visit/Seminar on the report of visit, University Social Responsibility,MOOCS(SWAYAM/NPTEL)

Note: Students will undergo summer training of 4-5 weeks after fourth semester

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters. The details are as below

Generic Elective-Student selects the Generic subject from other department

Departmental Specific Elective-I

SDCE-241 Water resource engineering
SDCE-242 Concrete technology
SDCE-243 Hydraulics and hydraulic machine
SDCE-244 Rural water supply and sanitation

****ENGINEERING SCIENCE ELECTIVES**
(Effective from session 2022-23)

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SESB-231/ SESB-241	Engineering Mechanics	3	1	0	30	20	0	100	0	150	4
2	SESB-232/ SESB-242	Material Science	3	1	0	30	20	0	100	0	150	4
3	SESB-233/ SESB-243	Energy Science & Engineering	3	1	0	30	20	0	100	0	150	4
4	SESB-234/ SESB-244	Sensor & Instrumentation	3	1	0	30	20	0	100	0	150	4
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	3	1	0	30	20	0	100	0	150	4
6	SESB-236/ SESB-246	Introduction to Soft Computing	3	1	0	30	20	0	100	0	150	4
7	SESB-237/ SESB-247	Analog Electronics Circuits	3	1	0	30	20	0	100	0	150	4
8	SESB-238/ SESB-248	Electronics Engineering	3	1	0	30	20	0	100	0	150	4
9	SESB-239/ SESB-249	Digital Electronics	3	1	0	30	20	0	100	0	150	4

S.No	Subject Code	Subject Name	Remark
1	SESB-231/ SESB-241	Engineering Mechanics	Subject can be offered to any branch except ME/ CE/ AG and allied branches
2	SESB-232/ SESB-242	Material Science	
3	SESB-233/ SESB-243	Energy Science & Engineering	Subject can be offered to any branch except EE and allied branches
4	SESB-234/ SESB-244	Sensor & Instrumentation	
5	SESB-235/ SESB-245	Basics Data Structure & Algorithms	Subject can be offered to any branch except CSE and allied branches
6	SESB-236/ SESB-246	Introduction to Soft Computing	
7	SESB-237/ SESB-247	Analog Electronics Circuits	Subject can be offered to any branch except EC and allied branches
8	SESB-238/ SESB-248	Electronics Engineering	
9	SESB-239/ SESB-249	Digital Electronics	Subject can be offered to any branch except EC/ EE and allied branches

Bachelor of Technology (B.Tech.)
Civil Engineering 5th Semester

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SECE-351	Geotechnical Engineering	3	1	0	30	20	0	100	0	150	4
2	SECE-352	Structural Analysis	3	1	0	30	20	0	100	0	150	4
3	SECE-353	Design of concrete structure-I	3	1	0	30	20	0	100	0	150	4
4	SDCE-351 /SDCE-354	Discipline Specific Elective –II	3	1	0	30	20	0	100	0	150	4
5	SECE-351P	Geotechnical Engineering Lab	0	0	3	0	0	20	0	30	50	2
6	SECE-352P	Structural Analysis Lab	0	0	3	0	0	20	0	30	50	2
7	SECE-353P	Building planning and drawing Lab	0	0	3	0	0	20	0	30	50	2
8	SECE-354P	Internship Assessments/Industrial Training	0	0	2	0	0	50	0	0	50	2
9	SECE-359P	Research Project-RP-I	0	0	2	0	0	50*	0	0	50*	NC*
10	NECC-353	University Social Responsibility	0	0	0	0	0	25*	0	0	25*	NC*
11	SPT-351	SPORTS	0	0	0	0	0	50*	0	0	50*	NC*
		Grand Total	**12**	**4**	**13**	**120**	**80**	**110**	**400**	**90**	**800**	**24**

2 Credit Minor certification paper-2(Not to be included in the credit list)	
L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
***Note**: NECC-352& SPT-351are Noncredit courses (Audit Courses) and will be evaluated on the basis of report Presented by the student of his/her industrial visits, social visits & sports activities respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Skill Enhancement Courses	University Social Responsibility, MOOCS(SWAYAM/NPTEL)

Note: Internship to be done of minimum 4 weeks after summer break will be counted in 7th semester

Department Specific Elective -II

SDCE -351 Urban Transportation Planning
SDCE -352 Pavement Design
SDCE -353 Hydrology
SDCE-354 Estimating and costing

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters. The details are as below

Bachelor of Technology (B.Tech.)
Civil Engineering 6th Semester

S.No.	Subject Code	Subject Name	Evaluation Scheme									
			Periods			InternalMarks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SECE-361	EnvironmentalEngineering	3	1	0	30	20	0	100	0	150	4
2	SECE-362	Design of ConcreteStructures-II	3	1	0	30	20	0	100	0	150	4
3	SDCE-361 /SDCE-364	Discipline SpecificElective -III	3	1	0	30	20	0	100	0	150	4
4	UVE-601	Universal Human Values & Professional Ethics	3	0	0	10	5	0	35	0	50	3
5	SECE-361P	Environmental Engineering Lab	0	0	3	0	0	20	0	30	50	2
6	SECE-363P	Mini project Lab	0	0	3	0	0	50	0	0	50	2
7	SECE-362P	Simulation Lab-I	0	0	3	0	0	20	0	30	50	2
8	SECE-369P	Research project-II	0	0	2	0	0	50*	0	0	50*	NC
9	NECC-365	MOOC/ SWAYAM	0	0	2	0	0	50	0	0	50	2
10	NECC-362	University SocialResponsibility	0	0	0	0	0	25*	0	0	25*	NC*
11	*SPT-361	SPORTS	0	0	0	0	0	50*	0	0	50*	NC*
		Grand Total	**12**	**3**	**13**	**100**	**65**	**140**	**335**	**60**	**700**	**23**

2 Credit Minor certification paper-3(Not to be included in the credit list)	
L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
***Note**: NECC-361, NECC-362& SPT-361are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits, social visits & sports activities respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Skill Enhancement Courses	Industrial Visit/Seminar on the report of visit,University Social Responsibility, Moocs(SWAYAM/NPTEL)

Generic Elective-II- Student selects the Generic subject from other department

Department SpecificElective –III

SDCE-361 Railway and tunnels

SDCE-362 Principle of town planning and architecture

SDCE-363Ground water management

SDCE-364 Foundation engineering

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 7^{th} Semester.

Bachelor of Technology (B.Tech.)
Civil Engineering 7th Semester

S. No	SubjectCode	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			ExternalMarks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SECE-471	Design of Steel Structures	3	1	0	30	20	0	100	0	150	4
2	GE-II	Generic elective(Theory)	3	1	0	30	20	0	100	0	150	4
3	NECC-475	MOOCS/Swayam	0	0	2	0	0	50	0	0	50	2
4	SECE-471P	Non-destructive testing Lab	0	0	3	0	0	20	0	30	50	2
5	SECE-472P	Minor Project	0	0	8	0	0	40	0	60	100	4
6	SECE-474P	Internship Assessments	0	0	2	0	0	50	0	0	50	2
7	NECC-472	University Social Responsibility	0	0	0	0	0	25*	0	0	25*	NC*
8	SPT-471	SPORTS	0	0	0	0	0	50*	0	0	50*	NC*
		Grand Total	**6**	**02**	**15**	**60**	**40**	**160**	**200**	**90**	**550**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

Bachelor of Technology (B.Tech.)
Civil Engineering 8th Semester

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	GE-3	Generic Elective-3	3	1	0	30	20	0	100	0	150	4
2	SDCE-481 /SDCE-484	Discipline Specific Elective –IV	3	1	0	30	20	0	100	0	150	4
3	SECE-481P	Major Project	0	0	20	0	0	100	0	150	250	10
		Grand Total	**06**	**2**	**20**	**60**	**40**	**100**	**200**	**150**	**550**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

Departmental Specific Elective-IV

SDCE-481 CPM & PERT
SDCE-482 Open Channel flow
SDCE-483 Pre-stressed concrete structures
SDCE-484 River engineering

Format-1

Format-1

CBCS: Statement of Credit distribution

College/School:School of Engineering & Technology Programme:B.Tech Duration: 8 Semester Annual/Semester: Semester	Credit range: 160-190 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr)	Ability Enhancement Compulsory Course (AECC)	Skill Enhancment Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	26	C-1 (4 Credit) C-2 (4 Credit)+P-01(2 Credit) C-3 (4 Credit)+P-02(2 Credit) C-4 (4 Credit)+P-03(2 Credit)	AECC-1(2) AECC-2(2)				
II	28	C-5 (4 Credit)+P-04(2 Credit) C-6 (4 Credit)+P-05(2 Credit) C-7 (4 Credit)+P-06(2 Credit) C-8 (4 Credit)+P-07(2 Credit)	AECC-3(2)	SEC-1(2)			
Provision to change the stream							
III	24	C-09 (4 Credit) C-10 (4 Credit)+P-08(2 Credit) C-11 (4 Credit)+P-09(2 Credit) C-12 (4 Credit)+P-10(2 Credit)		SEC-2(2)			
Provision to change the core papers							
IV	28	C-13 (4 Credit)+P-11(2 Credit) C-14 (4 Credit)+P-12(2 Credit) C-15 (4 Credit)+P-13(2 Credit)		SEC-3(2)	DSE-1(4)	**GE-1(4)**	
V	24	C-16 (4 Credit)+P-14(2 Credit) C-17 (4 Credit)+P-15(2 Credit) C-18 (4 Credit)+P-16(2 Credit)		SEC-4(2)	DSE-2(4)		RP-I (NC*)
VI	23	C-19 (4 Credit)+P-17(2 Credit) C-20 (4 Credit)+P-18(2 Credit)	AECC-4(3)	SEC-5(2) SEC-6(2)	DSE-3(4)		RP-II(NC*)
VII	18	C-21 (4 Credit)+P-19(2 Credit)		SEC-7(2) SEC-8(2)		**GE-2(4)**	Minor Project (4)
VIII	18				DSE-4(4)	**GE-3(4)**	Major Project (10)

Total Credits	**189**	21(Th)*4(Cr) = 84 19(Pr)*2(Cr) = 38 **Total = 122**	2*2 = 04 1*3 = 03 1*2 = 02 **= 09**	8*2 = 16 **= 16**	4*4 = 16 **=16**	3*4 = 12 **= 12**	4+10 **= 14**
***MOOCs certification Elective #Entreprenuership & Innovation core paper**							

Format-2

Format-2

IIMTU-NEP Implementation: (B.Tech Civil Engineering)

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES B.Tech. CE	**FIRST YEAR**	**SEMESTER -I**	i) C1 (Th.4 Cr.) ii) AECC-1 (Th.2 Cr + P 2 Cr.)	4 2 2	4 3 3	48 36 26	Engineering Mathematics –I Professional Communication Professional Communication Lab	5 5		
			i) C2(Th.4 Cr.+ P 2 Cr).	4 2	4 3	48 26	Engineering Chemistry Engineering Chemistry (Lab)	5		
			i) C3 (Th.4 Cr.+ P 2 Cr.)	4 2	4 3	48 36	Learning Computers with Thinking and Programming in C Learning Computers with Thinking and Programming in C lab	5		
			i) C4 (Th.4 Cr. .+ P 2Cr.)	4 2	4 3	48 36	Basic Electrical Engineering Basic Electrical Engineering Lab	5		
		SEMESTER - II	i) C5 (Th.4 Cr) ii) AECC-2 iii) SEC-1	4 2 2	4 3 2	48 36 24	Engineering Mathematics –II Environmental Studies MOOCS (Swayam/ NPTEL)	5 5		
			i) C6(Th.4Cr.+ P 2Cr.)	4 2	4 3	48 36	Engineering Physics Engineering Physics (Lab)	5		
			i) C7 (Th.4Cr.+ P 2Cr.)	4 2	4 3	48 36	Concepts of Mechanical Engineering & Mechatronics Engineering Graphics & Design Lab	5		
			i) C8 (Th.4Cr.+ P 2Cr.) ii) P 2 Cr.	4 2 2	4 3 3	48 36 36	Fundamentals of Electronics Engineering Fundamentals of Electronics Engineering (Lab) Engineering Workshop Lab	5		

Programme Outcome:
PO_1-PO_{12} [Annexture-1]

Programme Specific Outcome:
PSO_1-PSO_5 [Annexture-2]

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR	SEMESTER -III	i) C9 (Th. 4 Cr. + P 2Cr.)	4 2	4 3	48 36	Mechanics of Solids Mechanics of Solids Lab	5		
			ii) C10 (Th. 4 Cr. + P 2Cr.)	4 2	4 3	48 36	Building Construction and Maintenance Engineering Building Construction and Maintenance Engineering (Lab)	5		
			iii) C11 (Th. 4 Cr)	4	4	48	Engineering Mathematics-III	5		
			iv) C12 (Th. 3 Cr)+(P 2Cr.)	4 2	4 3	48 36	Surveying Surveying Lab	5		
			i) SEC-2 (Th. 2 Cr)	2	3	36	Python Programming	5		
		SEMESTER -IV	i) C13 (Th. 4 Cr.) ii) SEC-3 iii) DSE-1 iv) GE-1	4 2 4 4	4 2 4 4	48 24 48 48	Engineering Science Electives** (List is attached separately) MOOCS (SWAYAM/ NPTEL) Water resource engineering Concrete technology Hydraulics and hydraulic machine Rural water supply ***#To be opted from other department***	5 5		
			i) C14 (Th. 4 Cr. + P 2Cr.)	4 2	4 3	48 36	Fluid Mechanics Fluid Mechanics Lab	5		
			i) C15 (Th. 4 Cr+ P 1Cr.) ii) P 2 Cr.	4 2 2	4 3 3	48 36 36	Transportation Engineering and introduction to ITS Transportation Engineering and introduction to ITS Lab CAD Lab-I	5		

Programme Outcome:
PO_1-PO_{12} [Annexture-1]

Programme Specific Outcome:
PSO_1-PSO_5 [Annexture-2]

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	THIRD YEAR	SEMESTER - V	i) C16 (Th. 4 Cr. + P 2 Cr.) ii) SEC-4	4 2 2	4 3 2	48 36 24	Geotechnical Engineering Geotechnical Engineering Lab Internship*	5		
			iii) DSE-2	4	4	48	Urban Transportation Planning Pavement Design Hydrology Estimating and costing	5		
			i) C17 (Th. 4 Cr. + P 2 Cr.)	4 2	4 3	48 36	Structural Analysis Structural Analysis Lab	5		
			i) C18 (Th. 4 Cr.) ii) P 2 Cr.)	4 2	4 3	48 36	Design of concrete structure -I Building Planning and Drawing Lab	5		
		SEMESTER - VI	i) C19(Th. 4 Cr. + P 2Cr.) ii) SEC-5	4 2 2	4 3 2	48 36 24	Environmental Engineering Environmental Engineering Lab MOOCS (SWAYAM/ NPTEL)	5		
			iii) DSE-3	4	4	48	Railway and Tunnels Principle of Town Planning and Architecture Ground Water Management Foundation Engineering	5		
			i) C20 (Th. 4 Cr.) ii) P 2Cr.	4 2	4 3	48 36	Design of concrete structure –II Simulation Lab-I	5		
			i) AECC (Th. 3Cr) ii) SEC-6	3 2	3 3	36 36	Universal Human Values & Professional Ethics Mini project Lab	5		

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

Programme Outcome:

PO_1-PO_{12} [Annexture-1]

Programme Specific Outcome:

PSO_1-PSO_5 [Annexture-2]

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	FOURTH YEAR	SEMESTER - VII	i) C21 (Th. 4 Cr.)	4	4	48	Design of Steel Structure	5		
			ii) 2Cr.)	2	3	36	Non-Destructive Testing Lab			
			ii) SEC-7	2	2	24	MOOCS (SWAYAM/NPTEL)			
			iii) Project Lab (Minor)	4	8	96	Minor Project*			
			i) SEC-6	2	2	24	Internship			
			i) GE-2	4	4	48	***#To be opted from other department***			
		SEMESTER - VIII	i) Generic Elective-3 (Th. 4Cr)	4	4	48	***#To be opted from other department***			
			ii) DSE-4	4	4	48	CPM & PERT Open Channel Flow Pre-Stressed concrete Structure River Engineering			
			iii) Major Project	10	20	240	Major Project			

***Major Project report will be evaluated by external & internal examiners.**
*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

Programme Outcome:
PO_1-PO_{12} [Annexture-1]

Programme Specific Outcome:
PSO_1-PSO_5 [Annexture-2]

ANNEXTURE-1

Program Outcomes:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

ANNEXTURE-2

Program Specific Outcomes:

PSO_1- To develop the professional skills in the area of construction & management and structural engineering.

PSO_2-Analyze and design the various structural components by using codal provisions.

PSO_3-Analytical and ethical design skills among students to make the capable to started career as a good engineer.

PSO_4-To enhance the sustainable development in the word with their skills.

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I
Credits : Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-I
Course Code: SEAS-111	**Title: :** Engineering Mathematics-I

Course Objectives:

1. To apply the knowledge of differential calculus in the field of engineering.
2. To deal with functions of several variables that is essential in optimizing the results of real life problems.
3. To understand the essential tools of matrices and linear algebra, Eigen values and diagonalization in a Comprehensive manner are required.
4. To understand Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc.
5. To deal with vector calculus that is required in different branches of Engineering to graduate engineers.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**DIFFERENTIAL CALCULUS-I:** Successive Differentiation (nth order derivatives), Leibnitz theorem and its application. Curve tracing: Cartesian and Polar co-ordinates. Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions.	**8L**
II	**DIFFERENTIAL CALCULUS-II:** Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians.	**8L**
III	**MATRICES:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, System of linear equations, Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem and its application Diagonalisation of a Matrix	**8L**
IV	**INTEGRAL CALCULUS:** Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Application: Areas and volumes.	**8L**
V	**Vector Calculus:** Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem	**8L**

	(without proof) and their applications	

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of differentiability and apply in the study of Successive differentiation, Leibnitz theorems and Partial differentiation.

CO2 Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.

CO3 Remember the concept of matrices and apply for solving linear simultaneous equations

CO4 Illustrate the working methods of multiple integral and apply for finding area, volume.

CO5 Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

CO6 Apply the concept of calculus in solving engineering problems

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: II
Credits : Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-II
Course Code: SEAS-121	**Title: :** Engineering Mathematics-II

Course Objectives:
1. To understand the effective mathematical tools for the solutions of differential equations that model physical processes
2. To get the idea of types of partial differential equations and their solutions.
3. To deal with applications of partial differential equations e.g. wave and heat equations.
4. To understand the concept of Laplace Transform and its application to solve differential and integral equations.
5. To be familiar with the concept and expansion of Fourier series.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**ORDINARY DIFFERENTIAL EQUATIONS:** Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation.	**8L**
II	**PARTIAL DIFFERENTIAL EQUATIONS:** Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order, Lagrange's Equations, Charpit's method, Solution of Linear Partial Differential Equation of Higher order with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients.	**8L**
III	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**: Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension.	**8L**
IV	**LAPLACE TRANSFORM:** Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem,	**8L**

	Application to solve simple linear and simultaneous differential equations.	
V	**FOURIER SERIES:** Euler's Formulae, Functions having arbitrary periods,πPeriodic functions, Fourier series of period 2 Change of interval, Even and odd functions, Half range sine and cosine series.	**8L**

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1 Understand the concept of differentiation and apply for solving differential equations

CO2 Remember the concept of partial differential equation and to solve partial differential equations.

CO3 Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations

CO4 Understand the concept of Laplace Transform and apply for solving differential equations.

CO5 Remember &Understand the concept of Fourier Series.

CO6 Apply the concept of calculus in solving engineering problems

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Physics
Course Code: SEAS-112/122	**Title: :** Engineering Physics
Course Objectives: 1. To Understand the concept of Relativistic Mechanics 2. To know the significance of Maxwell's equations in the Engineering applications of electromagnetic waves. 3. Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore. 4. To know the concept of Interference and Diffraction. 5. To Understand the Phenomenon of Polarization and Laser.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Relativistic Mechanics:** Inertial and Non- Inertial Frames; Michelson-Morley Experiment; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Mass Energy Equivalence and Variation of Mass with Velocity.	**8L**
II	**Electromagnetic:** Gauss law Ampere's law and displacement current; Equation of continuity; Maxwell's equations in Integral and Differential Forms; Electromagnetic Wave Propagation in Free Space and Conducting Media; Poynting Theorem	**8L**
III	**Quantum Mechanics:** Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box.	**8L**
IV	**Wave Optics:** **Interference:** Basics of interference of light; Principle of superposition, coherent Sources, Conditions of Interference; Interference by division of wave front and amplitude (Fresnel's bi-prism, Interference due to thin film, Newton's Rings). **Diffraction:** Fraunhoffer Diffraction Due Single and N-slit; Diffraction Grating; Rayleigh's criterion of resolution; absent spectra, dispersive Power of grating, Resolving power of Grating.	**8L**

V	**Polarization:** Phenomenon of double refraction; Ordinary and extra-ordinary rays; Nicol Prism; quarter wave plate and half wave plate; Production and analysis of Plane, Circularly and Elliptically Polarized Light; Optical Activity; Specific Rotation, Laurent half's half shade Polari meter.	**8L**

Reference / Text Books:

Text Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

Reference Books:

1. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
2. Engineering Physics-Malik HK and Singh AK (McGrawHill)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 To describe the classical relativity and wave mechanics problems.
CO2 To demonstrate the electromagnetic waves and their application in various processes
CO3 To calculate and solve the engineering problems of quantum mechanics.
CO4 To evaluate and grade the engineering problems of wave optics.
CO5 To prepare the classical physics & to prepare the ideas in solving the problems in their parent streams.
CO6 To prepare the Production and analysis of Plane

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Physics Lab
Course Code: SEAS-112P/ SEAS-122 P	**Title: :** Engineering Physics Lab

Course Objectives: The objectives of studying this course are,

1. To understand the concept of wave length by the interference
2. To understand the concept of wave length by the diffraction.
3. To understand the concept of viscosity of liquid and flow of liquid.
4. To understand the energy band gap in the semiconductors.
5. To understand the concept of polarization.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To determine the wavelength of Sodium light by Newton's rings
Practical-2	To determine the wavelength of prominent lines of mercury by plane diffraction grating
Practical-3	To determine the focus length combination of two lenses separated by distance and verify the formula for the focal length of combination of lenses
Practical-4	To determine the wave length of sodium light with the help of Fresnel's bi-prism
Practical-5	To determine the coefficient of viscosity of a given liquid
Practical-6	To verify Stefan's law
Practical-7	Calibration of a volt meter with potentiometer
Practical-8	To determine the resistance per unit length and specific resistance of a given resistance using Carey Foster 's Bridge
Practical-9	To determine the energy bend gap of a given semiconductor material
Practical-10	To determine the Specific Rotation of the Cane sugar solution with the help of Polarimeter.

Reference / Text Books:

1. Practical Physics- K. K. Dey& B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics- Practical- Katiyar & Pandey (Wiley India)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** To determine the wavelength of sodium light by Newton's ring experiment. **CO2.** To determine the wavelength of sodium light with the help of Fresnel's bi-prism. **CO3.** Understand measurement technology, usage of new instruments and real time applications in engineering studies. **CO4.** To determine the viscosity of liquid. **CO5.** To determine the emission of energy with respect the temperature and verify Stefan's law. **CO6.** To determine the calibration of potential and draw the curve.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Chemistry
Course Code: SEAS-113/123	**Title: :** Engineering Chemistry

Course Objectives:

1. Student will be able to apply fundamental concepts of chemistry in different fields of Engineering.
2. Student will be able to identify compounds using different spectroscopic techniques
3. Student will be able to understand the basic principles of electrochemistry for different engineering applications
4. Student will be able to illustrate different types of impurities in water and its softening techniques
5. Student will be able to apply the concepts of determination of calorific values and analyze the coal
6. Student will be able to recall the basic knowledge of polymerization & and applications

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Atomic and Molecular Structure:** Molecular orbitals of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application	**8L**
II	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	**8L**
III	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system.	**8L**
IV	**Water Analysis:** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulon'smethos).	**8L**
V	**Polymers:** Basic concepts of Polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.	**8L**

Reference / Text Books:

Text Books:

1. University Chemistry ByB.H.Mahan
2. University Chemistry ByC.N.R.Rao
3. Organic Chemistry By I.L.Finar
4. Physical Chemistry By S.Glasstone
5. Engineering Chemistry By S.S.Dara
6. Polymer Chemistry By FreW.Billmeyer

Reference Books:

1. Elementary Organic Spectroscopy ByY.R.Sharma
2. Principles of Physical Chemistry By Puri, Sharma,Pathania
3. Principles of Inorganic Chemistry By Puri, Sharma,Kalia
4. Concise Inorganic Chemistry ByJ.D.Lee

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Apply fundamental concepts of chemistry in different fields of Engineering
CO2 Identify compounds using different spectroscopic techniques.
CO3 Understand the basic principles of electrochemistry for different engineering applications
CO4 Illustrate different types of impurities in water and its softening techniques
CO5 Apply the concepts of determination of calorific values and analyze the coal
CO6 Recall the basic knowledge of polymerization and its applications

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:**B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Chemistry Lab
Course Code: SEAS-113P/ SEAS-123P	**Title: :** Engineering Chemistry Lab
Course Objectives: The objectives of studying this course are, 1. Student will be able to Estimate different impurities present in water sample. 2. Student will be able to Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution 3. Student will be able to Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks / 2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	
Practical	**Contents**
Practical-1	To determine total alkalinity in the given water sample.
Practical-2	To determine the temporary and permanent hardness in water sample using EDTA as standard solution.
Practical-3	To determine the available chlorine in bleaching powder solution.
Practical-4	To determine the chloride content in the given water sample by Mohr's method.
Practical-5	To determine the pH of the given solution using pH meter and pH-metric titration.
Practical-6	To determine the Equivalent weight of Iron by the chemical displacement method.
Practical-7	To determine the Viscosity of an addition polymer like polyester by Viscometer.
Practical-8	To find chemical oxygen demand of waste water sample by potassium dichromate
Practical-9	To determine the iron content in the given sample using external indicator
Practical-10	To determine the strength of given HCL solution by titrating against N/10 Standard Sodium hydroxide solution
Reference / Text Books: 1. Practical Chemistry B.Tech. Text Book, Dr. Usha Nakra and Laxmi Kant Sharma Dr. Vivek Pandey, Dr. T. L. Rajawat, Dr. Sama Jain, Dr. Monika Sharma, Dr. Virendra Singh (Neelkanth Publishers(P) Ltd.)	
If the course is available as Generic Elective then the students of following departments may opt it. NO	

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to	

CO1. Analyze the need, design and perform a set of experiments.
CO2. Identify the structure of unknown/new compounds with the help of spectroscopy
CO3. Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.
CO4. Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution
CO5. Equipped with basic knowledge of polymer reinforced composites, applications of semiconductor photochemistry in energy harnessing and optical sensors.
CO6. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Learning Computers with Thinking and Programming in C
Course Code: SECS-111/121	**Title: :** Learning Computers with Thinking and Programming in C

Course Objectives:
1. After studying this course students will be able to develop simple algorithms for arithmetic and logical problems.
2. After studying this course students will be able to translate the algorithms to programs &finally execution in C language.
3. After studying this course students will be able to implement conditional branching, iteration and recursion in C language.
4. After studying this course student will be able to decompose a problem into functions and synthesize a complete program using divide and conquer approach using C language.
5. After studying this course students will be able to use arrays, pointers and structures to develop algorithms and programs for implementation in C language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Programming basics.** Conceptual Introduction to components of a computer system i.e. Memory, processor, I/O Devices, storage, operating system. Understanding assembler, compiler, interpreter, loader and linker. Understanding Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics of C language**. Core Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.	**8L**
II	**Arithmetic expressions & Conditional Branching in C language**: Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively. Conditional Branching: Applying if and switch	**8L**

	statements, nesting of if and else, use of break and default with switch	
III	**Loops & Functions in C language:** Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.	**8L**
IV	**Arrays & Basic Algorithms in C language**: Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.	**8L**
V	**Pointer& File Handling in C language**: Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.	**8L**

Reference / Text Books:

Text Books:

1. Let Us C By Yashwant P. Kanetkar.
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.

Reference Books:

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Programming in C by Kochan Stephen G. Pearson Education – 2015.
3. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
4. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
CO1 To understand the basic computer concepts and programming principles of C language. **CO2** To develop simple algorithms for arithmetic and logical problems. **CO3** To translate the algorithms to programs & execution (in C language). **CO4** To implement conditional branching, iteration and recursion. **CO5** To decompose a problem into functions and synthesize a complete program using divide and conquer approach. **CO6** To use arrays, pointers and structures to develop algorithms and programs

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Learning Computers with Thinking and Programming in C Lab
Course Code: SECS-111 P/ SECS-121P	**Title: :** Learning Computers with Thinking and Programming in C Lab

Course Objectives: The objectives of studying this course are,

1. After studying the above course the student will be able to implement algorithms and draw flowcharts for solving easy and complex Mathematical as well as engineering problems..
2. After studying the above course the student will be able to, understand and demonstrate programming language concepts by implementing programs in C language.
3. After studying the above course the student will be able to, design and develop programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage in computer language C.
4. After studying the above course the student will be able to, able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures in C language which will be latter helpful in understanding the concept of object oriented programming in C++.
5. After studying the above course the student will be able to, develop confidence for self-learning and ability for life-long learning needed for learning any computer language.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Write a program to calculate the area of triangle using formula Area=√s(s- a)(s-b)(s-c) where s=(a+b+c)/2.
Practical-2	We input the basic salary of an employee through the keyboard. The Dearness allowance (DA) is25% of the basic salary while the house rent allowance (HRA) is 15% of the basic salary. While the provident fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA). Write a program in Ctocalculate the Net Salary.
Practical-3	Writeaprogram in C to determine the roots of quadratic equation.
Practical-4	Writeaprogram in C to find the largest of three numbers using then estedifelse construct.
Practical-5	Writeaprogram in Ctoreceivemarksofhistory, geography&civicsfromuser& check its eligibility for course if a) Marksofhistory>40 b) Marksofgeography>50 c) Marksofcivics>60 d) Totalofhistory&civicsmarks>150 orTotalofthreesubjectsmarks>200

Practical-6	Writeaprogram in Ctofindthevalueofyforaparticularvalueofn. Thea, x, b, n is input by user if n=1 y=ax%b if n=2 y=ax2+b2 if n=3 y=a-bx ifn=4 y=a+x/b
Practical-7	Writeaprogramin C to constructaFibonacciseriesuptonterms.
Practical-8	Writeaprogram in Ctofindwhetherthenumberis Armstrongnumber or not.
Practical-9	Write aprogramin C togeneratesumofseries1!+2!+3!+ n!
Practical-10	Writea program in Ctofind the sumoffollowingseries1-X1/1!+X2/2!-…………Xn/n!.
Practical-11	Writeaprogram in Ctoprinttheentireprimenobetween1and 500.
Practical-12	Writeaprogramin C toprintoutalltheArmstrongnumberbetween 50and 600.
Practical-13	Writeaprogramin C todrawthefollowing figure: 4 3 2 1 321 2 1 1
Practical-14	Writeaprogram in Ctoreceiveafive-digit no anddisplayas like12345: 1 2 3 4 5
Practical-15	Writea function in Cthatreturnsumofalltheevendigitsofagivenpositiveno entered through keyboard.
Practical-16	Writeaprogram in C toprintareaofa trapezium using function&returnitsvalue to main function.
Practical-17	Writeaprogram in Ctocalculatethefactorialforgivennumberusingfunction.
Practical-18	Writea program in CtofindsumofFibonacciseriesusingfunction.
Practical-19	Writeaprogramin C to findthefactorialofgivennumberusingrecursion.
Practical-20	Writeaprogram in Ctofindthesumofdigitsofa5digit number using recursion.
Practical-21	Writeaprogramin C tocalculatetheGCDofgivennumbersusingrecursion.
Practical-22	Writeaprogram in Ctoconvertdecimalnumberintobinarynumber.
Practical-23	Writeaprogramin C toconvertbinarynumberintodecimalnumber.
Practical-24	Writeaprogramin C todeleteduplicateelementina listof20elements& display it on screen.
Practical-25	Writeaprogram in Ctomergetwosortedarray&no element isrepeatedduringmerging.
Practical-26	Writeaprogram in C to evaluatetheadditionofdiagonalelementsoftwo square matrixes.
Practical-27	Writeaprogram in Ctofindthetransposeofagivenmatrix&checkwhether it is symmetric or not.
Practical-28	Writeaprogram in Cto print themultiplicationoftwoN*N (Square) matrix.
Practical-29	WriteaprograminCtocheckwhetherthegivenstringisapalindromeor not.

Practical-30	Write program in C to sort the array of character (String) in alphabetical order like STRING in GNIRTS.
Practical-31	Write a program in C to remove all the blank space from the string & print it, also count the no of characters.
Practical-32	Write a program in C to store the following string “zero”, “one” -- “five”. Print the no in words, given in figure as 3205.
Practical-33	Write a program in C to compare two given dates. To store a date use a structure that contains three members namely day, month and year. If the dates are equal then display message equal otherwise unequal.
Practical-34	Write a C program to copy & count the character content of one file says c. txt to another file d.txt.
Practical-35	Write a program in C to print all the prime number, between 2 to 200 in a file name prime. txt.
Practical-36	Write the following C program using pointer: a) To sort the list of numbers through pointer b) To reverse the string through pointer.
Practical-37	Write a program in C to find the largest no among 30 integers array using dynamic memory allocation.
Practical-38	Using Dynamic Memory Allocation, Write a program in C to find the transpose of given matrix.
Practical-39	Write a program in C to find the factorial of given number using command line argument.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Implementation of algorithms and drawing flowcharts for solving easy and complex Mathematical as well as Engineering problems.

CO2. Computer programming language concepts understanding and demonstration.

CO3. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

CO4. Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures.

CO5. Development of confidence for self-education and ability for life-long learning needed for Computer language.

CO6. Understand the basics of file handling mechanisms

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Concepts of Mechanical Engineering & Mechatronics
Course Code: SEME-111/121	**Title: :** Concepts of Mechanical Engineering &Mechatronics

Course Objectives:

1. Acquire knowledge of various types of force system , free body diagram and equilibrium of body under various types of forces
2. Acquire knowledge of basic concepts of strength of materials, and statically determinate and indeterminate structures, simple beams subjected to various types of loading and plot shear force and bending moment diagrams
3. Acquire knowledge of the fundamentals of thermodynamics, temperature scales and various modes of heat transfer so that student will now begin to utilize these concepts in real-world applications
4. Acquire knowledge of various types of engines and its components, mechatronics with their advantages,
5. The learner will have a good understanding of the all-important basic technologies that are useful in daily activities.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Force Systems**: Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Classification of forces & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces **Coplanar Concurrent Force system and Coplanar:** Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem.	**8L**
II	**Introduction to mechanics of solid:** Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety. Basic Numerical problems. Types of beams under various loads, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment. Basic Numerical problems	**8L**
III	**Basic concepts of thermodynamics**: Basic concepts, Concept of continuum, Microscopic and Macroscopic approach, Thermodynamic	

	equilibrium, State and process, Reversible and Quasi-static process, Work, Zeroth law, Concept of temperature and heat. First law of thermodynamics and its importance, **Second law of thermodynamics**: Kelvin Planck and Clausius statements, Heat engine, Refrigerator and Heat pump, Efficiency and COP, Thermodynamic temperature scale. **Heat transfer and its various modes**: Conduction, Convection and Radiation.	**8L**
IV	**Introduction to IC engines**: IC Engine: Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to electric, and hybrid electric vehicles	**8L**
V	**Introduction to mechatronics**: Evolution, Scope, Advantages and disadvantages of Mechatronics, Industrial applications of Mechatronics, Introduction to autotronics, bionics, and avionics and their applications. Sensors and Transducers: Types of sensors, types of transducers and their characteristics. **Overview of mechanical actuation system**: Kinematic Chains, Cam, Train Ratchet Mechanism, Gears and its type, Belt, Bearing. **Hydraulic and pneumatic actuation systems**: Overview: Pressure Control Valves, Cylinders, Direction Control Valves, Rotary Actuators, Accumulators, Amplifiers, and Pneumatic Sequencing Problems	**8L**

Reference / Text Books:

Text Books:

1. Engineering Mechanics: Statics" , J.L Meriam , Wiley.
2. "Engineering Mechanics", Thimoshenko & Young, 4ed, Tata McGraw Hill.
3. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson.

Reference Books:

1. Engineering Mechanics", Dr Sadhu Singh, Umesh Publications.
2. "Engineering Mechanics", Bhavikatti , New Age.
3. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI.
4. Mechatronics : Principles, Concepts and Applications, NitaigourMahalik, McGraw Hill.
5. Mechatronics, As per AICTE: Integrated Mechanical Electronic Systems, K.P.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the basics of mechanics, construct free body diagrams and appropriate equilibrium equations.

CO2 Understand and draw shear force and bending moment diagram for a beam under different loading conditions

CO3 Understand the basic concepts of thermodynamics and their applications

CO4 Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump

CO5 Understand the concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation, hydraulic and pneumatic

CO6 Understand the analysis of different machine parts and working principal and future prospects of mechatronics fields.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Fundamentals of Electronics Engineering
Course Code: SEEC-111/121	**Title: :** Fundamentals of Electronics Engineering

Course Objectives:
1. To develop a strong foundation of concept of PN Junction and solid state devices
2. To present the Operational amplifier and its applications
3. To familiarize with digital electronics & the design of various digital circuits using logic gates
4. To introduce the various communication systems

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Overview of Semiconductors**, PN junction Diode, Zener Diodes, Diode Application: Half and Full Wave rectification, Clippers, Clampers Special Purpose two terminal Devices: Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**8L**
II	**BJT**: Transistor Construction, Operation, Amplification action (Common Base, Common Emitter, Common Collector) **Field Effect Transistor:** Construction, Operation and Characteristic of JFET and MOSFET (Depletion and Enhancement) Type	**8L**
III	**OP AMP:** Introduction, Op-amp symbol, terminals, packages, Block diagram Representation of op-amp- Ideal opamp& practical op-amp – Open loop & closed loop configurations, characteristics of op-amp, Op-Amp Circuits: Inverting Amplifier, Non-inverting Amplifier, Voltage Follower, Summing Amplifier, scaling & averaging amplifiers, Integrator, Differentiator.	**8L**
IV	**Digital Electronics:** Number systems, Binary codes – Binary Arithmetic, Logic gates, Boolean algebra, laws and theorems, Simplification of Boolean expressions, Implementation of Boolean expressions using logic gates Standard forms of Boolean expression, K Map Minimization upto 4 Variables.	**8L**
V	**Fundamentals of Communication Engineering**: Block diagram of a basic communication system, Frequency spectrum, Need for modulation, Methods of modulation, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	**8L**

Reference / Text Books:

Text Books:

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication

Reference Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford Uni Press India

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of PN Junction and devices.
CO2 Understand the concept of BJT, FET and MOFET
CO3 Understand the concept of Operational amplifier
CO4 Understand the Principles of digital electronics
CO5 Principles of various communication systems
CO6 Design rectifier & measure the waveform parameters

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Fundamentals of Electronics Engineering Lab
Course Code: SEEC-111P/ SEEC-121P	**Title:** Fundamentals of Electronics Engineering Lab

Course Objectives: The objectives of studying this course are,

1. To introduce the concepts of electronic circuits and its components
2. To introduce the concepts of diodes & transistors
3. To impart the knowledge of various configurations, characteristics and applications.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
Practical-2	To verify the PN diode characteristics
Practical-3	To verify the Zener diode characteristics
Practical-4	To verify the BJT characteristics (either of the configurations)
Practical-5	Study of Logic Gate
Practical-6	Design and implementation of Adder and Subtractor using logic gates.
Practical-7	To determine the external characteristics of DC Shunt generator
Practical-8	Implement an Adder and Subtractor Circuit using Operational Amplifier
Practical-9	To study Full Wave Rectifier Circuit
Practical-10	Study of AM modulator and Demodulator

Reference / Text Books:

Text Books:

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication

Reference Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India

If the course is available as Generic Elective then the students of following departments may opt it.

NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Conduct experiments illustrating the application of Fundamentals of semiconductor, electronic components/devices.

CO2. Demonstrate the behavior of Principles of digital electronics.

CO3. Apply the operation and discuss the performance of several fundamentally important op-amp circuits that have certain features or characteristics oriented to special applications.

CO4. Analyze the concept with the working principles of forward and reverse bias characteristics.

CO5. Demonstrate the basic skills in design and analysis of filter circuits, biasing circuits.

CO6. Discriminate the principle, construction and operation of BJTs, FETs and MOSFETs.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td colspan="2">Programme: UG
Class: B.TECH(CSE,ME,CE,EE)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: Basic Electrical Engineering</td></tr>
<tr><td colspan="2">Course Code: SEEE-111/121</td><td>Title: : Basic Electrical Engineering</td></tr>
<tr><td colspan="3">Course Objectives:
1. The objective of this course is to teach the students Introduction to Electrical Engineering
2. To understand the fundamental concept of Electrical Engineering like DC Network, AC Network,
3. Measuring Instruments, Energy Conversion Devices</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="3">L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Circuit theory Concepts-Mesh and nodal analysis; Network Theorems-Superposition theorem, Thevenin’s theorem, Norton’s theorem and Maximum Power Transfer theorem; Star Delta transformation..</td><td>8L</td></tr>
<tr><td>II</td><td>Sinusoidal and phasor representation of voltage and current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel; Apparent, active & reactive powers, Power factor; Series and parallel resonance; Bandwidth and quality factor.</td><td>8L</td></tr>
<tr><td>III</td><td>Measuring Instruments: Construction and principles of operation of voltage and current measuring instruments; introduction to power and energy meters.
Three Phase A.C. Circuits: Star-Delta connections; Line and phase voltage/current relations; Three phase power and its measurement.</td><td>8L</td></tr>
<tr><td>IV</td><td>Transformer: Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and voltage regulation of single phase transformer.
D.C. Machines: Principles of electromechanical energy conversion; Types of D.C. machines; E.M.F. equation; Losses and efficiency; applications of DC machines.</td><td>8L</td></tr>
<tr><td>V</td><td>Three phase induction Motor: Principle of operation; Types, slip-torque characteristics; Applications. Synchronous Machines: Principle of Operation of Alternator and synchronous motor. Single phase Motors: Principle of operation of induction motor.</td><td>8L</td></tr>
</table>

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons.
4. BL Theraja , A Textbook of Electrical Technology - Volume I, S. Chand Publishing

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.
4. Cotton H., Advanced Electrical Technology, Wheeler Publishing.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Apply the concepts of KVL/KCL and network theorems in solving DC circuits.

CO2 Analyze the steady state behavior of single phase and three phase AC electrical circuits.

CO3 Identify the application areas of a single phase two winding transformer and calculate their efficiency.

CO4 Illustrate the working principles of induction motor, synchronous machine and employ them in different area of applications.

CO5 To make students capable of analyzing and solving the varieties of problems and issues coming up in the vast field of electrical measurements.

CO6 Illustrate the working principles of DC machine and employ them in different area of applications.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Basic Electrical Engineering Lab
Course Code: SEEE-111P/ SEEE-121P	**Title: :** Basic Electrical Engineering Lab
Course Objectives: The objectives of studying this course are, 1. Understand and gain knowledge about circuit laws and theorems. 2. Gain knowledge about time domain analysis of circuit transients. 3. Understand the concept of resonance in series and parallel circuits.	
Nature of Paper: Core/DSE/SEC/GE/AECC	
Minimum Passing Marks/Credits: 50% Marks / 2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Practical-1	To verify the Kirchhoff's current and voltage laws
Practical-2	To verify the Superposition theorem
Practical-3	To verify the Thevenin's theorem
Practical-4	To verify the Norton's theorem
Practical-5	To determine the external characteristics of DC Shunt generator
Practical-6	To measure current and speed for speed control of D.C. Shunt Motor
Practical-7	To measure the power in a 3-phase system by two-wattmeter method
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:
1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.

Reference Books:
1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.

CO2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase.

CO3. Calculate efficiency of a single phase transformer and DC machine.

CO4. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

CO5. Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits

CO6. Determination of efficiency of a single-phase transformer by direct load test.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML, ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 2 Practical: 0	**Subject:** Professional Communication
Course Code: PCE-111/121	**Title:** Professional Communication

Course Objectives:

1. To enhance one's ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2. Toincreaseone'sknowledgeandawarenessofemotionalcompetencyandemotionalintelligenceatplaceo fstudy/work.
3. To provide opportunity for realizing one's potential through practical experience.

Nature of Paper: AECC

Minimum Passing Marks/Credits: 40% Maks /2

L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	**Contents**	**No. of Lectures Allotted**
I	**Listening** • Techniques of effective listening • Listening and comprehension • Probing questions • Barriers to listening **Speaking** • Pronunciation • Enunciation • Vocabulary • Fluency • Common Errors ***Reading*** • Techniques of effective reading • Gathering ideas and information from a given text i. Identify the main claim of the text ii. Identifythepurposeofthetext iii. Identifythecontextofthetext iv. Identify the concepts mentioned • Evaluating these ideas and information i. Identify the arguments employed in the text ii. Identify the theories employed or assumed in the text	**8L**

	• Interpretthetext i. To understand what a text says ii. To understand what a text does iii. To understand what a text means	
II	***Writing and different modes of writing*** • Clearly state the claims • Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues • Provide background information • Effectively argue the claim • Provide evidence for the claims • Use examples to explain concepts • Follow convention • Be properly sequenced • Use proper signposting techniques	**8L**
III	• Be well structured i. Well-knit logical sequence ii. Narrative sequence iii. Category groupings • Different modes of Writing - i. E-mails ii. Proposal writing for Higher Studies iii. Recording the proceedings of meetings iv. Any other mode of writing relevant for learners ***Effective use of Social Media*** • Introduction to social media websites • Advantages of social media • Ethics and etiquettes of social media • How to use Google search better • Effective ways of using Social Media • Introduction to Digital Marketing ***Non-verbal communication*** • Meaning of non-verbal communication • Introduction to modes of non-verbal communication • Breaking the misbeliefs • Open and Closed Body language • Eye Contact and Facial Expression • Hand Gestures • Do's and Don'ts • Learning from experts • Activities-Based Learning	**8L**
IV	***Resume Skills*** • Resume Skills : Preparation and Presentation i. Introduction of resume and its importance ii. Difference between a CV, Resume and Bio data iii. Essential components of a good resume	**8L**

	• Resume skills : common errors i. Common errors people generally make in preparing their resume ii. Prepare a good resume of her/his considering all essential components ***Interview Skills*** • Interview Skills : Preparation and Presentation i. Meaning and types of interview (F2F, telephonic, video, etc.) ii. Dress Code, Background Research, Do's and Don'ts iii. Situation, Task, Approach and Response (STAR Approach) for facing an iv. interview v. Interview procedure (opening, listening skills, closure, etc.) vi. Important questions generally asked in a job interview (open and closed vii. ended questions) • Interview Skills : Simulation i. Observation of exemplary interviews ii. Comment critically on simulated interviews	
V	• Interview Skills : Common Errors i. Discuss the common errors generally candidates make in interview ii. Demonstrate an ideal interview	**8L**

Reference / Text Books:

1. Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.
2. Brown, Michele & GylesBrandreth. How to Interview and be Interviewed. London: Sheldon Press1994.
3. Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977.
4. Collins, Patrick. Speak with Power and Confidence. New York: Sterling, 2009.
5. Hughes, Shirley. Professional Presentations: A Practical Guide to the Preparation and Performance ofSuccessful Business Presentations. Sydney: McGraw-Hill, 1990.
6. Kratz, Abby Robinson. Effective Listening Skills. Toronto: ON: Irwin Professional Publishing, 1995.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	10 05 35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:
CO1 The students will Gain Self Competency and Confidence.
CO2 They will be fluent speaker and proficient writer and enhance their LSRW Skills.
CO3 The students will demonstrate a fuller and deeper understanding of all the facets of Professional communication.
CO4 They will be able to enrich their vocabulary and their correct usage.
CO5 They will develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation.
CO6 The students will Gain Knowledge about the world of work**.**

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Professional Communication Lab
Course Code: PCE-111P/121P	**Title:** Professional Communication Lab

Course Objectives: The objectives of studying this course are,
1. Improve the dynamics of professional presentations.
2. Develop the ability to compeer professional occasions.
3. Enable to read newspaper for their communicative competence.
4. Equip with effective business correspondence.
5. Develop in them communication and social graces necessary for functioning.

Nature of Paper: Core/DSE/SEC/GE/AECC

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical 1	Group Discussion: Practice Based on Accurate and Current Grammatical Patterns
Practical 2	Intonation Pattern Practice: Rising, Falling, and Level Tones.
Practical 3	Communication Skills /Conversational Skills for Interviews/ Seminars/ Workshops with Emphasis on Kinesics/Para linguistics along with Promotion of Phonetic Script Skills.
Practical 4	Presentation Skills for Technical Paper / Project Reports / Professional Report based on Proper Stress and Intonation Mechanics.
Practical 5	Theme Presentation Practices Based on Linguistic Patterns
Practical_6	***Digital Literacy*** • Role of Digital literacy in professional life • Trends and opportunities in using digital technology in workplace • Internet Basics • Introduction to MS Office tools v. Paint vi. Office vii. Excel viii. Powerpoint

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons.

Reference Books: 1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill. 2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. 3. A Grabel, Basic Electrical Engineering, McGraw Hill.	
If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** Develop all-round personalities with a mature outlook to function effectively in different circumstances. **CO2**. Develop effective communication and presentation skills **CO3.** Learn corporate etiquette - organizing and managing professional events and will understand how reading enhances their communicative competency **CO4.** Conduct effective correspondence and prepare reports which produce results. **CO5.** Write logical sentences and paragraphs, use appropriate diction, grammar and punctuation. **CO6.** produce business documents for mailing to external recipients or intra-organizational circulation	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 2 Practical: 0	**Subject:** Environment Studies
Course Code: SEHU-111/122	**Title:** Environment Studies

Course Objectives:

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
3. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
6. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.

Nature of Paper: AECC

Minimum Passing Marks/Credits: 40% Marks /2

L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to environmental studies** • Multidisciplinary nature of environmental studies; • Scope and importance; Concept of sustainability and sustainable development.	**4L**
II	**Ecosystems** • What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**4L**
III	**Natural Resources: Renewable and Non-renewable Resources** • Land resources and land use change; Land degradation, soil erosion	

	and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & interstate). • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	**4L**
IV	**Biodiversity and Conservation** • Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots • India as a mega--biodiversity nation; Endangered and endemic species of India • Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	**4L**
V	**Environmental Pollution** • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies.	**4L**
VI	**Environmental Policies & Practices** • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.	**4L**
VII	**Human Communities and the Environment** • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. • Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. • Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	**4L**

VIII	**Field work** visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site---Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems---pond, river, Delhi Ridge, etc.	**4L**

Reference / Text Books:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., &Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	10 05 35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1. Gain in-depth knowledge on natural processes that sustain life, and govern economy.
CO2. Estimate and predict the consequences of human actions on the web of life, global economy and quality of human life.
CO3. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
CO4. Acquire values and attitudes towards understanding complex environmental economic social challenges, and participate actively in solving current environmental problems and preventing the future ones.
CO5. Adopt sustainability as a practice in life, society and industry.
CO6. Develop real field experience.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Engineering Workshop Lab
Course Code: SEME-112P/ SEME-122P	**Title:** Engineering Workshop Lab
Course Objectives: The objectives of studying this course are, 1. To understand the importance of tools used in workshop. 2. To prepare various joints used in workshop. 3. To identify & apply the most appropriate tools for various applications. 4. To perform the various types of black smithy and sheet metal shop operations. 5. To prepare core and mould in foundry shop.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks / 2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Module -1	Carpentry Shop: Practical-1: To prepare half-lap corner joint. Practical-2: To prepare mortise &Tenon joint. Practical-3: To prepare a cylindrical pattern on woodworking lathe
Module -2	Fitting Bench Working Shop: Practical-1: To prepare a V-joint fitting Practical-2: To prepare a U-joint fitting Practical-3: To make a perfect square job
Module -3	Black Smithy Shop: Practical-1: To prepare a square rod from given circular rod Practical-2: To prepare a square S- shape from given circular rod Practical-3: To prepare a nail from given circular rod.
Module -4	Welding Shop: Practical-1: To prepare a butt welded joints using arc welding machine. Practical-2: To prepare a Lap welded joints using arc welding machine. Practical-3: To prepare a Lap welded joint using spot welding machine.
Module -5	Sheet-metal Shop: Practical-1: To make round duct of GI sheet using 'soldering' process. Practical-2: To prepare a tray of GI by fabrication
Module -6	Machine Shop: Practical-1: To prepare a bolt on the lathe machine as per given. Diagram. Practical-2: To prepare a job on the lathe machine as per given diagram.
Module -7	Foundry Shop: Practical-1: To prepare core as per given size.

	Practical-2: To prepare a mould for given casting.
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

Reference Books:

1. Business Communication, II Ed, OUP, by Meenakshi Raman & Prakash Singh, 2012.
2. Speak well----- orient black swan.
3. Everyday dialogues in English----- Robert J.Dixon.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Understand the tools used in workshop & their applications.

CO2. Prepare various joints used in carpentry, fitting and welding shop.

CO3. Identify & apply the most appropriate tools for various manufacturing operations like turning, facing and threading.

CO4. Perform the various types of black smithy and sheet metal shop operations.

CO5. Prepare core and mould in foundry shop.

CO6. Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: UG **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Graphics & Design Lab
Course Code: SEME-111P/ SEME-121P	**Title: :** Engineering Graphics & Design Lab

Course Objectives: The objectives of studying this course are,

1. To study the standard and rules to be trailed by engineers for making precise drawings.
2. To understand the fundamental dimensioning practices that must be continued in the arrangement of drawings.
3. To draw the various types of projection of lines, planes and solids.
4. To apply the CAD for design.
5. To create the engineering models.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Module-1	Introduction to Engineering Drawing, Orthographic Projections: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Module -2	Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.
Module -3	Projections and Sections of Regular Solids: Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans they include: windows, doors. Prism, Cylinder, Pyramid, Cone – Auxiliary Views.
Module -4	Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.
Module -5	Computer Graphics: Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids].

Reference / Text Books: **Text Books:** 1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Charotar Publishing House 2. Engineering Drawing, Narayana, K.L. & P Kannaiah (2008), Scitech Publishers. 3. Engineering Drawing Paperback, P.S. Gill (Author), S.K. Kataria& Sons. **Reference Books:** 1. Engineering Drawing and Computer Graphics, Shah, M.B. &Rana B.C. (2008), Pearson Education. 2. Engineering Graphics, Agrawal B. &Agrawal C.M. (2012), TMH Publication. 3. Engineering Graphics & Design, A.P. Gautametc, Khanna Publishing House.	
If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** Understand the basic concepts and principles of engineering graphics and their significance. **CO2.** Understand the theory of projections and regular solids. **CO3**. Draw the various types of projection of lines, planes and solids. **CO4.** Apply the CAD for design. **CO5.** Creating the engineering models using solid modeling. **CO6.** Gain knowledge about orthographic and isometric projections	

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B.TECH (CE)**	Year:II Semester: III
Credits Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-III
Course Code:SEAS-231	**Title:** Engineering Mathematics-III

Course Objectives:
1. To make the students familiar with complex functions and its calculus.
2. To deal with applications, residues and conformal mapping.
3. To understand the concept and applications of integral transforms
4. To deal with numerical solutions of algebraic equations and differential equations
5. To understand the statistical aspect of functions

Nature of Paper: Applied

Minimum Passing Marks/Credits:40% Marks /4

L:3
T:1
P: 0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Unit-I	**Functions of a Complex Variable I**: Analytic functions; C-R equations and harmonic functions; Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.	**8L**
Unit-II	**Functions of a Complex Variable II**: Representation of a function by power series; Taylor's and Laurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilinear transformations.	**8L**
Unit-III	**Integral Transforms:** Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations.	**8L**
Unit-IV	**Numerical Techniques:** Solution of polynomial and transcendental equations Bisection method, Regula – Falsi method, Newton - Raphson method. **Interpolation:** Finite difference, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals; **Numerical Differentiation**, **Numerical Integration**; Trapezoidal, Simpson's 1/3 and 3/8 rules. **Numerical solutions of first order differential equations** by Euler's method and 4^{th} order Runge-Kutta method.	**8L**

Unit-V	**Statistical Techniques:** Moments, Moment generating functions, Skewness, Kurtosis, Curve Fitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	**8L**

Reference / Text Books:

1. *B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.*
2. *B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.*
3. *Dass H.K., Engineering Mathematics Vol-I, S. Chand.*
4. *E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.*
5. *Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.*

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	**30**
2) Assignments	**20**
3) ESE	**100**
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

1. Understand and check the Analyticity of a complex function.
2. To apply the concept of Analytic functions in residue and conformal mappings.
3. To solve and apply the concepts of transforms in the area of engineering.
4. To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.
5. To understand and use the concept of statistical tools to analyze the different data.
6. To apply the knowledge of mathematics in solving various engineering problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: III
Credits Theory: 4 Practical: 2	**Subject:** Mechanics of Solids
COURSE CODE –SECE-231	**TITLE -** Mechanics of Solids
Course Objectives: 1. To understand fundamentals regarding Mechanics of Solids. 2. To develop ability of students to carryout analysis of complex state of stress. 3. To familiarize students about the fail ure modes of materials. 4. To understand the thick and thin cylinder working process. 5. To enhance skills of utilizing materials of appropriate strength for civil engineering applications.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 2 (In Hours/Week) Theory - 4 Practical- 2	

Unit	Contents	No. of Lectures Allotted
I	**Simple stresses & strains Basics of stress and strain:** 3 -D state of stress (Concept only) Normal/axial stresses: Tensile & compressive Stresses: Shear and complementary shear Strains: Linear, shear, lateral, thermal and volumetric. Hooke's law, Elastic Constants: Modulus of elasticity, Poisson's ratio, Modulus of rigidity and bulk modulus and relations between them with derivation. Application of normal stress & strains: Homogeneous and composite bars having uniform & stepped sections subjected to axial loads and thermal loads, analysis of homogeneous prismatic bars under multidirectional stresses. **Theories of failure**, thermal stresses, strain energy, impact loads and stresses.	8L
II	**Types of loads**, Types of supports, Types of beams; Determination of support reactions, Relationship between loading, shear force & bending moment, Bending moment and shear force diagrams for beams subjected to only three types of loads : i) concentrated loads ii) uniformly distributed loads iii) couples and their combinations; Point of contra flexure, point & magnitude of maximum bending moment, maximum shear force. **Torsion Loads:** Torsion of solid and hollow circular shafts, stepped and composite shafts, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes	8L

III	**Columns and Struts:** Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, columns and struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns and struts. **Friction:** Theory of friction, Types of friction, Static and kinetic friction, Cone of friction, Angle of repose, Coefficient of friction, Laws of friction, Application of theory of friction: Friction on inclined plane, ladder friction, wedge friction, belt and rope friction	8L
IV	**Thin cylinders & spheres:** Introduction, difference between thin walled and thick walled pressure vessels, hoop and axial stresses and volumetric strains in thin walled cylindrical shells and spheres under internal pressure. 1. Introduction to longitudinal stresses, circumferential or hoop stresses and radial stresses 2. Longitudinal and circumferential stresses in thin cylinder 3. Longitudinal and circumferential stresses in thin Spherical shells **Thick cylinders:** Lame's Equation. Radial, axial and circumferential stresses in thick cylinders due to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.	8L
V	**Unsymmetrical Bending:** Properties of beam cross-section slope of neutral axis, stress and deflection in unsymmetrical bending. Determination of bending stresses, deflection and neutral axis in Angle, I- section, channel section **Shear centre:** Determination of shear centre for I-section and channel section. **Curved Beams:** Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections. Stress in curved bars like crane hooks, circular rings etc. subjected totension or compression.	8L

Reference / Text Books:
Text Books

- Strength of Materials by Timoshenko and Yσungs, East West Press.
- Mechanics of Materials by Hibbeler, Pearson.
- Mechanics of Materials", 2nd Ed by Timoshenko, S.P., and Gere, J.M., CBS Publishers 2002

Reference Books

- Mechanics of Materials by Beer, Johnston, Dewolf and Mazurek, McGraw Hill India.
- Strength of Materials by Pytel and Singer, Harper Collins
- Strength of Materials by Ryder, Macmillan.

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	

Seminar On Research Project Report 5) ESE	 70
Total:	150
Prerequisites for the course: NA	

Course learning outcomes

1. Understand the concepts of stress and strain at a point as well as the stress-strain relationships.
2. Learn about the different kinds of loading on the structure.
3. Apply mathematics science, for engineering applications and ability to identify, formulates, and solves engineering problems.
4. Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic and solve the concept of thick and thin cylinder.
5. Make the necessary theoretical background for further structural analysis.
6. Analyze the elastic deformation of members and apply theories of elastic failure.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: III
Credits Theory: 4 Practical: 3	**Subject: Building Construction and Maintenance Engineering**
Subject code – SECE-232	**Title-Building Construction and Maintenance Engineering**

Course Objectives:
1. To how the wood, cement, admixtures is used for buildings and construction process.
2. To develop the building walls and foundations and how they are useful for buildings.
3. In these mainly we know about building arches, roofs, doors, windows and ventilators and how they are given for buildings.
4. To develop the form work and finishing work which is used for buildings and to solve the defects of building properties which are able to know with material
5. To understand the Principles of Building Planning and building types.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 2 (In Hours/Week)
Theory - 4
Practical- 2

Unit	Contents	No. of Lectures Allotted
I	**Study of building Materials:** Building materials and their performance, economics of the building materials. **Stones and Bricks**, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing. Bricks – Composition of Brick earth – manufacture and structural requirements, **Fly ash, Ceramics. Timber, Aluminium, Glass, Paints and Plastics: Wood** - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel & aluminium, Plastics. **Cement Concrete:** Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete. **Pozzolona:** Chemical composition and requirements for uses, Natural and Artificial fly ash, Surkhi (burntclay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction. **Asphalt:** Bitumen and Tar: Terminology, specifications and uses, Bituminous materials.	8L
II	**Admixtures** – mineral & chemical admixtures – uses. **Plastics:** classification, advantages of plastics, Mechanical properties and	8L

	use of plastic in construction. **Paints, varnishes and distempers:** Common constituents, types and desirable properties, Cement paints. **Building Services: Plumbing Services:** Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Hazards – Classification of fire resistant materials and constructions. **Insulating Materials:** Thermal and sound insulating material, desirable properties and types.	
III	**Buildings:** Components of building, area considerations, Construction Principle and Methods for layout, damp proofing, anti-termite treatment in buildings, Vertical circulation means: stair cases and their types, design and construction. Different types of floors, and flooring materials (Ground floor and upper floors).Bricks and stone masonry construction, Cavity wall & hollow block construction.	8L
IV	**Mortars, Masonry and Finishing's** **Mortars:** Lime and Cement Mortars Brick masonry – types – bonds; Stone masonry – types; Composite masonry– Brick-stone composite; Concrete, Reinforced brick. **Finishers:** Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP. **Form work:** Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning **Doors and Windows:** Construction details, types of doors and windows and their relative advantages &disadvantages. Types of roof and roof treatments, Lintel sand Chhajja, Principles of building Planning.	8L
V	**Building Planning:** Principles of Building Planning, Classification of buildings and Building by laws.	8L

Reference / Text Books:

Text Books

- SK Duggal, "Building Materials" New Age International
- BC Punmia, "Building Construction" Laxmi Publication.
- PC Varghese, "Building Materials" PH

Reference Books

- Adams, "Building Construction" CRC Press Taylor & Francis Group.
- Sandeep Mantri, "Practical building Construction and its Management" Satya Publisher, New Delhi
- Deodhar, "Civil Engineering Materials" Khanna Publishers

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
3) Assignments 4) Research Project Report	20

Seminar On Research Project Report 5) ESE	100
Total:	150
Prerequisites for the course: NA	
Course learning outcomes 1. Understand the role of materials in engineering and check the quality of material. 2. To identify the admixtures and thermal & sound insulating material. 3. To compute the method of layout and know the protection criteria of building. 4. To distinguish the masonry in building Structure. 5. Evaluate the building planning drawing by building laws. 6. To apply appropriate material in construction on the basis of assigned work.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: III
Credits Theory: 4 Practical: 3	**Subject- SURVEYING**
SUBJECT CODE- SECE-233	**TITLE- SURVEYING**

Course Objectives:
1. The purpose of geodesy is to compile a map that shows the relative positions of objects on the Earth's surface.
2. Develop methods based on the knowledge of modern science and technology and use them in the field.
3. Well knowledge about level of grounds for many construction work.
4. Plane table surveying is a graphical surveying method used to create maps and plans, and to gather details (such as topographical details) through field observations
5. All curves of roads and railways based on survey methods.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 2 (In Hours/Week)
Theory - 4
Practical- 3

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Surveying**- Principles, Linear, angular and graphical methods, Survey stations, Surveylines- ranging, Bearing of survey lines, Local attraction, Declination, Dip, Latitude and Departure, Methods of orientation, Principle of resection	8L
II	**Linear measurement:** chain and tape surveying, types of chain and tape, ranging, obstacles and tapecorrection. Compass surveying: Measurement of directions, Reference meridians, bearing and azimuths, local attraction. Theodolite survey: Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control.	8L
III	**Levelling: Principles of levelling**- Dumpy level booking and reducing levels, Methods- simple, differential, reciprocal levelling, profile levelling and cross sectioning. Introduction of Digital and AutoLevel, Errors in leveling. **Contouring:** Characteristics, methods, uses.	8L
IV	**Plane Table Surveying** Parts and accessories. Methods of surveying. Two-point and three-point problems.	8L
V	**Elements of simple circular curves:** theory and methods of setting out simple circular curves, transitioncurves- types and their characteristics, ideal transition curve, Introduction to vertical curves, Survey Layoutfor culverts,	8L

	canals, bridges, road/railway alignment and buildings.	

Reference / Text Books:

Text Books

- BC Punamia et al: Surveying Vol. I, II, Laxmi Publication
- AM Chandra: Plane Surveying, Higher Surveying, Naros
- SK Duggal, Surveying Vol. I, II, McGraw Hill Education.

Reference Books

- Charles D. Ghilani, Elementary Surveying Pearson Education
- R Subramanian : Surveying & Leveling , Oxford University Pres
- Schofield, “Engineering Surveying” 6/e, CRC Press Taylor & Francis Group.

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To describe basic research tools and techniques of surveying.
2. To describe the purpose of curve for road survey.
3. To understand the level of ground.
4. To develop the ability to measure angles and distances using modern surveying equipment.
5. To evaluate the linear or angular distance by many equipment.
6. To determine the relative position of any object or point on earth.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester III

Programme: UG **Class: B. Tech CSE**	**Year: II** **Semester: III**
Credits **Theory: 2** **Practical: 0**	**Subject: Python Programming**
Course Code:STCS-239	**Title: Python Programming**

Course Objectives:

- Students will be able to read and write simple Python programs.
- Students will be able to develop Python programs with conditionals and loops
- Students will be able to define Python functions and to use Python data structures –- lists, tuples, dictionaries
- Students will be able to do input/output with files in Python
- Students will be able to do searching ,sorting and merging in Python

Nature of Paper: Engineering Courses (Core)

Minimum Passing Marks/Credits: 40% Marks/2

L:3
T:0
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction of Python, Overview of Python IDE, Overview of Python Programs, Basic elements of Python, Type Conversion in Python. Basics of python: Concept of expressions, Assignment Statement, Usage of Arithmetic Operators, Operator Precedence, Evaluation of Boolean Expressions.	**10 L**
II	Illustration of Conditional statements in Python and their implementation, Evaluation of expressions & Float Representation. Loops basics and working of loops, Use of Break and Continue.	**10 L**
III	Implementation of functions in detail, Strings, Python Data Structure : Tuples, Unpacking Sequences, Lists, Mutable Sequences , List Comprehension, Sets, Dictionaries, Higher Order Functions, Overview of Lambda Expressions	**10 L**
IV	Implementation of Sieve of Eratosthenes, File input and output operations, Exceptions and Assertions Modules, Importing Modules, Abstract Data types, Classes, Special Methods (such as _init_, _str_, comparison methods and Arithmetic methods etc.), Inheritance and OOP implementations.	**10 L**
V	Recursive Fibonacci, Tower of Hanoi Search, Binary Search and Sorting& Merging, Selection Sort, List merging, Merge Sort, Higher Order Sort.	**10 L**

Reference / Text Books:

Text books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016).
2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books:

1. John V Guttag, ―Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	10 05 35
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

1. To read and write simple Python programs.
2. To develop Python programs with conditionals and loops
3. To define Python functions and to use Python data structures –- lists, tuples, dictionaries
4. To do input/output with files in Python
5. To do searching ,sorting and merging in Python
6. Implement error handling.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: III
Credits Theory: 0 Practical: 2	**Subject:** Mechanics of Solids Lab
COURSE CODE – SECE-231P	**TITLE -** Mechanics of Solids Lab

Course Objectives:

1. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
2. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
4. Students will understand how to calculate normal and shear stresses on any cross-section of a beam. Different cross-sections (including I-beam) will be discussed and applied Continuous Assessment Test 10 marks Mid Semester Test 15 marks End
5. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviours due to different types of loading will be discussed.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 0
Practical-

Unit	Contents	No. of Lectures Allotted
Practical-1	Tension test on Mild Steel	2L
Practical-2	Bending tests on simply supported beam and Cantilever beam.	2L
Practical-3	Determination of torsion and deflection	2L
Practical-4	Measurement of forces on supports in statically determinate beam	2L
Practical-5	Determination of shear forces in beams	2L
Practical-6	Determination of bending moments in beams	2L
Practical-7	Measurement of deflections in statically determinate beam.	2L
Practical-8	To determine Flexural Rigidity (EI) of a given beam	2L
Practical-9	To find deflection of curved members.	2L
Practical-10	To find Critical load in Struts with different end conditions.	2L
Practical-11	Hardness Test (Brinnel's and Rockwell)	2L
Practical-12	Impact test (Charpy and IZOD)	2L

Reference / Text Books:

Text Books

- Strength of material, Ananad Jaya Kumar Arumugham

- A Textbook of Strength of material 6th edition
- Strength of Materials 3/E by R. Subramanian |

Reference Books

- Strength of material, S S Rattan 3rd edition
- Strength of Materials: Fundamentals and Applications by T. D. Gunneswara Rao and Mudim by Andal
- Strength of material, R.S. Khurmi & N. Khurmi

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	30
Total:	50

Prerequisites for the course: NA

Course learning outcomes

1. To understand the behavior of the solid bodies subjected to various types of loading.
2. Application of knowledge on the different materials and structural elements to the analysis structures.
3. In the identification and formulation of the problems related to the solid mechanics.
4. Analyze the laboratory data behavior of structures and the materials they are made of.
5. To check the capacity of structure members to undertake lifelong learning.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: III
Credits Theory: 0 Practical: 2	**Subject:** Building Construction and Maintenance Engineering Lab
COURSE CODE – SECE-232 P	**TITLE -** Building Construction and Maintenance Engineering Lab

Course Objectives:
1. To determine normal consistency of cement by Vicat's apparatus.
2. To determine initial & final setting time of cement by Vicat's apparatus.
3. To determine compressive strength of cement.
4. To determine fineness of cement by air permeability and Le-chatalier's apparatus.
5. To determine soundness of cement by Le-chatalier's apparatus.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 0
Practical- 2

Unit	Contents	No. of Lectures Allotted
Practical-1	To determine normal consistency of cement by Vicat's apparatus.	2L
Practical-2	To determine initial & final setting time of cement by Vicat's apparatus.	2L
Practical-3	To determine compressive strength of cement.	2L
Practical-4	To determine soundness of cement by Le-chatalier's apparatus.	2L
Practical-5	To determine fineness of cement by air permeability and sieve analysis.	2L
Practical-6	To determine amount of water absorption of aggregate.	2L
Practical-7	To perform sieve analysis test on aggregate.	2L
Practical-8	To determine specific gravity & bulk density of coarse aggregates	2L
Practical-9	To determine grading of aggregates.	2L
Practical-10	To perform sieve analysis test on sand.	2L
Practical-11	To determine silt content of sand.	2L
Practical-12	To determine water content required for bulking of sand.	2L
Practical-13	To determine amount of water absorption of bricks.	2L
Practical-14	To perform dimension tolerances test on bricks.	2L
Practical-15	To determine compressive strength of bricks.	2L

Reference / Text Books:

Text Books

- Building Construction and Material, Testing and Quality Control, M.L. Gambhir & Neha Jamwal
- Testing of Construction Material, Ravi Kumar Sharma
- Soil Testing Manual: Procedures, Classification Data, and Sampling Practices by Robert Day by Whitman

Reference Books

- Testing of Civil Engineering Material, Ram Chandra Mardi
- Buildings for Advanced Technology (Science Policy Reports) by Ahmad Soueid, E. Clayton Teague, et al.
- Building a K-12 STEM Lab: A Step-by-Step Guide for School Leaders and Tech Coaches by Deborah Kantor Nagler and Martha Osei-Yaw

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course: NA

Course learning outcomes

1. Identify the quality of cement & their properties.
2. Learn about the aggregate & their grading characteristics.
3. To identify the water absorption capacity of aggregate.
4. To implement the characteristics of bricks in construction.
5. To evaluate the quality of brick and differentiate their classes.

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: III
Credits Theory: 0 Practical: 2	**Subject:** Surveying Lab
COURSE CODE – SECE-233 P	**TITLE -** Surveying Lab

Course Objectives:
1. The purpose of the Survey Lab is to enable students to develop maps of appropriate scale using a variety of surveying instruments such as total stations, theodolites, auto-levels, global positioning systems (GPS), and geographic information systems. It is to acquire enough knowledge and ability to draw.), electromagnetic distance measurement (EDM).
2. The main object of surveying lab to make a superstructure or infrastructure alignment on proper way according to map.
3. With the help of this we can easily find out the levels of construction projects, which is very important part for civil engineering.
4. Well knowledge about setting out of curve.
5. To determine the relative position of any objects or points of the earth.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 0
Practical- 2

Unit	Contents	No. of Lectures Allotted
Practical-1	Measurement of distance by Ranging and Chaining	2L
Practical-2	To measure distance by chain survey.	2L
Practical-3	Locating various objects by Chain & Cross staff surveying. Determination of area of polygon by Chain and Cross staff survey.	2L
Practical-4	Measurement of bearings of sides of traverse with Prismatic Compass and computation of correct included angle.	2L
Practical-5	Determination of elevation of various points with dumpy level by Collimation Plane Method and Rise & Fall Method.	2L
Practical-6	To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.	2L
Practical-7	To measure horizontal angle by reiteration method.	2L
Practical-8	To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical Leveling by taking observations in single vertical plane.	2L
Practical-9	To set out a simple circular curve by Rankine's method.	2L
Practical-10	To plot contour map of given area.	2L

Reference / Text Books:

Text Books

- The Miner's Manual of Arithmetic and Surveying; With a Compendium of Mensuration and a Concise Treatise on Practical Geometry and Plane Trigonometry; ... Together with Levelling and Land Surveying by William Rickard
- Surveying and Levelling, Vol I by S.S. Bhavikatti
- Surveying & Levelling Vol - Ii by T P Kanetkar

Reference Books

- Surveying and Levelling, 2E (Oxford Higher Education) by R. Subramanian
- Civil Engineering Books Combo - Surveying and Levelling + Prestressed Concrete (Set of 2 Books)
- Surveying Volume – 1, 5th Edition by S. K. Duggal

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course: NA

Course learning outcomes

1. To understand work with many Civil engineering applications such as structural plot and road profiling using traditional surveying tools such as chain/tape measures, compasses, plane tables and levels etc.
2. To create properly plan a survey with the ability to understand the environment.
3. To evaluate accurate measurements, field submissions, plots, and error corrections can be tracked.
4. To apply fieldwork techniques and work as a research team.
5. To construct a contour map for different regions.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class:** B. Tech (CE)	Year: II Semester: IV
Credits Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-III
Course Code: SEAS-241	**Title:** Engineering Mathematics-III
Course Objectives: 1. To make the students familiar with complex functions and its calculus. 2. To deal with applications, residues and conformal mapping. 3. To understand the concept and applications of integral transforms 4. To deal with numerical solutions of algebraic equations and differential equations 5. To understand the statistical aspect of functions	
Nature of Paper: Applied	
Minimum Passing Marks/Credits: 40% Marks/4	
L:3 T:1 P: 0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Functions of a Complex Variable I**: Analytic functions; C-R equations and harmonic functions; Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.	**8L**
II	**Functions of a Complex Variable II**: Representation of a function by power series; Taylor's and Laurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilinear transformations.	**8L**
III	**Integral Transforms:** Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations.	**8L**
IV	**Numerical Techniques:** Solution of polynomial and transcendental equations Bisection method, Regula – Falsi method, Newton - Raphson method. **Interpolation:** Finite difference, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals; **Numerical Differentiation**, **Numerical Integration**; Trapezoidal, Simpson's 1/3 and 3/8 rules. **Numerical solutions of first order differential equations** by Euler's method and 4th order Runge-Kutta method.	**8L**

V	**Statistical Techniques:** Moments, Moment generating functions, Skewness, Kurtosis, Curve Fitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	**8L**

Reference / Text Books:

- B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
- B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.
- Dass H.K., Engineering Mathematics Vol-I, S. Chand.
- E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
- Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Assignments	20
3) ESE	100
Total:	**150**

Prerequisites for the course: NA

Course Learning Outcomes:

1. Understand and check the Analyticity of a complex function.
2. To apply the concept of Analytic functions in residue and conformal mappings.
3. To solve and apply the concepts of transforms in the area of engineering.
4. To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.
5. To understand and use the concept of statistical tools to analyze the different data.
6. To apply the knowledge of mathematics in solving various engineering problems.

IIMTU-NEP IMPLEMENTATION
Year: II/ Semester: IV

Programme: UG **Class:** B.Tech (CE)	Year: II Semester: IV
Credits Theory: 4 Practical: 2	**Subject:** Fluid Mechanics
Course Code: SECE-241	**Title:** Fluid Mechanics

Course Objectives:

1. To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc.
2. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
3. To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
4. To imbibe basic laws and equations used for analysis of static and dynamic fluids.
5. To inculcate the importance of fluid flow measurement and its applications in Industries.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 2 (In Hours/Week)
Theory - 4
Practical- 2

Unit	Contents	No. of Lectures Allotted
I	**FLUID PROPERTIES AND FLUID STATICS** **Fluid** – definition, distinction between solid and fluid – Units and dimensions – Properties of fluids – density,specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity andsurface tension – Fluid statics: concept of fluid static pressure, absolute and gauge pressures – pressuremeasurements by manometers-forces on planes – centre of pressure – buoyancy and floatation.	8L
II	**FLUID KINEMATICS AND DYNAMICS** Fluid Kinematics – Classification and types of flow – velocity field and acceleration – continuity equation (oneand three dimensional differential forms)- stream line-streak line-path line- stream function – velocity potentialfunction – flow net. Fluid dynamics – equations of motion -Euler's equation along a streamline – Bernoulli'sequation – applications – venturimeter, orifice meter and Pitot tube- linear momentum equation and itsapplication to pipe bend.	8L

III	**FLOW THROUGH PIPES** Reynold's experiment – laminar flow through circular pipe (Hagen poiseulle's) – hydraulic and energy gradient –flow through pipes – Darcy – Weisbach's equation – pipe roughness -friction factor Moody's diagram-major andminor losses of flow in pipes – pipes in series and in parallel	8L
IV	**Laminar & Turbulent flow:** Equation of motion for laminar flow through pipes, Stokes' law, transition fromlaminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale andintensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocitydistribution in turbulent flow over smooth and rough surfaces. **Boundary layer:** Boundary layer – definition- boundary layer on a flat plate – laminar and turbulent boundarylayer displacement, energy and momentum thickness – Momentum integral equation-Boundary layer separationand control – drag on flat plate.	8L
V	Drag and lift, drag on a sphere, a two-dimensional cylinder, and an aero foil, Magnus effect. Similarity Laws:geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis,Buckingham's Pi theorem, important dimensionless numbers and their significance.	8L

Reference / Text Books:
Text Books
- Hibbler, "Fluid Mechanics in SI Units" 1/e Pearson Education, Noida.
- Katz, "Introductory Fluid Mechanics" Cambridge University Press
- Gupta, "Fluid Mechanics & Hydraulic Machines" Pearson Education, Noida

Reference Books
- Esposito, "Fluid Power & Applications" 7/e Pearson Education, Noida.
- Fox & Donald, "Introduction to Fluid Mechanics" John Wiley & Sons Pvt. Ltd.,
- Cengel & Cimbala," Fluid Mechanics" TMH, New Delhi.

If the course is available as Generic Elective, then the students of following departments may opt it.
Not applicabl

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	**150**

Prerequisites for the course: NA

Course learning outcomes

1. To understand the basic terms used in the fluid mechanics and understand the postulate of fluid statics and kinematics.
2. To understand the principles of the hydraulics and fluid mechanics.
3. To get the functional recognition of the fluid properties.
4. Undergraduate be able to apply the continuity and momentum equation in the field of field mechanics.
5. Determine the losses through the pipes and on the boundary layers.
6. Measure and describe fluid flow phenomena.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II/ Semester: IV

Programme: UG **Class: B.Tech (CE)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 2**	**Subject:** Transportation Engineering and introduction to ITS
Course Code:SECE-242	**Title:** Transportation Engineering and introduction to ITS

Course Objectives:
1. Understand the interactions between transportation planning and land use planning, economics, social planning and master plans.
2. To learn about highway location and alignment position.
3. Have the capability to identify and solve transportation problems within the context of data availability and limitations of analysis tools.
4. Gain the facility of utilizing the state-of-the-art techniques and models in the field.
5. To construct the highway pavement and its evaluation.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 2 (In Hours/Week)
Theory - 4
Practical- 2

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur Road plan, Bombay Road plan & 3rd 20 Year Road Plan, NHAI Act (1988), Road Development Plan Vision: 2021 documents, Expressway Master Plan, Features of PMGSY.	8L
II	**Highway Alignment & Location Survey:** Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, Preparation of Detailed Project Report (DPR) Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves	8L
III	**Traffic Engineering:** Traffic Characteristics, traffic volume and speed study, traffic capacity, density, traffic control devices, signs, signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection.	8L
IV	**Highway Materials:** Road Construction materials: Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications, Design of Highway Pavement: Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC: 37-2012), Design of rigid pavement,	8L

	Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2011)	
V	**Highway Construction and ITS:** Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB), Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads.	8L

Reference / Text Books:

Text Books

- Khanna, S. K. and Justo, C.E.G. "Highway Engineering", Nem Chand and Bros, Roorkee, 8th edition, 2011
- Khanna, S. K and Arora, M.G & Jain, S. S, "Airport Planning and Design", Nem Chand and Bros, Roorkee, 2001
- Transportation Engineering (Dip. IV Sem. CE) by S. S. Gurnule

Reference Books

- Kadiyali, L. R., "Principles and Practice of Highway Engineering", Khanna Publishers Ltd. New Delhi, 2000
- Sehgal, S.B and Bhanot, B. L, "Highway and Airport Engineering", S. Chand and Company Ltd. New Delhi, 1978
- VenkatappaRao, G., "Principles of Transportation and Highway Engineering", Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2000

If the course is available as Generic Elective, then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
5) Seminar On Research Project Report	
6) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To understand the role of transportation and how to utilize it.
2. To identify the characteristics of traffic and how to design of signal & road intersection.
3. Compute the horizontal & vertical alignment and their uses in road transport.
4. To differentiate the limits of speed of any vehicle on different road as per IRC.
5. To evaluate responsibilities of travels & smart route system for travels.
6. To analyze traffic data and its use for traffic safety.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class: B.Tech (CE)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject:** Water resource engineering
Course Code:SDCE 241	**Title:** Water resource engineering

Course Objectives:

1. In we work in the field of engineering irrigation. we should know the amount of water entering the soil from where the plants can get water
2. If you are concerned about water resources, you need to know how much water will flow into your river so that you can control floods or avoid water shortages to irrigate other areas.
3. Knowledge of hydrology is a prerequisite for the design of irrigation techniques and hydraulic structures. Therefore, one of the goals of this course is to impart knowledge of hydrology, which deals with the occurrence, distribution, movement, and properties of water on Earth.
4. Know about different irrigation techniques, plant requirements.
5. To learn more about canal irrigation distribution systems, design unlined and lined irrigation canals, design canal related sediment problems.

Nature of Paper: Departmental Specific Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Necessity of irrigation- scope of irrigation engineering- benefits and ill effects of irrigation, irrigation development in India- types of irrigation systems, Soil-water plant relationship: Classification of soil	8L
II	**Water- soil moisture contents-** depth of soil water available to plants permanent and ultimate wilting point	8L
III	**Water requirements of crops:** Depth of water applied during irrigation- Duty of water and delta improvement of duty command area and intensity of irrigation consumptive use of water and evapotranspiration irrigation efficiencies- assessment of irrigation water	8L
IV	**Methods of Irrigation:** Classification- choice of method of irrigation- surface and subsurface irrigation methods, Sprinkler and Drip Irrigation	8L
V	**Design of Irrigation Channel:** Alignment- canal capacity- losses- FSL of canal- design of canal in alluvial soil and non-alluvial soils- Kennedy's silt theory- Lacey's regime theory- balancing depth- use of Garrets diagrams	8L

Reference / Text Books:

Text Books

- Modi, P.N., IrrigationWater Resources and Water Power Engineering, Standard Book House, New Delhi.
- Garg, S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi.
- Sharma, R.K., Text book of Irrigation Engineering and Hydraulic Structures, Oxford and IBK Publishing House, New Delhi.

Reference Books

- Sharma, S.K., Principlesand Practice of Irrigation Engineering, S. Chand & Company Pvt. Ltd, New Delhi
- Punmia, B.C., and B.B. Pande, "Irrigation and Water Power Engineering", Laxmi Publication Pvt. Ltd., New Delhi
- A.M. Micheal, "Irrigation, Theory and Practice", Vikas Publishing House Pvt. Ltd. New Delhi

If the course is available as Generic Elective, then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To understand about various flows measurement techniques.
2. To gain knowledge about the basic requirements of irrigation and different irrigation techniques, the requirements of crops etc.
3. To explain about canal irrigation distribution systems and the basics of designing unlined and lined irrigation canals.
4. To apply application of mathematics, science and technology in the field of water resource engineering.
5. To analyze hydrology of a catchment area.
6. To develop the spirit of working in team for common objectives.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II/ Semester: IV

Programme: UG **Class: B.Tech (CE)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject:** Concrete Technology
Course Code:SDCE 242	**Title:** Concrete Technology

Course Objectives:

1. The route pertains to the basics associated with concrete and concrete fabric, besides dealing with masonry, reinforcement, and many others.
2. The direction begins with an outline of what concrete is, what are the techniques concerned in formation of concrete, numerous substances that are utilized in concrete formation, homes of every aspect of concrete, widespread tests to be applied to concrete and urban substances.
3. The route then actions on to design-mix, special concretes, Nondestructive trying out, etc.
4. For safety purpose concrete technology is very important.
5. To study the role of high strength concrete.

Nature of Paper: Departmental Specific Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Cement: Productions, composition properties, types and cement chemistry. Introduction to supplementary cementitious materials. Aggregates: mineralogy, properties, test and standards. Quality of water for use in concrete.	8L
II	Introduction & study of accelerators, retarders, water reducers, air entertainers, water proofers, super plasticizers. Study of supplementary cementing materials like fly ash, silica fume, ground granulated blast furnace slag, meta-kaoline and pozzolana; their production, properties and effect on concrete properties.	8L
III	Principle of mix proportioning, properties related to mix design, Mix design method (IS method and ACI method). Mix design of concrete: packing density, Rheology, mix design examples.	8L
IV	Concert production, batching, mixing and transportation of concrete. Workability: test for workability of concrete (slump test, compacting factor test and Vee Bee test). Segregation and bleeding in concrete, curing of concrete and its methods. Determination of compressive and flexural strength as per BIS. Mechanical properties of concrete: elastic modules, Poisson's ratio, creep, shrinkage and durability of concrete.	8L

V	Study and uses of high strength concrete, self-compacting concrete, fiber reinforced concrete, Ferro cement, ready Mix Concrete, recycled aggregate concrete and status in India.	8L

Reference / Text Books:

Text Books

- Neville, A.M. and Brooks, J.J.," CONCRETE TECHNOLOGY", ELBS.
- Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.
- Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.

Reference Books

- Santha Kumar, A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007.
- Gupta B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
- Newman, K., "CONCRETE SYSTEMS in COMPOSITE MATERIALS". EDT BY L.Holliday. Elsevier Publishing Company. 1966.

If the course is available as Generic Elective, then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To understand about concrete and how it is shaped, what substances are involved and residences and requirements of each concrete factor.
2. To describe about the concrete material.
3. To design the principle of mix proportioning.
4. Apply codal provisions to structural members i.e. beam, column, etc.
5. To analyze various unique concrete and their programs.
6. Students also find out the properties of cement, concrete etc.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II/ Semester: IV

Programme: UG **Class: B.Tech (CE)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject:** Hydraulics and hydraulic machine
Course Code:SDCE 243	**Title:** Hydraulics and hydraulic machine

Course Objectives:
1. Identify importance of various fluid flows.
2. derive and apply general governing equations for various fluid flows
3. Understand the concept of fluid flow.
4. To understand the phenomenon of hydraulic jump.
5. Evaluate the performance characteristics of hydraulic turbines and pumps and OCF.

Nature of Paper: Departmental Specific Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Difference between open channel flow and pipe flow, geometrical parameters of a channel. Continuity equation for steady and unsteady flow. Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.	8L
II	Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound channels.	8L
III	Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, Flow in channels of non-linear alignment specifically for the case of a bend.	8L
IV	Classical hydraulic jump, Evaluation of the jump elements in rectangular and non- rectangular channels on horizontal and sloping beds. Rotodynamic pumps, classification on different basis, basic equations, Velocity triangles, manometric head, efficiencies, cavitation in pumps, characteristics curves.	8L
V	Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free over fall. Roto-dynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.	8L

Reference / Text Books: **Text Books** • Chow,V.T."Open Channel hydraulics" McGraw Hill Publication • Subramanya, K., Flow through Open Channels, TMH, New Delhi • RangaRaju, K.G., Flow through open channels, T.M.H. New Delhi **Reference Books** • Rajesh Srivastava, Flow through Open Channels, Oxford University Press • Streeter, V.L.& White E.B.," Fluid Mechanics" McGraw Hill Publication • RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication
If the course is available as Generic Elective, then the students of following departments may opt it. **Not applicable**

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course: NA	

Course learning outcomes

1. Understand the behavior of fluid mechanics in addressing the problems of open channel flow.
2. Illustrate the various classifications of pumps and study on hydraulic jump.
3. To solve the problem of varied flow equation.
4. To analyze the velocity distribution system for different section in open channel.
5. Implement the characteristics of turbine in open channel flow.
6. Perform dimensional and model analysis for different fluid flow problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class: B.Tech (CE)**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject:** Rural water supply and sanitation
Course Code: SDCE 244	**Title:** Rural water supply and sanitation
Course Objectives: 1. Provide knowledge on environmental and sanitary conditions in rural areas. 2. Provides knowledge on specific issues in rural water supply and treatment. 3. Provide knowledge about canal works and water distribution for rural areas. 4. Provide technique to remove the solid waste. 5. Sanitation of water is very important to save water.	
Nature of Paper: Departmental Specific Elective	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (In Hours/Week) Theory - 4 Practical- 0	

Unit	Contents	No. of Lectures Allotted
I	Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies. Low-Cost water Treatment: Introduction – Epidemiological aspects of water quality methods for low-cost water treatment - Specific contaminant removal systems.	8L
II	Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas stabilization ponds - septic tanks - Imhoff tank- soak pits- low-cost excreta disposal systems Effluent disposal. Identify problems pertaining to rural water supply and sanitation. Design water supply and sanitation system for rural community.	8L
III	Industrial Hygiene and Sanitation: Occupational Hazards- Schools Public Buildings-Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.	8L
IV	Solid Waste Management: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.	8L
V	Conveyance of water; pipe materials, corrosion, laying of pipes, pipe appurtenances, pumps for water supply, distribution system, planning of water supply projects. Design of water distribution network. Rural water	8L

	supply distribution system.	

Reference / Text Books:
Text Books
- 'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.
- Operation and maintenance of rural water supply and sanitation systems by Brikké F
- 'Water Supply for Rural Areas & Small Communities' by Wanger E.G., and Lanoix J.N.

Reference Books
- 'Water Supply and Sewerage', by E.W.Steel&T.J.Mcghee, McGraw Hill.
- 'Manual on Water Supply and Treatment', CPHEEO, Ministry of Urban Development, Govt. of India.
- 'Manual on Sewerage and Sewage Treatment', CPHEEO, Ministry of Urban Development, Govt. of India

If the course is available as Generic Elective, then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes
1. To understand the technique of rural water supply.
2. To explain the process of industrial sanitation.
3. To apply all management of rural sanitation.
4. To analyse the process of solid waste management.
5. To identify the purification of water, which is very helpful for our society.
6. To develop technology choice to deal with water quality issues in order to operate and maintain working treatment systems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: IV
Credits Theory: 0 Practical: 2	**Subject:** Fluid mechanics lab
COURSE CODE – SECE-241 P	**TITLE -** Fluid mechanics lab

Course Objectives:
1. To comprehend fluid dynamics and fluid characteristics
2. To thoroughly research the theory of boundary layers.
3. To analyze laminar and turbulent flows.
4. To understand the fundamental rules and formulas used in the analysis of static and dynamic fluids.
5. To estimate particle routes and stream lines, among other kinematic issues.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 0
Practical- 2

Unit	Contents	No. of Lectures Allotted
Practical-1	To verify the Bernoullis equation.	3 L
Practical-2	To determine the coefficient of discharge of venturimeter.	3 L
Practical-3	To determine the coefficient of discharge of rectangular notch	3 L
Practical-4	To determine the coefficient of discharge of rectangular notch	3 L
Practical-5	To determine co-efficient of discharge, contraction & velocity of an orifice.	3 L
Practical-6	To determine head loss in pipe (Expansion, Contraction and Bend)	3 L
Practical-7	To determine the meta centric height of a floating body	3 L
Practical-8	To study the variation of friction factor, ‘f’ for turbulent flow in commercial pipes.	3 L
Practical-9	To find a critical Reynold’s number for a pipe flow	3 L

Reference / Text Books:

Text Books
- Fluid Mechanics and Hydraulic Machines Lab Manual by Damodara Reddy Annapureddy
- Micro and Nano flows: Modeling and Experiments: 118 (Fluid Mechanics and Its Applications) by Valery Ya. Rudyak, Vladimir M. Aniskin, et al.
- Speckle Photography for Fluid Mechanics Measurements (Experimental Fluid Mechanics) by Nikita A. Fomin

Reference Books
- Fluid Mechanics and Hydraulic Machines: A Lab Manual by T.S. Desmukh
- Physics of Separated Flows: Numerical, Experimental and Theoretical Aspects: Dfg Priority

Research Programme 1984-1990: Vol 40 (Notes on Numerical Fluid Mechanics) by Gersten Klaus • Particle Image Velocimetry: A Practical Guide (Experimental Fluid Mechanics)by M. Raffel, C. E. Willert, et al.		
If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**		
Evaluation/Assessment Methodology		
		Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE		20 30
	Total:	50
Prerequisites for the course: NA		
Course learning outcomes 1. To understand the basic movement of fluid flow. 2. To learn the use of fluid machinery in the field of fluid mechanics 3. To get the knowledge about fluid flow through momentum and continuity equations. 4. To determine the different properties of fluid by fluid machinery. 5. Determine the properties of different kinds of jump in hydraulics and fluid flow.		

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: IV
Credits Theory: 0 Practical: 2	**Subject:** Transportation Engineering Lab
COURSE CODE – SECE-242P	**TITLE -** Transportation Engineering Lab

Course Objectives:
1. To understand the shape and size of the aggregate.
2. To check the abrasive strength of the aggregate.
3. To find out the specific gravity of the coarse aggregate
4. To find out the hardness of aggregate.
5. To understand the different properties of the bitumen.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 0
Practical- 2

Unit	Contents	No. of Lectures Allotted
Practical-1	Flakiness and elongation test	3 L
Practical-2	C B R Value test	3 L
Practical-3	Impact value Test	3 L
Practical-4	Abrasion Test	3 L
Practical-5	Specific gravity test	3 L
Practical-6	Penetration test of bitumen	3 L
Practical-7	Aggregate Hardness test	3 L
Practical-8	Ductility of bitumen	3 L
Practical-9	Aggregate Water absorption Test	3 L
Practical-10	Fire and flash point of bitumen	3 L

Reference / Text Books:

Text Books
- Transportation Engineering Lab Manual by Prof Harshal Pandule, Prof Chetan More, et al.
- Laboratory manual in highway ingineering by Ajay k Duggal Vijay P Puri
- Transportation engineering lab manual by Christy C. J.

Reference Books
- Transportation engineering lab manual by Prof. Harshal Pandey
- Transportation engineering-1 lab manual by Ravi Gupta
- Transportation engineering-1 lab manual by Rahul Joshi

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	
5) ESE	30
Total:	50
Prerequisites for the course: NA	

Course learning outcomes

1. To understand the properties of aggregates.
2. To identify the quality of aggregates.
3. Apply the concept of utilization of the grade of bitumen and their properties.
4. To examine the hardness of aggregate by different method.
5. To evaluate the capacity of water absorption for aggregate.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: IV

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: IV
Credits Theory: 0 Practical: 2	**Subject:** CAD Lab-I
COURSE CODE – SECE-243P	**TITLE -** CAD Lab-I

Course Objectives:
1. To learn software like AutoCAD, Invertor/ Pro E/ Uni-graphics and to produce basic concepts to make 2D drafting
2. To apply basic concept to drawing, edit, dimension, hatching etc. to develop 2D & 3D Modelling
3. To make 3D modelling, Assembling, modification & manipulation along with detailing.
4. To prepare surface modelling and sheet metal operations through various exercises
5. To understand and resolve the one dimensional problem using FEM.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Maks /2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 0
Practical- 2

Unit	Contents	No. of Lectures Allotted
Practical-1	Introduction of AUTOCAD and write down the different command of AUTOCAD.	3 L
Practical-2	Draw different types of shape using AutoCAD (Rectangle, Ellipse, Circle, Square, Hexagon, Pentagon, Octagon, etc)	3 L
Practical-3	Draw single line plan of two room set house using AutoCAD.	3 L
Practical-4	Draw single line plan of residential building using AutoCAD (2BHK)	3 L
Practical-5	Draw single line plan of commercial building using AutoCAD (Hospital)	3 L
Practical-6	Draw single line plan of commercial building using AutoCAD (School)	3 L
Practical-7	Draw double line plan of residential building using AutoCAD (2BHK)	3 L
Practical-8	Draw double line plan of commercial building using AutoCAD (Hospital)	3 L
Practical-9	Draw single line plan of commercial building using AutoCAD (School)	3 L
Practical-10	Drawings using AUTOCAD software for the following :- a) Simply supported, Continuous and Cantilever RCC Beams (T-beam and l-Beam) b) RCC Slabs – (Simply supported, Continuous, One way and two way). c) RCC Columns –(Tied columns and Spirally reinforced columns) d) Isolated and combined footings for RC Columns.	3 L

Reference / Text Books:

Text Books

- AutoCAD Book: Command on AutoCAD by Junaid Khan
- COI Daily Planner to Do List Notepad - Undated Day Planner Note Pad - Work Planner, Calendar, Scheduler, Checklist, Productivity Organizer, Cute Office Supplies Set of 6 by COI
- Autocad with Lab Applications by Shannon Kyles

Reference Books

- Advanced Auto Cad Lab For Polytechnic First Year, second Semester, Common to all Branches by V. MAMATHA
- Manual de AutoCAD: 2D y 3D (Spanish Edition) Spanish Edition | by Raul M. and Margareth A.
- Manual de AutoCAD 2013 (Manuales nº 1) (Spanish Edition) Spanish Edition | by MEDIAactive

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course: NA

Course learning outcomes

1. Understand the introduction & history of auto cad software.
2. Remember the auto cad software command for engineering purpose.
3. To compute the drawing of single line plan for different types of building.
4. To examine the drawing parameter of double line plan for different types of building.
5. To evaluate the various structural elements by using auto cad software.

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits- **Theory: 4** **Practical: 2**	**Subject: GEOTECHNICAL ENGINEERING**
Course Code:SECE-351	**Title: GEOTECHNICAL ENGINEERING**
Course Objectives: 1. To understand the Classification of the soil and determine its Index properties. 2. To evaluate permeability and seepage properties of soil. 3. Interpretation of the compaction and consolidation characteristics & effective stress concept of soil. 4. To determine the vertical and shear stress under different loading conditions and explain the phenomenon of soil liquefaction. 5. Interpret the earth pressure and related slope failures	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 2 (In Hours/Week) Theory - 4 Practical- 2	

Unit	Contents	No. of Lectures Allotted
I	**Soil Formation and Composition, Basic Soil Properties** Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, interparticle forces, soil structure, Principle clay minerals. Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate Properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, Consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.	8L
II	**Origin and classification:** Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, sensitivity and thixotropic, Particle Size analysis, Unified and Indian standard soil classification system.	8L
III	**Compressibility and Consolidation** **Introduction**-components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande`s graphical method of estimating pre-consolidation pressure,	8L

	Terzaghi`s theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, Construction period settlement, secondary consolidation	
IV	**Soil Hydraulics:** Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Darcy's Law, hydraulic conductivity, equivalent hydraulic conductivity in Stratified soil. Seepage, flow nets, seepage calculation from a flow net, flow nets in anisotropic Soils, seepage through earth dam, capillarity, critical hydraulic gradient and quick sand condition, Uplift pressure, piping.	8L
V	**Shear Strength:** Mohr-Coulomb failure criterion, shear strength parameters and determination; Direct and tri-axial shear test; unconfined compression test; pore pressure, Skempton's pore Pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine's approaches for Frictional and c-φ soils, inclined backfill, Stability of slopes, Culman method & Method of slices, Stability number & chart.	8L

Reference / Text Books:

References Books

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

Text Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. NarasingaRao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002..
4. Alam Singh – Modern Geotechnical Engineering
5. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
6. I.H. Khan – Text Book of Geotechnical Engineering
7. C. Venkataramaiah – Geotechnical Engineering
8. GopalRanjan and A.S.R. Rao – Basic and Applied Soil Mechanics
9. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After completion of the course the student should be able –

1. To learn a rational adulthood to the undergraduate for the courses in field of Geotechnical Engineering & Soil enhancement Technologies.
2. To understand the foundations of soil classifications to the students related to the geotechnical

engineering.

3. To give an experience in the commission of engineering concepts which are applied in area of Geotechnical Engineering?
4. To analyze the stress conditions in the soil stratum.
5. To check the different types of pressure on the soil and collect the information of foundation design.
6. To understand the Classification of the soil and determine its Index properties.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits - **Theory: 4** **Practical: 2**	**Subject: STRUCTURAL ANALYSIS**
Course Code:SECE-352	**Title: STRUCTURAL ANALYSIS**

Course Objectives:

1. To understand the principle of virtual work and the application of influence line diagrams in structural analysis problems.
2. The course runs through a number of techniques which are used for the analysis of civil engineering structures.
3. Explain type of structures and method for their analysis. .
4. Compute slope and deflection in determinate structures using different methods.
5. To understand about the plastic analysis

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 2 (In Hours/Week)
Theory - 4
Practical- 2

Unit	Contents	No. of Lectures Allotted
I	**Classification of Structures**: Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom, Static and Kinematic Indeterminacy for beams, trusses and building frames. **Suspension Cables:** Analysis of suspension cables with concentrated loading & continuous loading.	8L
II	**Trusses:** Classification of Pin jointed determinate trusses, Analysis of determinate plane trusses. **Influence line diagrams**: Rolling loads and influence line diagrams for determinate beams and trusses, Absolute maximum bending moment and shear force. Muller-Breslau's principal & its applications for determinate structures.	8L
III	**Moment Distribution Method:** Distribution and carry-over of moments, Stiffness and carry over factors - Analysis of continuous beams with sinking of supports, single storey Portal frames with and without sway. Slope deflection method as applied to indeterminate beams & continues beams portal frames.	8L
IV	**Columns and Struts:** Types of column, Buckling of columns, different end conditions, effective length, Euler's and Rankine's formulae, Factor of safety. Strain Energy of deformable systems,	8L

V	**Basics of plastic analysis:** Applications of static and kinematic theorem for Plastic analysis of Beams and Frames	8L

Reference / Text Books:

Text/Reference Books:

1. ". Hibbler, “Structural Analysis”, Pearson Education
2. “Theory of structures” by Dr. B C Punamia, Laxmi Publications (P) Ltd.
3. Timoshenko & Young “Theory of Structure” Tata Mc Grew Hill.
4. Jain, O.P. and Jain, B.K., “Theory & Analysis of Structures”. Vol-.I &II ,Nem Chand.
5. Wilbur and Norris, “Elementary Structural Analysis”, Tata McGraw Hill.
6. Reddy, C.S., “Basic Structural Analysis”, Tata McGraw Hill.
7. Vazirani&Ratwani, “Analysis of Structures” ,Khanna Publishers 8. Coates, R.C., Coutie, M.G. & Kong, F.K., “Structural Analysis”, English Language Book Society & Nelson, 1980

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

By the end of the course, the students should have the

1. To define the types of structure and their analysis methods.
2. To know the behavior of ILD and truss and calculated the forces on their member.
3. Analyze the slope and deflection in structure by using different methods.
4. To evaluate the column buckling in structures with different end conditions.
5. To check the behavior of plastic analysis for beam and frame.
6. Compute slope and deflection in determinate structures using different methods.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject: DESIGN OF CONCRETE STRUCTURES-1**
Course Code:SECE-353	**Title: DESIGN OF CONCRETE STRUCTURES-1**

Course Objectives:
1. Analyse and Design RCC beams for flexure by IS methods.
2. Analyse and Design RCC beams for shear by IS methods.
3. Analyse and Design RCC slabs and staircase by IS methods.
4. Design the RCC compression members by IS methods.
5. Analyse and Design RCC beams for shear by IS methods.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L:3
T:1
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Concrete Making materials, Properties of concrete and reinforcements, testing of concrete, Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.	8L
II	Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method.	8L
III	Behaviors of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, and flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.	8L
IV	Design of one way and two-way slabs and & continuous slab by Limit State Design Method	8L
V	Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.	8L

Reference / Text Books: **Text Books & References Books:** 1. Minocha&Diwedi, Design of RCC Structures, B. Bharat Prakashan, Meerut. 2. Jain A.K., Reinforced Concrete Design by LSM, Nem Chand & Bros, Roorkee. 3. Raju N.K., Reinforced Concrete Design IS 456-2000 Principles & Practices, New Age International Publishers, New Delhi. 4. BIS, IS 456-2000 Code of Practice for Plain & Reinforced Concrete.	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: On completion of this course, students should be able to: 1. To learn the properties of the concrete used for the construction of different structural member. 2. To understand about the analyzing methods like LSM and WSM. 3. To use the concept of development length and stirrups. 4. To learn the designing of various structural member like slab foundation and beam etc. 5. To check the stability of columns. 6. Design the RCC members by IS methods.	

IIMTU-NEP IMPLEMENTATION
Year: III/ Semester: V

Programme: UG **Class: B-Tech (CE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject: Urban transportation planning**
Course Code:SDCE-351	**TITLE - Urban transportation planning**

Course Objectives:
1. To understand the basics principles of transportation.
2. To study the urban transportation planning & processes.
3. To study the behavior transport network.
4. To use the laboratory concepts for solving the problems related urban transportation.
5. To study the evaluation of transport planning.

Nature of Paper: Core

Minimum Passing Marks/Credits: **40% Marks /4**

L: 3
T: 1
P: 0
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Introduction and scope; Definition and basic principles; Transportation problems; Types of models; Planning methodologies; Conventional transportation planning process; Travel demand modeling and forecasting;	8L
II	Urban Transportation Planning Process, Urban Travel and Transportation Systems Characteristics, Travel Demands Fore casting-trip generation, trip distribution, modal split and trip assignment.	8L
III	Transport Behavior of Individuals and Households, Land use/ Transportation systems; Traffic Assignment – route building, capacity restraint, multipath, incremental and equilibrium assignment; Graph theory applications in transport network analysis;	8L
IV	Laboratory Component: Solving case study problems in travel demand modeling with the help of transportation planning and econometric packages. Developing computer programs for the calibration of travel demand, land-use and land use-transport models.	8L
V	Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods like Net present Value methods, Benefit Cost method, Internal rate of return method, Land use transport models. Transport system management: Long term and short term planning.	8L

Reference / Text Books:

Text Books:

1. Oppenheim, N., Urban Travel Demand Modeling: From Individual Choices to General Equilibrium, Wiley, New York, 1995.
2. Thomas, R., Traffic Assignment Techniques, Avebury Technical, Aldershot, 1991.
3. Bruton, M.J., Introduction to Transportation Planning,

Reference Books:

1. Hutchinson, B.G., Principles of Urban Transport Systems Planning, McGraw Hill, New York, 1974.
2. Ortuzar, J. and Willum Sen, L.G., Modelling Transport, Wiley, Chinchestor, 1994.
3. Introduction to Transportation Engineering: William W. Hay.

If the course is available as Generic Elective then the students of following departments may opt it.

- SDCE -351 Urban Transportation Planning
- SDCE -352 Pavement Design
- SDCE -353 Hydrology
- SDCE-354 Estimating and costing

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. Study about the modeling and travel forecasting demand.
2. Identify the role of transportation in urban areas.
3. To compute the network theory for transportation system.
4. To analyze the problems of traveling demand of transportation.
5. Evaluate the planning of transport rate.
6. Design the various components of urban transport.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III/ Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject: Pavement Design**
Course Code:SDCE-352	**TITLE - Pavement Design**

Course Objectives:

1. To study latest methods of analysis and design of flexible and rigid pavements including its maintenance
2. To understand the behavior of different pavement materials
3. To predict stresses developing in flexible and rigid pavements
4. To study the design, testing and evaluation of pavements.
5. To study the maintenance criteria of pavement.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Maks /4

L: 3
T: 1
P: 0
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Pavement Materials: Types and component parts of pavements, highway and airport pavements, Materials used in pavements, basic soil properties relevant to pavement applications, resilient modulus, and modulus of sub-grade reaction, Physical properties: Aggregates and blending, Basic properties of bitumen, polymer and rubber modified bitumen, Dynamic modulus, flow time and flow number of bituminous mixes. Cement: chemical composition, types, physical properties.	8L
II	**Stresses in flexible pavements:** layered system concepts, stress solution for one, two and three layered systems, fundamental design concepts. Stresses in rigid pavements: Westergaard's theory and assumptions, stresses due to curling, stresses and deflections due to loading, frictional stresses, stresses in dowel bars and tie bars. **Factors Affecting Pavement Design:** Variables considered in pavement design, Classification of axle types, articulated commercial vehicles, legal axle and gross weights on single and multiple units, tyre pressure, contact pressure, ESWL, EWLF and EAL concepts, Traffic analysis: ADT, AADT, growth factor, lane distribution, directional distribution and vehicle damage factors.	8L
III	**Pavement testing and evaluation**: Field Density, CBR, Plate load Test, Condition surveys and surface evaluation for unevenness, rut depth, profilometers, Bump integrators, Benkalman Beam Deflection study.	8L

IV	**Design of Pavements:** IRC method of flexible pavement design, Design of flexible pavements for low volume roads using IRC method, IRC methods of rigid pavement design, Design of rigid pavements for low volume roads using IRC method.	8L
V	**Strengthening of pavements:** Repairs, Maintenance and rehabilitation of pavements	8L

Reference / Text Books:

Text Books:

1. Khanna& Justo, Highway Engineering, 10th Edition, Nem Chand Brothers,
2. Huang, Y.H. Pavement Analysis and Design, Second Edition, Dorling Kindersley (India) Pvt. Ltd., New Delhi, India, 2008
3. Economy of design of bituminous and concrete pavements by S.N. Sachdeva

Reference Books:

1. IRC: 37-2012 Guidelines for the Design of Flexible Pavements, the Indian Roads Congress, New Delhi, India, 2012.
2. IRC: 58-2011 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, The Indian Roads Congress, New Delhi, India, 2011.
3. IRC: SP: 62-2004 Guidelines for the Design and Construction of Cement Concrete Pavements for Rural Roads, The Indian Roads Congress, New Delhi, India, 2004.

If the course is available as Generic Elective then the students of following departments may opt it.

- SDCE -351 Urban Transportation Planning
- SDCE -352 Pavement Design
- SDCE -353 Hydrology
- SDCE-354 Estimating and costing

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To define the different types of pavement materials and their properties.
2. To learn the stress distribution in the pavement.
3. To do the pavement testing and evaluations.
4. Students have to design the flexible pavement.
5. Undergraduate should be able to do the Repairs, Maintenance and rehabilitation of pavements.
6. To understand the behavior of different pavement materials

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject: Hydrology**
Course Code: SDCE-353	**TITLE : Hydrology**

Course Objectives:
1. Contributed to the development of government civil engineering projects. Private or other companies within the sector.
2. Explain the importance of hydrological processes and associated spatiotemporal scales.
3. Quantify them by expressing them using mass and energy balance and estimate them based on statistical techniques and systems approaches.
4. To characterize the hydro graph and find out many constant for designing.
5. To understand the importance of ground water.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Introduction: hydrologic cycle, water budget equations, And world water balance, Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation.	8L
II	Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapotranspiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities indices, measurement & estimation	8L
III	Runoff and Hydrographs: Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs.	8L
IV	Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing.	8L
V	Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and	8L

	unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting.	

Reference / Text Books:

Text Books:

1. 'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.
2. 'Engineering Hydrology' by K. Subramanya, McGraw Hill Education.
3. 'Hydrology: Principles. Analysis. Design' by Raghunath H. M.

Reference Books:

1. 'Handbook of Applied Hydrology' by Chow V. T. , McGraw Hill Education.
2. 'Irrigation: Theory & Practice' by Michael A. M.
3. 'Engineering Hydrology' by Ojha, Oxford University Press.

If the course is available as Generic Elective then the students of following departments may opt it.

- SDCE -351 Urban Transportation Planning
- SDCE -352 Pavement Design
- SDCE -353 Hydrology
- SDCE-354 Estimating and costing

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To define hydrology and explain the water cycle in the context of engineering hydrology.
2. To understand about an introduction to the sector of engineering hydrology.
3. To compute the area runoff, which is important for any hydrological work.
4. To explain the well knowledge about ground water recharge.
5. To interpret hydrologic flood routing models for recharging through rain water harvesting.
6. To understand the importance of ground water.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject: Estimating and costing**
Course Code:SDCE-354	**TITLE : Estimating and costing**

Course Objectives:
1. Objective of this course to guidance of students in quantity surveys for the preparation of preliminary and detailed estimates.
2. Teach students how to analyze the cost of the above items for estimation purposes.
3. Specification is very important for any civil engineering work.
4. To teach how we can find out the rate of analysis of construction materials.
5. The main purpose is to provide the effort for cost control and to ensure that suitable material options are considered during project execution.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	**Estimate** Principle of estimation, units, item work, different kinds of estimates, different methods of estimation, estimation of materials in single room building, two room building, multi storey buildings, with different sections of walls ,foundation, floors and roofs, R.B and R.C.C works, Plastering, whitewashing, Distempering and painting, doors and windows, lump sum items, Estimates of canals, dams, barrages, Hilly roads etc.	8L
II	**Specification of Works:** Necessity of specification types of specification, general specification, specification of bricks, cement, sand, water, lime, reinforcement, detailed specification for earthwork, cement, concrete, brickwork, flooring, D.P.C, R.C.C, cement plastering, white and colour washing, distempering, painting.	8L
III	**Rate analysis** Purpose, importance and requirements of rate analysis, units of measurement preparation of rate analysis. Procedure of rate analysis for items: Earth work, concrete works, R.C.C works, reinforce brick work, plastering ,painting ,finishing (white washing, distempering)	8L
IV	**Public Works Account** Tender and acceptance of tender, Earnest money, security money, retention money, measurement book, cash book, preparation, examination and payment of bills, first and final bills, administrative sanction, technical sanction.	8L

V	**Billing:** maintenance of muster role, preparation of pay bill, measurement of work for payment of contractors. Different types of payment: first & final, running advance and final payment. Valuation: Purpose of valuation, principles of valuation depreciation, sinking fund, salvage & scrap value, valuation of a building: cost method, rental – return method.	8L

Reference / Text Books:

Text Books:
1. Dutta BN, Estimating & costing.
2. Rangwala SC Estimating & Costing, Anand Charotar Book Stall.
3. Chakraborty, Estimate costing & specification in Civil Engineering.

Reference Books:
1. Kohli & Kohli, A text book on estimating & costing (Civil) with drawings Ambala Ramesh Publications.
2. Srivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.
3. Delhi Schedule of Rates (latest version).

If the course is available as Generic Elective then the students of following departments may opt it.
- SDCE -351 Urban Transportation Planning
- SDCE -352 Pavement Design
- SDCE -353 Hydrology
- SDCE-354 Estimating and costing

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course: NA

Course learning outcomes
1. To understand the method of estimating and costing.
2. To analyze the charges for each item to create a quote.
3. To evaluate the quantity of construction material.
4. To explain the good knowledge about construction material.
5. To define the knowledge about public work accounts like contract, tenders etc.
6. To calculate out the quantity of material easily.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits **Theory: 0** **Practical: 2**	**Subject: GEOTECHNICAL ENGINEERING LAB**
Course Code: SECE-351 P	**TITLE : GEOTECHNICAL ENGINEERING LAB**

Course Objectives:
1. Determine the water content of soil by different method.
2. Determine the specific gravity and density of soil.
3. Determine the grain size of soil sample.
4. Determine the limits of soil sample.
5. Determine the moisture and shrinkage in soil.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 3
Theory - 0
Practical- 2

Unit/ Practical	Contents	No. of Lectures Allotted
Practical-1	Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pychno-meter method.	3
Practical-2	Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pychno-meter method.	3
Practical-3	Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.	3
Practical-4	Determination of relative density of a given soil sample.	3
Practical-5	Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.	3
Practical-6	Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).	3
Practical-7	Determination of shear strength of soil by Direct shear test.	3
Practical-8	Determination of compaction characteristics (OMC & MDD) of a given soil sample.	3
Practical-9	To determine the moisture content of soil using Hydrometer.	3
Practical-10	To determine the Shrinkage limit of the given Soil Sample.	3

Reference / Text Books:
Text Books:
Soil Mechanics Lab Manual by Michael E. Kalinski
Soil Mechanics Laboratory Manual by Braja M Das

Basic And Applied Soil Mechanics by Gopal Ranjan **Reference Books:** A Laboratory Manual on Soil Mechanics (Testing and Interpretation) by Ravi Kumar Sharma Soil Mechanics: Solutions Manual by R. F Craig Methods in Soil Biology (Springer Lab Manual) by Franz Schinner, Richard Öhlinger, et al.	
If the course is available as Generic Elective then the students of following departments may opt it. NA	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course: NA	

Course learning outcomes

1. The undergraduate will gain the knowledge in the discharge of Geotechnical Engineering on engineering concepts which are applied in area of Geotechnical Engineering.
2. To understand the water content and specific gravity determination.
3. The students will get theoretical and practical knowledge of geotechnical engineering along with the design and implementation through applications.
4. To analyze the liquid, plastic and shrinkage limits of soil.
5. To determine the water content through the laboratory experiments.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits **Theory: 0** **Practical: 2**	**Subject: STRUCTURAL ANALYSIS LAB**
Course Code:SECE-352P	**TITLE : STRUCTURAL ANALYSIS LAB**

Course Objectives:
1. To study the determination of flexural rigidity.
2. To study the determination of horizontal thrust in two hinge & three hinge arch.
3. To study the determination of bending moment.
4. To study the determination of critical load in strut.
5. To study the determination of deflection.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 3
Theory - 0
Practical- 2

Unit	Contents	No. of Lectures Allotted
Practical-1	To determine Flexural Rigidity (EI) of a given beam	3
Practical-2	To verify Maxwell's Reciprocal theorem.	3
Practical-3	To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust end Bending moment.	3
Practical-4	To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.	3
Practical-5	To find deflection of curved members.	3
Practical-6	To find bar forces in a three members structural frames with pin jointed bar	3
Practical-7	To find Critical load in Struts with different end conditions.	3
Practical-8	To find deflections in Beam having unsymmetrical bending.	3
Practical-9	To determine Flexural Rigidity (EI) of a given beam	3

Reference / Text Books:

Text Books:

- Protein Structure Analysis: Preparation, Characterization, and Micro sequencing (Springer Lab Manuals) by Roza Maria Kamp, Theodora Choli-Papadopoulou, et al.
- Matrix Methods of Structural Analysis by S.S. Bhavikatti
- Workbook and Lab Manual for Sonography - E-Book: Introduction to Normal Structure and Function by Reva Arnez Curry

Reference Books:

- Piling Engineering by Ken Fleming, Austin Weltman, et al.
- Dynamic Response of Infrastructure to Environmentally Induced Loads: Analysis, Measurements,

Testing, and Design (Lecture Notes in Civil Engineering Book 2) by Anastasios G. Sextos and George D. Manolis • Workbook and Lab Manual for Sonography: Introduction to Normal Structure and Function (Old Edition) by Reva Arnez Curry PhD RDMS RTR FSDMS and Betty Bates Tempkin BA
If the course is available as Generic Elective then the students of following departments may opt it. NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course: NA

Course learning outcomes

1. Understand the behavior of deflection at any point.
2. Examine the horizontal thrust for two and three hinged arch.
3. Draw influence line diagram of horizontal thrust and bending moment for two & three hinged arch.
4. Analyze the deflection on simple beam and curved beam.
5. To evaluate the critical load in strut with different end condition.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: V

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: V**
Credits **Theory: 0** **Practical: 2**	**Subject: BPD LAB**
Course Code: SECE-353P	**TITLE : BPD LAB**

Course Objectives:
1. To study the use of symbols in civil engineering drawing.
2. To learn the size of building components.
3. To lean the planning of building drawing.
4. To learn the planning of elevations.
5. To learn the preparation of building layout of different types building.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 2
Theory - 0
Practical- 2

Unit	Contents	No. of Lectures Allotted
Practical-1	Symbols used in Civil Engineering drawing , Types of Masonry Bonds	3
Practical-2	Doors, Windows and staircases.	3
Practical-3	Plumbing & Electrical fitting drawings	3
Practical-4	Comprehensive Planning and Drawings of Residential building (Layout, plan, elevation & sectional elevation) elevation, plumbing & electrical fillings in out.	3
Practical-5	Preparation of Layout plans of different types of Civil Engg. Projects.Viz Primary School, Intermediate college, Hospital building, Industrial Building etc.	3
Practical-6	Preparation of plan of pipe fitting in a building.	3
Practical-7	Draw the plan of building.	3
Practical-8	Make 3D plan of building.	3

Reference / Text Books:

Text Books:
- Building Planning And Drawing by M.V. Chitawadagi S.S. Bhavikatti
- Dating Buildings and Landscapes with Tree-Ring Analysis: An Introduction with Case Studies by Darrin L. Rubino and Christopher Baas
- Approaching Urban Design: The Design Process (Introduction to Planning Series) by Marion Roberts, Clara Greed, et al.

Reference Books:
- Better by Design: An Introduction to Planning, Designing and Developing Library Buildings by

Ayub Khan and Stella The bridge • Organizational Planning and Analysis: Building the Capability to Secure Business Performance by Rupert Morrison • The State-Society/Citizen Relationship in Security Analysis: Implications for Planning and Implementation of U.S. Intervention and Peace/State-building Operations by Strategic Studies Institute and Yannis A. Stivachtis	
If the course is available as Generic Elective then the students of following departments may opt it.	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20
Total:	50
Prerequisites for the course: NA	

Course learning outcomes

1. To learn about the building components, principles, methods, and software's for making.
2. To apply mastery of various building components like window and doors in structure.
3. To made a planned detailed addressed drawing of a building on paper sheet.
4. Analyze the planned drawing sheet and advice involved in planning and drawing of building.
5. Make the different plans of different types of buildings components.

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: VI**
Credits- **Theory: 4** **Practical: 2**	**Subject: ENVIRONMENTAL ENGINEERING**
Course Code: SECE-361	**Title: ENVIRONMENTAL ENGINEERING**

Course Objectives:
1. Assess water demand and optimal size of water mains.
2. Layout the distribution system & assess the capacity of reservoir.
3. Investigate physical, chemical & biological parameter of water.
4. Design treatment units for water and waste water.
5. Apply emerging technologies for treatment of waste water

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/4

L:3
T:1
P: 2 (In Hours/Week)
Theory - 4
Practical- 2

Unit	Contents	No. of Lectures Allotted
I	**Overview of Data Communication and Networking:** Fresh water, water demands, variation in demands, population forecasting by various methods, basic needs and factors affecting consumption, design period. Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control.	8L
II	**Storage and distribution of water**: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs. Capacity of distribution reservoirs: general design guidelines for distribution system.	8L
III	**Physical, chemical and bacteriological examination of water and wastewater**: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. quality requirements, standards of water and waste water, disposal of wastewater on land and water bodies.	8L
IV	**Objectives of water treatment:** unit operations, processes, and flow sheets. Water treatment: screening, sedimentation, determination of settling velocity, efficiency of ideal sedimentation tank, design of settling tanks, grit chamber. Primary sedimentation and coagulation, filtration: theory of filtration; hydraulics of filtration; slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters. Disinfection:	8L

	requirements of an ideal disinfectant; various disinfectants, chlorination and practices of chlorination, water softening and ion-exchange process	
V	**Objectives of waste water treatment**: unit operations, processes, and flow sheets. Secondary and tertiary treatment: secondary sedimentation and theory of organic matter removal. Working of activated sludge process, trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, rotating biological contactors (RBC). Anaerobic digestion of sludge: design of low and high rate anaerobic digesters and septic tank. Working of up flow anaerobic sludge blanket (UASB) reactor and other emerging technologies for wastewater treatment	8L

Reference / Text Books:

Text Books:

1. Rangwala S.C., Water Supply & Sanitary Engineering, Charotar Publishing House (P) Ltd.
2. Garg S.K., Water Supply Engineering, Khanna Publishers, Delhi.
3. Modi P.N., Water Supply Engineering, Standard Book House, Delhi.

Reference Books:

1. Environmental Engineering by N N Basak
2. Environmental Engineering Water SupplyEngineeringVol.1 by Santosh Kumar Garg.
3. Textbook of Environmental Engineering by Rao P.V

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After completion of the course the student should be able –

1. To learn about the water quality properties.
2. To understand the storage and distribution of water in the traditional life.
3. To get the functional knowledge of BOD and COD.
4. Undergraduate should be able to do the treatment of water purification.
5. Do the aerobic and anaerobic decomposition of the wastes.
6. Apply emerging technologies for treatment of waste water.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III/ Semester: VI

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Design Of Concrete Structures-II**
Course Code: SECE-362	**TITLE - Design Of Concrete Structures-II**

Course Objectives:
1. To Analyses the stresses in flat slab and design parameter for flat slab.
2. To Analyses and design footing.
3. To Analyses and design retaining wall.
4. To Analyses and design water tank.
5. To Analyses the losses in pre-stress beam.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).	8L
II	Analysis and design of beam curved in plan. Structural behavior of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.	8L
III	Structural behavior of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert	8L
IV	Design criteria, material specifications and permissible stresses for tanks, design concept, of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.	8L
V	Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section.	8L

Reference / Text Books:
Text Books:

1. IS: 456 – 2000, "Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.
2. Jain, A.K., "Reinforced Concrete: Limit State Design", Nem Chand & Bros., Roorkee.
3. Dayaratnam, P, "Limit State Design of Reinforced Concrete Structures" Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Reference Books:

1. Gambhir, M L,"Fundamentals of Reinforced Concrete", Prentice Hall of India.
2. Unnikrishna Pillai, S. & D. Menon, "Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.
3. Jain, O. P. & Jai Krishna, "Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.

If the course is available as Generic Elective then the students of following departments may opt it.

- Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. Understand the behavior of reinforcement in flat slab.
2. Describe the structural behavior of footing and designing parameter of footing.
3. Interpret the features of retaining wall and why it is required.
4. To organize about the water storage tank and how to design tank as per their capacity.
5. Study the behavior of stress on pre-stress member and identify their losses.
6. Design the heavy structure of civil engineering

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Railway and tunnels**
Course Code: SDCE-361	**TITLE - Railway and tunnels**
Course Objectives: 1. To study the function of railway. 2. To study the alignments in railway. 3. To study the signal in railway. 4. To study the parameter of tunnels. 5. To study the ventilation in tunnels.	
Nature of Paper: Departmental Elective	
Minimum Passing Marks/Credits:40% Marks /4	
L: 3 T: 1 P: 0 Theory - 4 Practical- 0	

Unit	Contents	No. of Lectures Allotted
I	**INTRODUTION OF RAILWAY** Introduction to Railways, History and Importance of Indian Railways, Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting(single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. Sleepers, types of sleepers, Requirements of sleeper, sleeper density, ballast: material, specifications	8L
II	**RAILWAYS ALIGNMENT** Track Geometrics, Turnouts and Crossings, Stations and Yards: Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning.	8L
III	**SIGNALS OF RAILWAYS** Signaling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high-speed technologies, Urban railway- railway system in urban areas.	8L

IV	**INTRODUCTION OF TUNNEL** General: Introduction of Tunnel, Necessity/Advantage of a tunnel, Classification of Tunnels, Size and shape of a tunnel, Alignment of a Tunnel, Portals and Shafts, Problems in Tunneling. Tunneling in Hard Rock: Sequence of operation, Faces of attack, Methods of tunneling in hard rock	8L
V	**VENTILATION & DRAINAGE SYSTEM OF TUNNEL** Tunneling in Soft Ground: Types and factors affecting the choice of method to sort ground, Methods of tunneling in soft rocks Lighting, Ventilation and Dust control: Tunnel Lighting, Ventilation of Tunnel, Methods of Ventilation, Dust control. Drainage and safety: Drainage of tunnel, Drainage system, Safety	8L

Reference / Text Books:

Text Books:

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Aggrawal.
3. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski

Reference Books:

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
3. Tunnel Engineering by S.C. Saxena

If the course is available as Generic Elective then the students of following departments may opt it.

- SDCE-361 Railway and tunnels
- SDCE-362 Principle of town planning and architecture
- SDCE-363Ground water management
- SDCE-364 Foundation engineering

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report /Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. Understand the history & role of railways in India.
2. Identify the alignments of railway and designing criteria.
3. To solve the problems of signal system used in railways and urban railway system.
4. Differentiate the behavior of tunnel for engineering purpose.
5. To evaluate the problems causes of ventilation & drainage system in tunnels.
6. Identify the alignments of railway and designing criteria.

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Principle of town planning and architecture**
Course Code:SDCE-362	**TITLE - Principle of town planning and architecture**
Course Objectives: 1. Study the concept of town planning and transportation. 2. Study the planning problems in cities. 3. Study the architectural development. 4. Study the elements of architectural design. 5. Study the planning of building as per government rule.	
Nature of Paper: Departmental Elective	
Minimum Passing Marks/Credits: 40% Marks /4	
L: 3 T: 1 P: 0 Theory - 4 Practical- 0	

Unit	Contents	No. of Lectures Allotted
I	Principles and history of town planning, Comprehensive planning of towns: Contemporary planning concepts, Problems of urban growth. Land use classification and patterns, Housing demographic arid social surveys, economic and environmental aspects. Concept of master plan, Zoning and Density. Transportation network and planning. Planning standards for different land use allocation. Role of town planners.	8L
II	An overview of ancient human settlements, Evolution of towns: Garden city movement, Linear city and concentric city concepts, Neighborhood and Radburn, La-cite industrielle, Radiant city to present day planning, Satellite town concepts. Concept of habitat, Neighborhood planning, problems of metropolis.	8L
III	Factors influencing architectural development. Impact of development of materials and techniques through ages. Evolution of architectural forms. Brief history of architecture.	8L
IV	Elements of Architectural Design: Line. Form, Shape, Space, texture, value and colour. Principles of Architectural Design: Balance, Rhythm, Emphasis, Proportion and Scale, Movement, Contrast, Unity, Harmony, Repetition, Hierarchy. Creation of 2 D and 3 D compositions. Role of architects.	8L
V	Functional planning of buildings: Occupancy classification of buildings, General requirements of site and building. Building codes, Acts and Bye-	8L

	laws, Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings – identifying activity areas and linkages, checking for circulation, ventilation, structural requirements and other constraints. Different symbols used in building industry as per NBC and preparing sketch plan, working drawing etc.	

Reference / Text Books:

Text Books:

1. Sir Banister Fletcher's, A History of Architecture, CBS Publisher.
2. Percy Brown, Indian architecture (Buddhist and Hindu Period), D. B. Taraporevala Sons & Co., Bombay.
3. G.K. Hiraskar, Great Ages of World Architecture, Dhanpat Rai Publications.

Reference Books:

1. Geoffrey Broadbent, Design in Architecture: Architecture and the Human Sciences, John Wiley & Sons, London.
2. Arthur Gallion, the Urban Pattern: City Planning & Design, D.Van Nostrand CD. Inc.
3. Nelson P. Lewis, Planning to Modern City, Routledge.

If the course is available as Generic Elective then the students of following departments may opt it.

- SDCE-361 Railway and tunnels
- SDCE-362 Principle of town planning and architecture
- SDCE-363Ground water management
- SDCE-364 Foundation engineering

Evaluation/Assessment Methodology	
	Max. Marks
1. Class tasks/ Sessional Examination 2. Presentations /Seminar 3. Assignments 4. Research Project Report Seminar On Research Project Report 5. ESE	30 20 100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To understand the history of the town planning.
2. To learn about the ancient settlement of the civilization.
3. Use the different materials techniques in civilization.
4. Analyze the planning laws, regulations and recommendations involved in planning, building drawings and architectural concepts of buildings.
5. Sketch the plans of different kinds of building.
6. Use the different materials techniques in civilization.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Ground water management**
Course Code:SDCE-363	**TITLE - Ground water management**
Course Objectives: 1. To recognize groundwater availability and domain names; recharge. 2. To introduce to ground development strategies. 3. To enhance floor water desk strategies. 4. To know about management of a ground water. 5. To improve ground water table techniques.	
Nature of Paper: Departmental Elective	
Minimum Passing Marks/Credits: 40% Marks /4	
L: 3 T: 1 P: 0 Theory - 4 Practical- 0	

Unit	Contents	No. of Lectures Allotted
I	Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium.	8L
II	Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters,	8L
III	Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation.	8L
IV	Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage,	8L
V	Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. Roof- top rainwater harvesting andrecharge.	8L

Reference / Text Books:

Text Books:

1. Groundwater Hydrology by Todd D. K.
2. Groundwater Resource Evaluation by Walton W. C.
3. Groundwater by Raghunath H. M.

Reference Books:

1. Handbook of Applied Hydrology by Chow V. T.
2. Irrigation: Theory & Practice by Michael A. M.
3. Groundwater by S. Ramakrishnan

If the course is available as Generic Elective then the students of following departments may opt it.

- SDCE-361 Railway and tunnels
- SDCE-362 Principle of town planning and architecture
- SDCE-363Ground water management
- SDCE-364 Foundation engineering

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To know about ground water availability zones and ground water management.
2. To Analyze and suggest appropriate soil improvement techniques for problematic ground conditions.
3. To apply knowledge of groundwater availability and natural resources for sustainable development with appropriate understanding.
4. To explain the phenomenon of groundwater movement.
5. To understand how to replenish groundwater reserves.
6. To introduce to ground development strategies.

IIMTU-NEP IMPLEMENTATION
Year: III/ Semester: VI

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Foundation engineering**
Course Code:SDCE-364	**TITLE - Foundation engineering**

Course Objectives:

1. To study the soil exploration and geophysical methods.
2. To study the soil bearing capacity and design of shallow foundation.
3. To design deep foundation.
4. To study the use of sheet piles.
5. To study the geotechnical properties of reinforced soil.

Nature of Paper: Departmental Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Introduction to soil exploration, methods of boring and drilling, soil sampling and sampler, in-situ tests, SPT, CPT, DCPT, geophysical methods; soil resistivity methods seismic refraction methods.	8L
II	Bearing capacity of shallow foundation, design criteria, factors affecting bearing capacity, factors influencing selection of depth of foundation, modes of shear failures, types of shallow foundations, contact pressure under rigid and flexible footings, Terzaghi's, Meyerhof, Hansen's bearing capacity theories, IS code method Settlement of shallow foundations: components of settlement & its estimation, immediate, consolidation, & differential settlements.	8L
III	Design of shallow foundation; principles of design of footing, design of isolated footings and strip footing. Deep foundation; introduction, necessity of deep foundations, pile installation, pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, single and double under reamed piles.	8L
IV	**Introduction** shapes and characteristics of wells, components of well foundation, forces acting on well foundation, sinking of wells, causes and remedies of tilts and shifts. Retaining walls: introduction, types of retaining structures, support systems for flexible retaining walls (struts, anchoring), construction methods, introduction and uses of sheet piles.	8L
V	Geotechnical properties of reinforced soil, use of soil reinforcement, shallow foundation on soil with reinforcement, design considerations,	8L

	idealized soil, and foundation and interface behaviour, elastic models of soil behaviour.	

Reference / Text Books:

Text Books:

1. Alamsingh; Soil Mechanics & Foundation Engineering; CBS Publishers & Distributors, Delhi
2. Taylor D.W.; Fundamentals of Soil Mechanics; Asia Publishing House, Mumbai
3. Das Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd.

Reference Books:

1. Joseph E. Bowles: Foundation analysis and design. McGraw-Hill Higher Education.
2. Gopal Ranjan, Rao A.S.R.; Basic and applied soil mechanics; New age int. (p) ltd.
3. Arora K.R.; Soil Mechanics & Foundation Engineering; Standard Pub., Delhi

If the course is available as Generic Elective then the students of following departments may opt it.

- SDCE-361 Railway and tunnels
- SDCE-362 Principle of town planning and architecture
- SDCE-363Ground water management
- SDCE-364 Foundation engineering

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. Understand the soil exploration & soil extraction from land for testing.
2. Identify the soil bearing capacity and design parameter of shallow foundation.
3. To solve the problems of deep foundation.
4. To classify the characteristics of well foundation & retaining wall.
5. To evaluate the geotechnical properties and concept of soil reinforcement.
6. To design deep foundation.

Year: III / Semester: VI

<table>
<tr><td colspan="2">Programme: UG
Class: B. Tech (CE)</td><td>Year: III
Semester: VI</td></tr>
<tr><td colspan="2">Credits
Theory: 3
Practical: 0</td><td>Subject: Universal Human Values and Professional Ethics</td></tr>
<tr><td colspan="2">Course Code: UVE-601</td><td>Title : Universal Human Values and Professional Ethics</td></tr>
<tr><td colspan="3">Course Objectives: The objectives of studying this course are,
1. To reinstate the rich cultural legacy and human values of which we are the custodians.
2. To focus on professional ethics which are broader indicators of desirable actions vis-à-vis undesirable actions?
3. To lay down broader guidelines of values and ethics for internal and external stakeholders.
4. To suggest operational guidelines for value-based and ethical practices in the higher educational institutions leading to implementation and monitoring.
5. To indicate the outcomes of creating a value-based and ethical culture in HEIs.
6. To suggest indicative reinforcement programme for nurturing human values and ethics in HEIs.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /3</td></tr>
<tr><td colspan="3">L: 3
T: 0
P: 0 (In Hours/Week)
Theory - 0
Practical- NIL</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction - Need, Basic Guidelines, Content and Process for Value Education
Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation-as the mechanism for self-exploration, Continuous Happiness and Prosperity-A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.</td><td>09</td></tr>
<tr><td>II</td><td>Understanding Harmony in the Human Being - Harmony in Myself
Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.</td><td>09</td></tr>
</table>

III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva*as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!.	09
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	09
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human for Conduct, Basis Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1. Class tasks/ Sessional Examination 2. Presentations /Seminar 3. Assignments 4. Research Project Report 5. Seminar On Research Project Report 6. ESE	15 0 -- 35
Total:	**50**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:

1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where ‘rights’ enjoy and ‘wrongs’ are discouraged.
6. Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III/ Semester: VI

Programme: UG **Class: B. Tech (CE)**	**Year: III** **Semester: VI**
Credits **Theory: 0** **Practical: 2**	**Subject: Environmental Engineering Lab**
Course Code: SECE-361P	**TITLE - Environmental Engineering Lab**

Course Objectives:

1. To learn the determination of turbidity, conductivity and alkalinity.
2. To learn the determination of hardness and residual chlorine.
3. To learn the determination of suspended particles in water.
4. To learn the determination of BOD & COD.
5. To learn the determination of quantity of fluoride.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 50% Marks /2

L: 3
T: 1
P: 0
Theory -
Practical- 2

Unit	Contents	No. of Lectures Allotted
Practical-1	Determination of turbidity and conductivity.	2
Practical-2	Determination of pH, alkalinity and acidity.	2
Practical-3	Determination of hardness and chlorides.	2
Practical-4	Determination of residual chlorine.	2
Practical-5	Determination of total, suspended and dissolved solids.	2
Practical-6	Determination of BOD.	2
Practical-7	Determination of COD.	2
Practical-8	Determination of kjeldahl nitrogen.	2
Practical-9	Determination of fluoride.	2

Reference / Text Books:

Text Books:

- Environmental Engineering by Howard S. Peavy , Donald R. Rowe, et al.
- Environmental Engineering (Vol. II) Sewage Waste Disposal and Air Pollution Engineering by Santosh Kumar Garg
- Khanna's Multi-Choice Questions & Answers in Environmental Engineering by O. P. Gupta

Reference Books:

- Environmental Design Sourcebook: Innovative Ideas for a Sustainable Built Environment by Will McLean and Pete Silver
  Environmental Design Sourcebook: Innovative Ideas for a Sustainable Built Environment by Will McLean and Pete Silver
- Elements of Environmental Engineering by Dr. K.N. Duggal

If the course is available as Generic Elective then the students of following departments may opt it. NA	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course: NA	
Course learning outcomes 1. Understand and check the quality of water for using purpose. 2. Identify the hardness of water. 3. To compute the total solid in water. 4. To differentiate the demand of BOD & COD. 5. To evaluate the optimum dose of coagulant.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III/ Semester: VI

Programme: UG **Class: B. Tech (CE)**		**Year: III** **Semester: VI**
Credits **Theory: 0** **Practical: 2**		**Subject: Simulation Lab-I**
Course Code:SECE-362 P		**TITLE - Simulation Lab-I**
Course Objectives: 1. To learn the use of ANSYS & mat lab. 2. To learn the use of STAAD PRO software. 3. To learn the use of geotechnical software. 4. To learn the water distribution system software. 5. To learn the use of GIS software.		
Nature of Paper: Departmental Elective		
Minimum Passing Marks/Credits: 50% Marks /2		
L: 0 T: 0 P: 2 Theory - Practical- 2		
Unit	**Contents**	**No. of Lectures Allotted**
Practical-1	Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB	2
Practical-2	Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP	2
Practical-3	Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS	2
Practical-4	Working on Latest Version of Environmental Engineering software for	2
Practical-5	Analysis and Design of water & wastewater treatment and distribution	2
Practical-6	systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)	2
Practical-7	Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.	2

Reference / Text Books:

Text Books:

- **Computer Aided Drafting & Modeling Lab by Venugopal**
- **Using Primavera 6 (English, Paperback, Al-Saridi Abdelrahman)**

Reference Books:

- Planning Using Primavera SureTrak Project Manager, Version 3.0, Revised 2004 Edition with Updated Workshops by Harris, Paul E

• Exploring Oracle Primavera P6 Professional 18 for Planners and Engineers • Prof. Sham Tickoo
If the course is available as Generic Elective then the students of following departments may opt it. NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course: NA

Course learning outcomes

1. Draw the 2-D & 3-D model on advanced software for structural analysis.
2. Analysis and design the structure using Staad-Pro software.
3. To compute the geotechnical software for engineering purpose.
4. Analysis waste water treatment and distribution system by using software.
5. To evaluate the road pattern by using transportation software and use of ARC GIS software.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : IV / Semester : VII

Programme: UG **Class:**B.TECH (CE)	Year: **IV** Semester:**VII**
Credits Theory: 4 Practical: 0	**Subject: Design of Steel Structures**
Course Code:SECE-471	**Title: Design of Steel Structures**

Course Objectives:

1. To teach students loading and load combinations for the design of steel structures.
2. To make the students familiar with the concepts of steel design starting with riveted, welded and bolted connection sand eccentric connections based on IS:800-1984andIS:800-2007.
3. To teach the students design of tension, compression members and flexural members based on IS: 800-2007.
4. To teach students beam-column design as a whole for uniaxial and biaxial loading along with elastic theory of buckling of beams and columns.
5. To teach students grillage foundation.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks /4

L: 3
T: 1
P: 2(In Hours/Week)
Theory - 4
Practical- 2

Unit	Contents	No. of Lectures Allotted
I	**Introduction** Properties of structural steel, Rolled steel sections as per IS specifications, factorofsafety. Working stress design of connections: riveted, welded and bolted connections, design of fillet and butt weld, eccentric connections, efficiency of joints, high tension bolts. Limit state design of Connections: welded and bolted.	8L
II	**Tension Member base don IS: 800-2007** Net Sectional Area, Permissible Stress, Design of Axially Loaded Tension Member, Design of Member Subjected to Axial Tension and Bending	8L
III	**DesignofCompressionMemberbasedonIS:800-2007** Column: Modes of Failure of a Column, Buckling Failure: Euler's Theory, Effective Length, And Slender-ness Ratio. Design of Compression Members, Design of Built-Up Compression Members: Laced and Battened Columns, Design of column splice.	8L
IV	**Design of Column Base sand Grillage foundation** Design of slab base and gusset base and grillage foundation along with its connection with column.	8L

V	**DesignofBeam based onIS:800-2007** **Introduction,** beam type, section classification, lateral stability of beam, lateral torsional buckling of symmetrical section, design strength of beam (Laterally supported and unsupported), shear strength and deflection, web buckling and web crippling.	8L

Reference / Text Books:

Text Books

- Design of Steel Structures by S.K. Duggal.
- Design of Steel Structures by N. Subramanian, Oxford Publication. Alam Singh
- Design of Steel Structures by Aryaand Ajmani, Nem Chand Brothers Roorkee.

Reference Books

- Vajrani V. N., Ratwani M.M. and Mehra H. Design and Analysis of Steel Structures, Oscar Publications.
- SyalI C. Design of Steel Structures, Standard Publishers Distributors, New Delhi Ramchandra, Non Linear Analysis of Steel Structures, Standard Publishers Distributors.
- Vajrani V. N., Ratwani M. M. and Mehra H. Design and Analysis of Steel Structures, Oscar Publications

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To learn a rational adulthood to the undergraduate for the courses in field of Geotechnical Engineering & Soil enhancement Technologies.
2. To understand the foundations of soil classifications to the students related to the geotechnical engineering.
3. To give an experience in the commission of engineering concepts which are applied in area of Geotechnical Engineering?
4. To analyze the stress conditions in the soil stratum.
5. To check the different types of pressure on the soil and collect the information of foundation design.
6. Student will be able to design a steel structure.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester: VII

Programme: UG **Class:**B.TECH (CE)	Year: **IV** Semester:**VII**
Credits Theory: Practical: 2	**Subject: Non Destructive Testing Lab**
Course Code:SECE-471P	**Title: Non Destructive Testing Lab**

Course Objective

1. To find out the strength assessment using rebound hammer.
2. To learn about how to find out compressive strength of steel.
3. To find out strength assessment using pull out method.
4. To check the corrosion of structural steel.
5. To perform the torsional test.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks /2

L: 3
T: 1
P: 0(In Hours/Week)
Theory -
Practical- 2

Practical	Contents	No. of Lectures Allotted
Practical-1	1. Destructive Testing of reinforced cement concrete	2L
Practical-2	(a) Strength assessment using rebound hammer	2L
Practical-3	(b) Quality assessment using ultrasonic plus velocity test	2L
Practical-4	(c) Strength assessment using pull out method	2L
Practical-5	(d) Assessment of corrosion of reinforcing bars using half-cell potentiometer	2L
Practical-6	2. Testing of structural steel	2L
Practical-7	(a) Testing for corrosion of structural steel	2L
Practical-8	(b) Assessment of thickness of pipes/tubes/structural steel	2L
Practical-9	(c) Test for welding performance with Di-penetration test, ultrasonic test & magnetic particle test	2L

Reference / Text Books:

- Laboratory Manual: For The Use Of Students In Testing Materials Of Construction (1912) by Leslie Abram Waterbury
- Laboratory Manual of Testing Materials by Hatt William Kendrick
- Laboratory Manual of Testing Materials by Hatt William Kendrick

Text Books

- Performance Assessment, Grade 7: Performance Assessment Student Edition Grade 7 (Collections) by Houghton Mifflin Harcourt |
- Performance Assessment, Grade 9 (Collections) by Houghton Mifflin Harcourt
- Performance Assessment, Grade 12: Performance Assessment Student Edition Grade 12 (Collections)

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course: NA	
Course learning outcomes 1. NDT techniques are used for locating flaws as well as for characterizing material properties. 2. The materials can play havocs and may cause planes to crash, reactors to fail, trains to derail, pipelines to burst and alike. 3. All these catastrophic failures can be avoided. Use of NDT techniques results in better confidence in the material	

IIMTU-NEP IMPLEMENTATION
Year : IV / Semester : VIII

Programme: UG **Class:**B.TECH (CE)	Year: **IV** Semester: **VIII**
Credits Theory: 4 Practical: 0	**Subject: Critical Path Method & Project Evaluation and Review Technique**
Course Code:SDCE-481	**Title: Critical Path Method & Project Evaluation and Review Technique**

Course Objectives:

1. The concept of project management exists because it helps assure completion of a project successfully.
2. This course covers the basics of project management where students will learn what project management involves and how to approach it successfully.
3. This course includes how to break down a complex project into manageable segments and use of effective project management tools and techniques to arrive at solution and ensure that the project meet sits deliverables and is completed within budget and on schedule.
4. To understands the knowledge of contracts.
5. To understands the knowledge of project management.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks /4

L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
I	Elements of Management and Network Techniques: Project Cycle, Organization, Planning, Scheduling, Monitoring, updating and Management System in Construction.	8L
II	Network Techniques: Bar Chart, Mile stone chart, work break down structure, and preparation of networks. Network techniques like PERT and CPM. In construction Management, Project Monitoring and resource allocations through network techniques.	8L
III	Project Cost Control: Cost Planning, Direct Cost, Indirect Cost, Total Cost Curve, Cost Slope. Time Value of Money, Present Economy studies, Equivalence Concept, financing of projects, Economic comparisons present worth method, Equivalent annual cost method, discounted cash flow method. Depreciation and break even cost analysis of construction projects.	8L
IV	Contract Management: Legal Aspects of Contracts, laws related to contracts, land acquisition, labor safety and welfare, Different types of contracts, their relative advantages and disadvantages, Elements of Tender Preparation, Process of tendering, pre qualifications of contracts,	8L

	Evaluation of tenders, contract negotiation and award of work, monitoring of contract, settlement of disputes, arbitration and commissioning of project.	
V	Equipment Management: Productivity, operational cost, owing and hiring cost. Constriction equipment: Earth moving, Hauling equipment's, Hoisting equipment's, Conveying Equipment's, Concrete Production equipment's, Tunneling equipment's	8L

Reference / Text Books:

Text Books

- Robert L. Peurifoy, Clifford J., Schexnayder, Aviad Shapira " Construction Planning Equipment and Methods" McGraw Hills Education (India), Private Ltd., New Delhi.
- Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.
- Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad – 500 004

Reference Books

- Construction Management by Ojha
- Srivastava, U.K.," Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.
- Construction Technology By Sarkar, Oxford.

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course learning outcomes

1. To learn about the site selection and suitability of the bridge construction.
2. To understand the load distribution on the RCC bridge.
3. Understand the Indian standard specification for bridge design that helps in analysis of bridges.
4. To do the evaluation for elements of plate girder, economical section for bridge.
5. Design of piers, pier caps and Abutments, different types of bridge bearings.
6. To build the Abutments.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester : VIII

<table>
<tr><td colspan="2">Programme: UG
Class:B.TECH (CE)</td><td>Year: IV
Semester: VIII</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: Open Channel Flow</td></tr>
<tr><td colspan="2">Course Code:SDCE-482</td><td>Title: : Open Channel Flow</td></tr>
<tr><td colspan="3">Course Objectives:
1. To understand the basic concept of surface flow.
2. To understand the energy relationship of flow.
3. To learn about the different kinds of flow profiles.
4. To know the different types of flow measuring devices.
5. To understand the designing of culvert</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits:40% Marks /4</td></tr>
<tr><td colspan="3">L: 3
T: 1
P: 0(In Hours/Week)
Theory - 4
Practical- 0</td></tr>
<tr><th>Unit</th><th>Contents</th><th>No. of Lectures Allotted</th></tr>
<tr><td>I</td><td>Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections, Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions.</td><td>08</td></tr>
<tr><td>II</td><td>Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections,
Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels.</td><td>08</td></tr>
<tr><td>III</td><td>Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater,
Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, and Freeoverfall. Rapidly varied unsteady flow: Equation of motion for unsteady flow, “Celerity” of the gravity wave, deep and shallow water waves, open channel positive and negative surge,</td><td>08</td></tr>
<tr><td>IV</td><td>Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions,</td><td>08</td></tr>
</table>

	Numerical methods for profile computation, Flow over side-weir and Bottom-rack.	
V	**Flow in channel of non-linear alignment and non-prismatic channel sections**: Design considerations for sub critical and super critical flows, Design of culvert.	08

Reference / Text Books:

Text Books

- Chow, V.T., Open channel Hydraulics, McGraw Hill International
- Henderson, F.M., Open Channel Flow, McGraw Hill International
- Subramanya, K., Flow in Open Channels, Tata McGraw Hill

Reference Books

- RangaRaju, K.G., Flow through open channels, T.M.H
- M. Hanif Chaudhry, Open Channel Flow, PHI
- French, R.H., Open channel Hydraulics, McGraw Hill International

If the course is available as Generic Elective then the students of following departments may opt it.**Not applicable**

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:NA

Course learning outcomes

1. To learn about the concepts of surface flow.
2. To understand the solution of flow problems through the appropriate equations.
3. Student has ability to explain the phenomena of hydraulic jump like surge and GVF.
4. Apply mathematical relationships and solve the problems related to the notches, hydraulic jumps, and surges.
5. Check about the various types of the flow channels.
6. Design considerations for sub critical and super critical flows.

Format-3

IIMTU-NEP IMPLEMENTATION
Year :IV / Semester : VIII

Programme: UG **Class:**B.TECH (CE)	Year: **IV** Semester: **VIII**
Credits Theory: 4 Practical: 0	**Subject: Pre-stressed concrete structures**
Course Code:SDCE-483	**Title: : Pre-stressed concrete structures**
Course Objectives: 1. To analysis the basic concepts of pre-stressing so that student understands the same 2. To find out the various pre-stressed losses. **Pre-stressed concrete structures** 3. To evaluate the pre-stressed components strength based on Indian code provisions 4. To design the pre-stressed sections 5. To check productivity analysis, Economics of form work.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:40% Marks /4	
L: 3 T: 1 P: 0 (In Hours/Week) Theory - 4 Practical- 0	

Unit	Contents	No. of Lectures Allotted
I	**INTRODUCTION AND ANALYS IS FOR STRESS** Basicconcepts-terminology-system of prestressing, pretensioning, posttensioning, principle of prestressing, types of prestressing. Assumptions, analysis of prestress, concentric & eccentric tendon, resultant stresses, rectangle, I-section(symmetrical only), concepts of prestressing, stress concept, strength concept and load balancing concept.	8L
II	Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections, Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels.	8L
III	**SHEAR STRENGTH** Behavior of prestressed concrete members under shear, Shear strength, principal stresses, Ultimate shear resistance, and Indian Standard code provision	8L
IV	Design of sections for flexure, stress condition, minimum section modulus, stresses at transfer, service loads, pre-stressing force, eccentricity, check for stresses, initial and final conditions, limit state of collapse in flexure, shear. (Rectangular Section only)	8L
V	Use of equipment's in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability,	8L

Reference / Text Books:
Text Books
- Chow, V.T., Open channel Hydraulics, McGraw Hill International
- Henderson, F.M., Open Channel Flow, McGraw Hill International
- Subramanya, K., Flow in Open Channels, Tata McGraw Hill

Reference Books
- RangaRaju, K.G., Flow through open channels, T.M.H
- M. HanifChaudhry, Open Channel Flow, PHI
- French, R.H., Open channel Hydraulics, McGraw Hill International

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:NA

Course learning outcomes
1. To learn about the concepts of surface flow.
2. To understand the solution of flow problems through the appropriate equations
3. Student has ability to explain the phenomena of hydraulic jump like surge and GVF.
4. Apply mathematical relationships and solve the problems related to the notches, hydraulic jumps, and surges.
5. Check about the various types of the flow channels.
6. Design considerations for sub critical and super critical flows

Format-3

IIMTU-NEP IMPLEMENTATION
Year :IV / Semester : VIII

<table>
<tr><td colspan="2">Programme: UG
Class:B.TECH (CE)</td><td>Year: IV
Semester: VIII</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: River Engineering</td></tr>
<tr><td>Course Code:SDCE-484</td><td colspan="2">Title: River Engineering</td></tr>
<tr><td colspan="3">1. The goals of this course are to bolster the potential of the Trainees inside the area of water sciences, to create a platform between professionals from one-of-a-kind countries, to change information and enjoy and to increase the expertise of natural river techniques.
2. Make observations of and inspect hypotheses approximately river approaches and the effects of river engineering alternatives.
3. To apprehend the conduct of alluvial rivers, morphological processes, sediment movement.
4. To assess channel instability.
5. To investigate flood control strategies.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits:40% Marks /4</td></tr>
<tr><td colspan="3">L: 3
T: 1
P: 0 (In Hours/Week)
Theory - 4
Practical- 0</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. 8	8L
II	Behavior of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control.	8L
III	Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration.	8L
IV	Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, and Analysis of flow, Sediment and channel geometry data.	8L
V	River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampers and other river/ flood protection works.	8L

Reference / Text Books:
Text Books

- River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
- Garg, S.K., Irrigation Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.

- River Engineering by Margeret Peterson **Reference Books**
- River and Coastal Engineering: Hydraulics, Water Resources and Coastal Engineering (Water Science and Technology Library Book 117)By Ramakar Jha, Vijay P. Singh, et al.
- River Engineering by Santosh Kumar
- Principles of River Engineering by (the non tidel alluvial) PH Jameen

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	**MAX MARKS**
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course: NA

Course Outcome

1. To understand the well knowledge about river engineering.
2. To explain the knowledge about canal parts.
3. To know about Distribution of structures for canal irrigation and the fundamentals of layout of unlined and coated irrigation canals layout.
4. To assess specific flood management techniques.
5. To know about basic components of river Training works.
6. Design the flow channels.

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III
ENGINEERING SCIENCE ELECTIVES

Programme: UG **Class: B-Tech (CE)**	**Year: II** **Semester: III**
Credits **Theory: 3** **Practical: 0**	**Subject: Material Science**
Course Code: SEME-231	**Title : Material Science**

Course Objectives: The objectives of studying this course are,

1. To reinstate the Solid solutions – Hume Rothery's rules – the phase rule – single component system
2. To focus on iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels
3. To lay down Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip
4. To suggest Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials
5. To indicate Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics
6. To suggest shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 0
P: 0 (In Hours/Week)
Theory - 0
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	Phase Diagrams: Solid solutions – Hume Rothery's rules – the phase rule – single component system – one-component system of iron – binary phase diagrams – isomorphous systems – the tie-line rule – the lever rule – application to isomorphous system – eutectic phase diagram – peritectic phase diagram – other invariant reactions – free energy composition curves for binary systems – microstructural change during cooling.	09
II	Ferrous Alloys: The iron-carbon equilibrium diagram – phases, invariant reactions – microstructure of slowly cooled steels – eutectoid steel, hypo and hypereutectoid steels – effect of alloying elements on the Fe-C system – diffusion in solids – Fick's laws – phase transformations – T-T-T-diagram for eutectoid steel – pearlitic, baintic and martensitic transformations – tempering of martensite – steels – stainless steels – cast irons.	09
III	Mechanical Properties: Tensile test – plastic deformation mechanisms – slip and twinning – role of dislocations in slip – strengthening methods – strain hardening – refinement of the grain size – solid solution strengthening – precipitation hardening – creep resistance – creep curves – mechanisms of	09

	creep – creep-resistant materials – fracture – the Griffith criterion – critical stress intensity factor and its determination – fatigue failure – fatigue tests – methods of increasing fatigue life – hardness – Rockwell and Brinell hardness – Knoop and Vickers microhardness.	
IV	Magnetic, Dielectric & Superconducting Materials: Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites – dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization – dielectric breakdown – insulating materials – Ferroelectric materials – superconducting materials and their properties.	09
V	New Materials: Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications – shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where ‘rights’ enjoy and ‘wrongs’ are discouraged.
6. Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: UG **Class: B-Tech (CE)**	**Year: II** **Semester: III**
Credits **Theory: 3** **Practical: 0**	**Subject: Engineering Mechanics**
Course Code: SESB-231-SESB-249	**Title : Engineering Mechanics**

Course Objectives: The objectives of studying this course are,

1. To reinstate Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel positionthe Solid solutions – Hume Rothery's rules – the phase rule – single component system
2. To focus on shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.
3. To lay down Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem.
4. To suggest plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.
5. To indicate normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants.

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 0
P: 0(In Hours/Week)
Theory - 0
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium. Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.	09
II	Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams. Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.	09
III	Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.	09
IV	Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.	09

	Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.	
V	Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy. Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections. Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque.	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination	30
2. Presentations /Seminar	
3. Assignments	20
4. Research Project Report	
5. Seminar On Research Project Report	--
6. ESE	100
Total:	**150**

Prerequisites for the course:

Course Learning Outcomes: After undergoing this course, the students will be able to:
1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where 'rights' enjoy and 'wrongs' are discouraged.
6. Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (CE)**	Year: II Semester: IV
Credits Theory: 4 Practical:2	**Subject:** Basic Data Structure & Algorithm
Course Code:SESB-235/245	**Title:** Basic Data Structure & Algorithm

Course Objectives:

- Acquire some basic mathematical tools and techniques of algorithm analysis.
- To familiarise with basic data structures and to develop the ability to choose the appropriate data structure for designing efficient algorithms.
- Learn some basic algorithms with their rigorous proofs of correctness and efficiency analysis of implementation using appropriate data structures

Nature of Paper: Engineering Science Elective

Minimum Passing Marks/Credits: 40% Marks/4

L:3
T:1
P:3 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction to data structure and Algorithms: Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and Multi dimensional arrays, spare matrices, Character storing in C, String operations.	**8**
II	Stack And Queue and Link List: Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue , Priority Queue , D-Queue , Singly and circularly linked list, List operations Lists implementations	**8**
III	Trees : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree.	**8**
IV	Graphs: Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths.	**8**

V	Searching and Sorting: Linear search, binary Search, Internal and External sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices : Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting.	**8**

Reference / Text Books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication.
3. Weiss, "Data Structure & Algorithm Analysis in C", Addision Wesley.
4. Basse, "computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
5. Lipschutz, "Data structure, "Schaum series.
6. Aho, hopcropt, Ullman, “Data Structure & Algorithm", Addision Wesley.
7. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

- Understand and analyze the time and space complexity of an algorithm
- Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)
- Discuss various algorithm design techniques for developing Algorithms
- Discuss various searching, sorting and graph traversal Algorithms
- Understand operation on Queue, Priority Queue, D-Queue.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B. Tech (CE)**	Year: II Semester: IV
Credits Theory: 4 Practical:2	**Subject:** Introduction to Soft Computing
Course Code:SESB-236/246	**Title: :** Introduction to Soft Computing
Course Objectives:	
Nature of Paper: Engineering Science Elective	
Minimum Passing Marks/Credits: 40% Marks/4	
L:3 T:1 P:3(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Introduction to Soft Computing, ARTIFICIAL NEURAL NETWORKS Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self-organizing networks - Hopfield network.	**8**
II	FUZZY SYSTEMS Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.	**8**
III	NEURO - FUZZY MODELING Adaptive networks based Fuzzy interface systems - Classification and Regression Trees – Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation	**8**
IV	GENETIC ALGORITHMS Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method	**8**
V	APPLICATION OF SOFT COMPUTING Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Introduction to MATLAB Environment for Soft computing Techniques	**8**

Reference / Text Books:

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)
5. Sivanandam, Deepa, “ Principles of Soft Computing”, Wiley

6. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
7. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
8. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
9. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley Wang, “Fuzzy Logic”, Springer

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

- Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning,fuzzy inference systems, and fuzzy logic
- Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self learning situations.
- Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.
- Develop some familiarity with current research problems and research methods in Soft Computing Techniques

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B.TECH (CE)**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject:** Energy Science and Engineering
Course Code:SESB-233	**Title: :** Energy Science and Engineering
Course Objectives: 1. To develop a strong foundation of concept of Energy and its units 2. To familiarize with Conventional & non-conventional energy source. 3. To introduce the various Systems and Synthesis.	
Nature of Paper: ESE	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 3 T: 1 P: 0 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Energy and its Usage: Units and scales of energy use, Mechanical energy and transport, Heat energy: Conversion between heat and mechanical energy, Electromagnetic energy: Storage, conversion, transmission and radiation, Introduction to the quantum, energy quantization, Energy in chemical systems and processes, flow of CO2, Entropy and temperature, carnot and Stirling heat engines, Phase change energy conversion, refrigeration and heat pumps, Internal combustion engines, Steam and gas power cycles, the physics of power plants. Solid-state phenomena including photo, thermal and electrical aspects	**8L**
II	**Nuclear Energy:** Fundamental forces in the universe, Quantum mechanics relevant for nuclear physics, Nuclear forces, energy scales and structure, Nuclear binding energy systematics, reactions and decays, Nuclear fusion, Nuclear fission and fission reactor physics, Nuclear fission reactor design, safety, operation and fuel cycles.	**8L**
III	**Solar Energy:** Introduction to solar energy, fundamentals of solar radiation and its measurement aspects, Basic physics of semiconductors, Carrier transport, generation and recombination in semiconductors, Semiconductor junctions: metal-semiconductor junction & p-n junction, Essential characteristics of solar photovoltaic devices, First Generation Solar Cells, Second Generation Solar Cells, Third Generation Solar Cells	**8L**
IV	**Conventional & non-conventional energy source:** Biological energy sources and fossil fuels, Fluid dynamics and power in the wind, available resources, fluids, viscosity, types of fluid flow, lift, Wind turbine dynamics and design, wind farms, Geothermal power and ocean thermal energy conversion, Tidal/wave/hydro power.	**8L**

V	**Systems and Synthesis:** Overview of World Energy Scenario, Nuclear radiation, fuel cycles, waste and proliferation, Climate change, Energy storage, Energy conservation. Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts, LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption	**8L**

Reference/Text Books

1. Energy and the Challenge of Sustainability, World Energy Assessment, UNDP, New York, (2000).
2. Perspective of Modern Physics, A. Beiser, McGraw-Hill International Editions (1968).
3. Introduction to Modern Physics, H.S. Mani and G.K.Mehta, East-West Press (1988).
4. Introduction to Electrodynamics, D. J. Griffiths, Fourth Edition, Prentice Hall (2013).
5. Introductory Nuclear Physics, R. K. Puri and V.K. Babbar, Narosa Publishing House (1996).
6. Physics of Solar Cells: From Basic Principles to Advanced Concepts by Peter Wurfel, John Wiley & Sons, 2016
7. Principles of Solar Engineering, D.Y. Goswami, F.Kreith and J.F. Kreider, Taylor and Francis, Philadelphia, 2000.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
CO1 Understand the concept of Energy and its Usage
CO2 Understand the concept of Nuclear Energy**.**
CO3 Understand the concept of solar Energy
CO4 Understand the Principles of Conventional & non-conventional energy source
CO5 Principles of various Systems and Synthesis

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (CE)**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject: Sensor and Instrumentation**
Course Code:	**SESB-234**

Course Objectives: The objectives of studying this course are,

1. Apply the use of sensors for measurement of displacement, force and pressure.
2. Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
3. Demonstrate the use of virtual instrumentation in automation industries.
4. Identify and use data acquisition methods.

Nature of Paper: ESE

Minimum Passing Marks/Credits: 40% Marks/4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement using Potentiometer, LVDT & Optical Encoder, and Measurement of **pressure** using LVDT based diaphragm & piezoelectric sensor.	09
II	Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive.	09
III	Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs, Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation.	09
IV	Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R Ladder type, Use of Data Sockets for Networked Communication.	09
V	Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.	09

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: After undergoing this course, the students will be able to:	

1. Apply the use of sensors for measurement of displacement, force and pressure.
2. Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
3. Demonstrate the use of virtual instrumentation in automation industries.
4. Identify and use data acquisition methods.
5. Comprehend intelligent instrumentation in industrial automation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (CE)**	**Year:III** **Semester: IV**
Credits **Theory: 4** **Practical:00**	**Subject: Electronics Engineering**
Course Code:SESB-238	**Title: Digital Electronics**

Course Objectives: The students will learn
1. To develop a strong foundation in analysis, design and implementation of electronic circuits
2. To present the electronics applications in diode systems
3. learn Bipolar junction transistors and its applications
4. Understand Operational amplifiers
5. Understand Electronic instrumentation and measurements.

Nature of Paper: ESE

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	PN junction diode: Introduction of semiconductor materials; Semiconductor diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, diode equivalent circuits, transition and diffusion capacitance, Zener diodes breakdown mechanism (Zener and avalanche).	(L-9)
II	Diode application: Series, parallel and series, parallel diode configuration, half and full wave rectification, clippers, clampers, Zener diode as shunt regulator, voltage-multiplier circuits special purpose two terminal devices : light-emitting diodes, Varactor (Varicap) diodes, tunnel diodes, liquidcrystal displays.	(L-9)
III	Bipolar junction transistors and field effect transistor: Bipolar junction transistor: Transistor construction, operation, amplification action, common base, common emitter, common collector configuration dc biasing BJTs: operating point, fixed-bias, emitter bias, voltage-divider bias configuration. Collector feedback, emitter-follower configuration. Bias stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (re Model), Field effect transistor: Construction and characteristic of JFETs. AC analysis of CS amplifier, MOSFET (depletion and enhancement) type, transfer characteristic.	(L-9)

IV	Operational amplifiers: Introduction and block diagram of Op-Amp, ideal & practical characteristics of Op-Amp, differential amplifier circuits, practical Op-Amp circuits (inverting amplifier, non-inverting amplifier, unity gain amplifier, summing amplifier, integrator, And differentiator), Op- Amp parameters: input offset voltage, output offset voltage, input biased current, input offset current differential and common-mode operation.	(L-9)
V	Electronic instrumentation and measurements: Digital voltmeter: Introduction, RAMP techniques digital multimeters: Introduction Oscilloscope: introduction, basic principle, CRT, block diagram of oscilloscope, simple, measurement of voltage, current phase and frequency using CRO, introduction of digital storage oscilloscope and comparison of DSO with analog oscilloscope.	(L-9)

Reference / Text Books:

1. Robert L. Boylestand / Louis Nashelsky, "Electronic Devices and Circuit Theory," Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.
3. Meetidehran/ A.K. singh "fundamental of electronics Engineering", New age international publisher.

If the course is available as Generic Elective then the students of following departments may opt it.
- NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the concept of PN junction and special purpose diodes.
2. Study the application of conventional diode and semiconductor diode.
3. Analyse the I-V characteristics of BJT and FET.
4. Analyzethe of Op-Amp, amplifiers, integrator, and differentiator.
5. Understand the concept of digital storage oscilloscope and compare of DSO with analog oscilloscope

Format-3

IIMTU-NEP IMPLEMENTATION
Year II / Semester IV

Programme: UG **Class: B-Tech (CE)**	**Year:III** **Semester: IV**
Credits **Theory: 4** **Practical:00**	**Subject: Digital Electronics**
Course Code:SESB-239	**Title: Digital Electronics**

Course Objectives: The students will learn

1. To develop a strong foundation in analysis, design and implementation of digital electronic circuits
2. To present the Digital fundamentals, Boolean algebra and its applications in digital systems
3. To familiarize with the design of various combinational digital circuits using logic gates
4. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
5. To introduce the fundamentals of digital logic families.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Digital System and Binary Numbers**: Number System and its arithmetic, Signed binary numbers, Binary codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc Clusky method (Tabular method).	(L-9)
II	Combinational Circuits: Analysis & Design procedure, Binary Adder, Subtractor, n-bit parallel Adder & Subtractor, Magnitude Comparator, Multiplexers, Demultiplexer, Decoders, Encoders.	(L-9)
III	Sequential Logic: Flip-flop and Latch, SR latch, JK flip-flop, T flip-flop, D flip-flop, Master-slave JK flip-flop, Flip Flop Conversion, Registers & Counters: Shift registers (SISO, SIPO, PISO, PIPO), Counters: Asynchronous/Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.	(L-9)
IV	Digital Logic Families: DTL, TTL, ECL & Metal Oxide Semiconductor logic families: N- MOS, P-MOS and CMOS logic circuits, Fan Out, Fan in, Noise Margin.	(L-9)
V	**Memory & Programmable Logic Devices:** RAM, ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL), Programmable Logic Array (PLA), Circuit Implementation using ROM, PLA and PAL.	(L-9)

Reference / Text Books: 1. *M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.* 2. *David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.* 3. *RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.* 4. *Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5^{th} Edition, 2010.*
If the course is available as Generic Elective then the students of following departments may opt it. - NA

Evaluation/Assessment Methodology	
Max. Marks	
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	NA
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	NA
5) ESE	100
Total:	150

Prerequisites for the course: NA

Course Learning Outcomes:

After completing the course, students should be able to:

1. Understand the concept of number system, Logic Gates, Boolean algebra, K-map and Quine Mclusky method
2. Design combinational and sequential logic circuits and their applications
3. Understand concepts of Synchronous & Asynchronous Sequential Circuits
4. Understand the idea of Digital Logic Families, memory and Programmable Logic Devices
5. To develop a strong foundation in analysis, design and implementation of digital electronic circuits.
6. To introduce the fundamentals of digital logic families.

Evaluation Scheme

Bachelor of Technology (B.Tech.) Aerospace Engineering

Bachelor of Technology (B.Tech.) Aerospace Engineering

FIRST YEAR, SEMESTER-I

S. No	Course Code	Course Name	Evaluation Scheme								Total Marks	Credits
			Periods			Internal Marks			External Marks			
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-111	Engineering Mathematics-I	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAS-112 / SEAS-113	Engineering Physics / Engineering Chemistry	3	1	0	30	20	0	100	0	**150**	**4**
3	SEAE-111 / SECS-111	History of Aviation/ Fundamentals of Computer Programming	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEE-111 / SEEC-111	Basic Electrical Engineering/ Fundamentals of Electronics Engineering	3	1	0	30	20	0	100	0	**150**	**4**
5	SEAE-112/ SEHU-111	Shrimad Bhagwat Geeta /Professional Communication	3	0	0	10	5	0	35	0	**50**	**2**
6	SEAS-112P / SEAS-113P	Engineering Physics (Lab) / Engineering Chemistry (Lab)	0	0	3	0	0	20	0	30	**50**	**2**
7	SEAE-111 P/ SECS-111P	Aerospace Engineering Graphics Lab / Fundamentals of Computer Programming lab	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEE-111P / SEEC-111P	Basic Electrical Engineering Lab/ Fundamentals of Electronics Engineering Lab	0	0	3	0	0	20	0	30	**50**	**2**
9	SEME-112P/ SEHU-111P	Engineering Workshop Lab/ Professional Communication Lab	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC -112*	University Social Responsibility - Community Outreach	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-111*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**12**	**130**	**85**	**80**	**435**	**120**	**850**	**26**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-112 & SPT-111 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Applied Science Courses(Core)	Engineering Mathematics-I, Engineering Chemistry / Engineering Physics
Common Engineering Courses (Core)	Fundamentals of Computer Programming / History of Aviation, Basic Electrical Engineering / Fundamentals of Electronics Engineering,
Skill Enhancement Courses	University Social Responsibility, SPORTS
Ability Enhancement Courses	Shrimad Bhagwat Geeta /Professional Communication, Aerospace Engineering Graphics Lab

Bachelor of Technology (B.Tech.) Aerospace Engineering

FIRST YEAR, SEMESTER-II

S. No	Course Code	Course Name	Evaluation Scheme								Total Marks	Credits
			Periods			Internal Marks			External Marks			
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-121	Engineering Mathematics-II	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAS-123/ SEAS-122	Engineering Chemistry/ Engineering Physics	3	1	0	30	20	0	100	0	**150**	**4**
3	SECS-121 / SEAE-121	Fundamentals of Computer Programming / History of Aviation	3	1	0	30	20	0	100	0	**150**	**4**
4	SEEC-121 / SEEE-121	Fundamentals of Electronics Engineering / Basic Electrical Engineering	3	1	0	30	20	0	100	0	**150**	**4**
5	SEHU-121/ SEAE-122	Professional Communication /Shrimad Bhagwat Geeta	3	0	0	10	5	0	35	0	**50**	**2**
6	SEAS-123P / SEAS-122P	Engineering Chemistry (lab)/ Engineering Physics (Lab)	0	0	3	0	0	20	0	30	**50**	**2**
7	SECS-121P / SEAE-121 P	Fundamentals of Computer Programming (Lab)/Aerospace Engineering Graphics (Lab)	0	0	3	0	0	20	0	30	**50**	**2**
8	SEEC-121P / SEEE-121P	Fundamentals of Electronics Engineering Lab / Basic Electrical Engineering (Lab)	0	0	3	0	0	20	0	30	**50**	**2**
9	SEME-122P/ SEHU-121P	Engineering Workshop Lab/ Professional Communication (Lab)	0	0	3	0	0	20	0	30	**50**	**2**
10	NECC -125	MOOCS (SWAYAM/NPTEL)	0	0	4	0	0	50	0	0	**50**	**2**
11	NECC-121*	Industrial Visit/ Seminar on the report of visit	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
12	NECC -122*	University Social Responsibility - Community Outreach	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
13	SPT-121*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**04**	**16**	**130**	**85**	**130**	**435**	**120**	**900**	**28**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- External Practical, NC- Non Credit Course	
***Note:** NECC-121, NECC-122 & SPT-121 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits , social visits /awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.	
Applied Science Courses(Core)	Engineering Mathematics-II, Engineering Chemistry /Engineering Physics
Common Engineering Courses (Core)	Computer Basics & 'C' Programming/History of Aviation, Fundamentals of Electronics Engineering / Basic Electrical Engineering
Skill Enhancement Courses	Industrial Visit/Seminar on the report of visit, University Social Responsibility, MOOCS (SWAYAM/NPTEL), SPORTS
Ability Enhancement Courses	Professional Communication /Shrimad Bhagwat Geeta

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 5th Semester.

Bachelor of Technology (B.Tech.) Aerospace Engineering

SECOND YEAR, SEMESTER-III

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAS-231	Engineering Mathematics-III	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAE-232	Flight Mechanics	3	1	0	30	20	0	100	0	**150**	**4**
3	SEAE-233	Aero Engineering Thermodynamics	3	1	0	30	20	0	100	0	**150**	**4**
4	SEME-234	Fluid Mechanics	3	1	0	30	20	0	100	0	**150**	**4**
5	SEME-235	Strength of Material	1	0	2	10	5	0	35	0	**50**	**2**
6	SEAE-232P	Flight Mechanics (Lab)	0	0	4	0	0	20	0	30	**50**	**2**
8	SEME-234P	Fluid Mechanics (Lab)	0	0	4	0	0	20	0	30	**50**	**2**
9	SEAE-236P	Aeromodelling (Lab)	0	0	4	0	0	20	0	30	**50**	**2**
10	NECC-232*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-231*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**14**	**04**	**14**	**130**	**85**	**60**	**435**	**90**	**800**	**24**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-232 & SPT-231 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks	
Applied Science Courses(Core)	Mathematics-III
Engineering Courses (Core)	Wind Tunnel, Aero Engineering Thermodynamics, Fluid Mechanics, Strength of Material , Wind Tunnel(Lab), Fluid Mechanics (Lab), Strength of Material (Lab)
Skill Enhancement Courses	University Social Responsibility, SPORTS, Strength of Materials, Aeromodelling Lab

Bachelor of Technology (B.Tech.) Aerospace Engineering

SECOND YEAR, SEMESTER-IV

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAE-241	Aerodynamics –I	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAE-242	Aircraft Structure-I	3	1	0	30	20	0	100	0	**150**	**4**
3	SEAE-243	Aerospace Propulsion –I	3	1	0	30	20	0	100	0	**150**	**4**
4	SDAE-241-SDAE-244	DSE-I	3	1	0	30	20	0	100	0	**150**	**4**
5		GE-1	3	1	0	30	20	0	100	0	**150**	**4**
6	SEAE-241P	Aerodynamics-I Lab	0	0	4	0	0	20	0	30	**50**	**2**
7	SEAE-242P	Aircraft Structure-I Lab	0	0	4	0	0	20	0	30	**50**	**2**
8	SEAE-243P	Aerospace Propulsion-I Lab	0	0	4	0	0	20	0	30	**50**	**2**
9	NECC-245	MOOCS (SWAYAM/NPTEL)	0	0	4	0	0	50	0	0	**50**	**2**
10	NECC-241*	Industrial Visit/ Seminar/Presentation on the report of visits	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	NECC-242*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
12	SPT-241*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**15**	**05**	**16**	**150**	**100**	**110**	**500**	**90**	**950**	**28**
13		**#Minor Certification Paper-I**	3	1	0	30	20	0	100	0	150	4

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessional), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-241, NECC-242 & SPT-241 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of Industrial visits, social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Aerodynamics –I, Aircraft Structure-I, Aerospace Propulsion –I, Aerodynamics-I Lab, Aircraft Structure-I Lab, Aerospace Propulsion-I Lab.
Discipline Specific Electives I	1. SDAE-241 Principles of Flight 2. SDAE-242 Aircraft System Maintenance 3. SDAE-243 Helicopter Theory 4. SDAE-244 Heat Transfer in Space application
Generic Electives-I	This subject will be opted by student from other department of the IIMT University
Skill Enhancement Courses	University Social Responsibility, SPORTS, MOOCS (SWAYAM/NPTEL)

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 5th Semester.

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

Bachelor of Technology (B.Tech.) Aerospace Engineering
THIRD YEAR, SEMESTER-V

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAE-351	Aerodynamics –II	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAE-352	Aircraft Structure-II	3	1	0	30	20	0	100	0	**150**	**4**
3	SEAE-353	Aerospace propulsion -II	3	1	0	30	20	0	100	0	**150**	**4**
4	SDAE-351-SDAE-354	DSE-II	3	1	0	30	20	0	100	0	**150**	**4**
5	SEAE-351P	Aerodynamics –II Lab	0	0	4	0	0	20	0	30	**50**	**2**
6	SEAE-352P	Aircraft Structure-II Lab	0	0	4	0	0	20	0	30	**50**	**2**
7	SEAE-353P	Aerospace Engine Lab	0	0	4	0	0	20	0	30	**50**	**2**
8	SEAE-354P	Internship Assessment	0	0	4	0	0	50	0	0	**50**	**2**
9	SEAE-359P	Research Project-I	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
10	NECC-352*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
11	SPT-351*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**12**	**04**	**16**	**120**	**80**	**110**	**400**	**90**	**800**	**24**
12		[#]**Minor Certification Paper-II**	3	1	0	30	20	0	100	0	150	4

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-352 & SPT-351 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. SEAE-359P is a Non credit course (Audit Course) and it will be assessed on the basis of research project. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Flight Dynamics, Aerodynamics –II, Aircraft Structure-II,DSE-2,Aerospace propulsion -II ,Introduction to Cryogenic, Aerodynamics –II Lab, Aerospace Engine Lab ,Aircraft Structure-II Lab
Discipline Specific Elective-II	1. SDAE-351-Experimental Stress Analysis 2. SDAE-352-Aircraft Instrument Maintenance 3. SDAE-353-UAV System and Design 4. SDAE-354-Smart Materials and Structures
Generic Electives-I	This subject will be opted by student from other department of the IIMT University
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship / Mini Project Assessment

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

Bachelor of Technology (B.Tech.) Aerospace Engineering

THIRD YEAR, SEMESTER-VI

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAE-361	Avionics System	3	1	0	30	20	0	100	0	**150**	**4**
2	SEAE-362	High Speed Aerodynamics	3	1	0	30	20	0	100	0	**150**	**4**
3	SDAE-361-SDAE-364	DSE-III	3	1	0	30	20	0	100	0	**150**	**4**
4	UVE-601	Universal Human Values & Professional Ethics	3	0	0	10	5	0	35	0	**50**	**3**
5	SEAE-361P	Avionics System Lab	0	0	4	0	0	20	0	30	**50**	**2**
6	SEAE-362P	Computer Aided Engineering Simulation Lab	0	0	4	0	0	20	0	30	**50**	**2**
7	SEAE-363P	Mini Project	0	0	4	0	0	50	0	0	**50**	**2**
8	NECC-365	MOOCS (SWAYAM/NPTEL)	0	0	4	0	0	50	0	0	**50**	**2**
9	SEAE-369P	Research Project-II	0	0	0	0	0	50*	0	0	50*	NC*
10	NECC-362*	University Social Responsibility	0	0	0	0	0	25*	0	0	25*	NC*
11	SPT-361*	SPORTS	0	0	0	0	0	50*	0	0	50*	NC*
		Grand Total	**15**	**03**	**16**	**100**	**65**	**110**	**335**	**90**	**700**	**23**
12		**#Minor Certification Paper-III**	2	0	0	30	20	0	100	0	150	2

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course	
*Note: NECC-361, NECC-362 & SPT-361 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of Industrial visits, social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. SEAE-369P is a Non credit course (Audit Course) and it will be assessed on the basis of research project. Student needs to qualify it but the marks will not be added in total marks	
Engineering Courses (Core)	Avionics System, High Speed Aerodynamics. Computer Added Engineering Simulation Lab ,Avionics System Lab, High Speed Aerodynamics
Discipline Specific Elective-III	1. SDAE-361 Aircraft Material 2. SDAE-362 Airframe Maintenance 3. SDAE-363 Helicopter System Maintenance 4. SDAE-364 Missile Aerodynamics
Ability Enhancement Courses	Universal Human Values & Professional Ethics
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship / Mini Project Assessment, MOOCS (SWAYAM/NPTEL)

Most Important regarding Internship: A minimum of 4-5 weeks internship is to be completed during summer break & its assessment will be done in 7th Semester.

#Minor Certification will be choice based and the student choosing any minor certification course has to clear all the three papers in three semesters (IV/ V/ VI Semester).

Bachelor of Technology (B.Tech.) Aerospace Engineering

FOURTH YEAR, SEMESTER-VII

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SEAE-471	Rocket Missile Designing	3	1	0	30	20	0	100	0	**150**	**4**
2		GE-II	3	1	0	30	20	0	100	0	**150**	**4**
3	SEAE-471P	Advanced Designing Lab	0	0	4	0	0	20	0	30	**50**	**2**
4	SEAE-472P	Minor Project Lab	0	0	8	0	0	40	0	60	**100**	**4**
5	SEAE-473P	Internship Assessment	0	0	4	0	0	50	0	0	**50**	**2**
6	NECC-475	MOOCS (SWAYAM/NPTEL)	0	0	4	0	0	50	0	0	**50**	**2**
7	NECC-472*	University Social Responsibility	*0*	*0*	*0*	*0*	*0*	*25**	*0*	*0*	*25**	*NC**
8	SPT-471*	SPORTS	*0*	*0*	*0*	*0*	*0*	*50**	*0*	*0*	*50**	*NC**
		Grand Total	**6**	**2**	**20**	**60**	**40**	**160**	**200**	**90**	**550**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

*Note: NECC-472 & SPT-471 is a Noncredit courses (Audit Courses) and will be evaluated on the basis of social visits/awareness campaigns/ awareness rallies & participation in sports activity respectively during the semester. Student needs to qualify it but the marks will not be added in total marks

Engineering Courses (Core)	Rocket missile Designing, Advanced Designing Lab
Skill Enhancement Courses	University Social Responsibility, SPORTS, Internship Assessment, MOOCS (SWAYAM/NPTEL), Minor Project Lab, Internship Assessment

Bachelor of Technology (B.Tech.) Aerospace Engineering
FOURTH YEAR, SEMESTER-VIII

S. No	Course Code	Course Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1	SDAE-481-SDAE-484	DSE-IV	3	1	0	30	20	0	100	0	**150**	**4**
2	GE-III	GE-III	3	1	0	30	20	0	100	0	**150**	**4**
3	SEAE-481P	Major Project Lab	0	0	20	0	0	100	0	150	**250**	**10**
		Grand Total	**6**	**2**	**20**	**60**	**40**	**100**	**200**	**150**	**550**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC- Non Credit Course

Discipline Specific Elective-V	1. SDAE-481-Aviation Fuels and Combustion 2. SDAE-482-Spaceflight Navigation And Guidance 3. SDAE-483-Introduction to composite material 4. SDAE-484-Electronics & Communication System.
Research Project	Major Project Lab

Format-1

Format-1

CBCS: Statement of Credit distribution							
College/School:School of Engineering & Technology Programme:B.Tech Duration: 8 Semester Annual/Semester: Semester					Credit range: 160-190 (suggested by CBCS Committee)		
Sem.	Cr	Core Course/ Foundation Course Th (6 cr)	Ability Enhancement Compulsory Course (AECC)	Skill Enhancment Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	26	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit)+P-2(2Credit) C-3 (4 Credit)+P-3(2Credit) C-4 (4 Credit)+P-4(2Credit)	AECC-1(2)				
II	28	C-5 (4 Credit) C-6 P-1(2Credit) C-7 (4 Credit)+P-2(2Credit) C-8 (4 Credit)+P-3(2Credit) C-9 (4 Credit)+P-4(2Credit)	AECC-2(2)	SEC-1(2)			
Provision to change the stream							
III	24	C-10 (4 Credit)+P-1(2Credit) C-11 (4 Credit)+P-2(2Credit) C-12 (4 Credit)+P-3(2Credit) C-13 (4Credit)		SEC-2(2)			
Provision to change the core papers							
IV	28	C-14 (4 Credit) C-15 P-1(2Credit) C-16 (4 Credit)+P-2(2Credit) C-17 (4 Credit)+P-3(2Credit)		SEC-3(2)	DSE-1(4)	GE-1(4)	
V	24	C-18 (4 Credit)+P-1(2Credit) C-19 (4 Credit)+P-2(2Credit) C-20 (4 Credit)+P-3(2Credit)		SEC-4(2)	DSE-2(4)		RP-1(NC*)
VI	23	C-21 (4 Credit)+P-1(2Credit) C-22 (4 Credit)+P-2(2Credit)	AECC-3(3)	SEC-5(2) SEC-6(2)	DSE-3(4)		RP-2(NC*)

VII	28	C-23 (4 Credit)+P-1(2Credit)		SEC-7(2) SEC-8(2)		GE-2(4)	Minor Project-1 (4)
VIII	18				DSE-4(4)	GE-3(4)	Major Project -1 (10)
Total Credits	**189**	21(Th)*4(Cr) = 84 20 (Pr)*2(Cr) = 40 **Total = 124**	2*2 = 04 1*3 = 03 **= 07**	8*2 = 16 **= 16**	4*4 = 16 **=16**	3*4 = 12 **= 12**	4+10 **= 14**

***MOOCs certification Elective** **#Entreprenuership & Innovation core paper**

Format-2

Format-2

IIMTU-NEP Implementation: (B.Tech Aerospace Engineering)

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES B.Tech AEROSPACE	**FIRST YEAR**	**SEMESTER -I**	i) C1 (Th.4Cr) ii) AECC-1 (Th.2 Cr +P 2Cr)	4 2 2	4 3 3	40 40 24	Engineering Mathematics –I Shrimad Bhagwat Geeta Aerospace Engineering Graphics Lab	5 5		
			i) C2 (Th.4 Cr. + P 2Cr.)	4 2	4 3	40 24	Engineering Physics Engineering Physics (Lab)	5		
			i) C3 (Th.4 Cr. +P 2Cr.)	4 2	4 3	50 24	History of Aviation Engineering Workshop Lab	5		
			i) C4 (Th.4 Cr. +P 2Cr.)	4 2	4 3	45 24	Basic Electrical Engineering Basic Electrical Engineering Lab	5		
		SEMESTER - II	i) C5 (Th.4 Cr.) ii) AECC-2 (Th.2 Cr +P 2 Cr.) iii) SEC-1(2Cr)	4 2 2 2	4 3 3 4	40 30 24 24	Engineering Mathematics –II Professional Communication Professional Communication Lab MOOCS (Swayam/ NPTEL)	5 5		
			ii) C6 (Th.4Cr. +P2Cr.)	4 2	4 3	40 24	Engineering Chemistry Engineering Chemistry (Lab)	5		
			iii) C7 (Th.2Cr. +P 2Cr.)	4 2	4 3	43 24	Fundamental of Computer Programming Fundamental of Computer Programming Lab	5		
			iv) C8 (Th.4Cr.+P 2Cr.)	4 2	4 3	45 24	Fundamentals of Electronics Engineering Fundamentals of Electronics Engineering (Lab)	5		

Programme Outcome:

$PO_1 – PO_{12}$ Annexure -1

Programme Specific Outcome:

PSO_1 -PSO_4 Annexure-2

Note: Correlation between CO/PO/PSO3 are to be established by bloom taxonomy:

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR	SEMESTER -III	i) C9 (Th. 4 Cr. + P 2Cr.)	4	4	45	Flight Mechanics	5		
				2	4	45	Flight Mechanics (Lab)			
			ii) SEC-2(2Cr)	2	2	32	Strength of Material	4		
			i) C10 (Th. 4 Cr. + P 2Cr.)	4	4	45	Fluid Mechanics	5		
				2	4	45	Fluid Mechanics Lab			
			i) C11 (Th. 4 Cr)	4	4	40	Engineering Mathematics-III	5		
			i) C12 (Th. 4 Cr+P 2Cr.)	4	4	45	Aero Engineering Thermodynamics	5		
				2	4	45	Aeromodelling Lab			
		SEMESTER -IV	i) C13 (Th.4 Cr. + P 2 Cr.)	4	4	40	Aerodynamics –I	5		
				2	4	24	Aerodynamics-I Lab			
			ii) SEC-3(2Cr)	2	4	45	MOOCS (Swayam/ NPTEL)			
							Principle of Flight	5		
							Aircraft System maintenance			
			iii) DSE-1(Th.4Cr)	4	4	45	Helicopter theory			
							Heat Transfer in Space Application	5		
			iv) GE-1(Th.4Cr)	4	4		**#To be opted from other department**			
			i)C14 (Th. 4 Cr. + P 2Cr.)	4	4	45	Aircraft Structure-I	5		
				2	4	24	Aircraft Structure-I Lab			
			i) C15 (Th. 4 Cr+ P 2Cr.)	4	4	45	Aerospace propulsion-I	5		
				2	4	45	Aerospace propulsion-I Lab			

Programme Outcome:

$PO_1 – PO_{12}$ Annexure -1

Programme Specific Outcome:

PSO_1 -PSO_4 Annexure-2

#Minor Certification Paper-I

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	THIRD YEAR	SEMESTER -V	i)C16 (Th. 4 Cr. +P 2 Cr.)	4 2	4 3	45 24	Aerodynamics –II Aerodynamics-II Lab	5		
			ii) SEC-4(2 Cr.)	2	2	24	*Internship			
			iii) DSE-2(4Cr.)	4	4	45	Experimental Stress Analysis Aircraft Instruments Maintenance UAV System Designing Smart material and Structure	5		
			i) C17 (Th. 4 Cr. +P 2 Cr.)	4 2	4 3	45 24	Aircraft Structure-II Aircraft Structure Lab	5		
			i) C18 (Th. 4 Cr. + P 2 Cr.)	4 2	4 3	45 24	Aerospace Propulsion –II Aerospace Engine Lab	5		
		SEMESTER - VI	i) C19 (Th. 4 Cr. + P 2Cr.)	4 2	5 3	45 24	Avionics System Avionics System Lab	5		
			ii) SEC-5(2.Cr.)	2	4	32	MOOCS (Swayam/ NPTEL)			
			iii) SEC-6(2.Cr)	2	3	24	Mini Project Lab			
			iii) DSE-3(Th.4Cr.)	4	4	45	Aircraft Material Airframe maintenance Helicopter System Maintenance Missile Aerodynamics	5		
			iv) AECC-3(Th.3Cr.)	3	4	40	Universal Human Values & Professional Ethics	5		
			i) C20 (Th. 4 Cr. + P 2Cr.)	4 2	5 3	45 24	High-speed Aerodynamics Computer Aided Engg. Simulation Lab	5		

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break** **#Minor Certification Paper-II &III**

Programme Outcome:
$PO_1 - PO_{12}$ Annexure -1

Programme Specific Outcome:
PSO_1 -PSO_4 Annexure-2

Note: Correlation between CO/PO/PSO3 are to be established by bloom taxonomy:

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	FOURTH YEAR	SEMESTER –VII	i) C21 (Th. 4Cr+ P 2Cr.)	4	4	45	Rocket Missile Designing	5		
				2	3	24	Advanced Designing Lab			
			ii) SEC-7(2.Cr)	2	2	24	*Internship			
			iii) SEC-8(2.Cr)	2	3	32	MOOCS (SWAYAM/NPTEL)			
			iii) Project Lab (Minor)	4	4	24	Minor Project Lab			
			v) GE-2	4			**#To be opted from other department**	5		
		SEMESTER - VIII	i) GE-3	4	4	40	**#To be opted from other department**	5		
			ii) DSE-4	4	4	45	Aviation Fuel and Combustion Space Flight Navigation And Guidance Introduction to Composite material Satellite Communication System	5		
			iii) Major Project	10	20	200	**Major Project Lab			

**Major Project report will be evaluated by external & internal examiners & Research topic may be selected from the main core paper

Programme Outcome:
$PO_1 - PO_{12}$ Annexure -1

Programme Specific Outcome:
PSO_1 -PSO_4 Annexure-2

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

ANNEXTURE-1

<u>Program Outcomes:</u>

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and

Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

ANNEXTURE-2

Program Specific Outcomes:

PSO1: Ability to recognize and examine the mechanical parts, machine apparatuses and systems and to get to know platforms, apparatuses, innovative work in the area of Mechanical Engineering.

PSO2: Apply the concepts of Mechanical Engineering and use AUTO CAD, Solid Works, and Ansys software for the design and development of industrial problems.

PSO3: Apply the knowledge of Mechanical Engineering in the various fields such as automobile industries, manufacturing units and power plants etc.

PSO4: Apply the principles and knowledge of Mechanical Engineering to analyze the most advanced system.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I

Programme : B.Tech. (Aerospace Engineering) **Class :** B.TECH (CSE,AIML,ME,CE,EE,AE)	Year : I Semester : I
Credits Theory: 4 Practical: 0	**Subject:** Engineering Mathematics-I
Course Code : SEAS-111	**Title :** Engineering Mathematics-I\

Course Objectives:

1. To apply the knowledge of differential calculus in the field of engineering.
2. To deal with functions of several variables that is essential in optimizing the results of real life problems.
3. To understand the essential tools of matrices and linear algebra, Eigen values and diagonalization in a Comprehensive manner are required.
4. To understand Multiple integral tools to deal with engineering problems involving centre of gravity, volume etc.
5. To deal with vector calculus that is required in different branches of Engineering to graduate engineers.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T:1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**DIFFERENTIAL CALCULUS-I:** Successive Differentiation (nth order derivatives), Leibnitz theorem and its application. Curve tracing: Cartesian and Polar co-ordinates. Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions.	**8L**
II	**DIFFERENTIAL CALCULUS-II:** Taylor and Maclaurin's theorems for a function of two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians.	**8L**
III	**MATRICES:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, System of linear equations, Characteristic equation, Eigen values and eigenvectors, Cayley-Hamilton Theorem and its application Diagonalisation of a Matrix	**8L**
IV	**INTEGRAL CALCULUS:** Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, Application: Areas and volumes.	**8L**
V	**Vector Calculus:** Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem (without	**8L**

	proof) and their applications	

Reference / Text Books:

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
2. Dass H.K., Engineering Mathematics Vol-I, S. Chand.
3. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of differentiability and apply in the study of Successive differentiation, Leibnitz theorems and Partial differentiation.

CO2 Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.

CO3 Remember the concept of matrices and apply for solving linear simultaneous equations

CO4 Illustrate the working methods of multiple integral and apply for finding area, volume.

CO5 Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

CO6 Apply the concept of calculus in solving engineering problems.

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class :**B.TECH(CSE,AIML,ME,CE,EE,AE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Physics
Course Code : SEAS-112/122	**Title:** Engineering Physics

Course Objectives:

1. To Understand the concept of Relativistic Mechanics
2. To know the significance of Maxwell's equations in the Engineering applications of electromagnetic waves.
3. Explain Quantum Mechanics to understand wave particle dualism. Necessity of quantum mechanics to explore.
4. To know the concept of Interference and Diffraction.
5. To Understand the Phenomenon of Polarization and Laser.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Relativistic Mechanics:** Inertial and Non- Inertial Frames; Michelson-Morley Experiment; Postulates of Special Theory of Relativity; Galilean and Lorentz Transformation; Length Contraction and Time Dilation; Addition of Velocities; Mass Energy Equivalence and Variation of Mass with Velocity.	**8L**
II	**Electromagnetic:** Gauss law Ampere's law and displacement current; Equation of continuity; Maxwell's equations in Integral and Differential Forms; Electromagnetic Wave Propagation in Free Space and Conducting Media; Poynting Theorem	**8L**
III	**Quantum Mechanics:** Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box.	**8L**
IV	**Wave Optics:** **Interference:** Basics of interference of light; Principle of superposition, coherent Sources, Conditions of Interference; Interference by division of wave front and amplitude (Fresnel's bi-prism, Interference due to thin film, Newton's Rings). **Diffraction:** Fraunh offer Diffraction Due Single and N-slit; Diffraction Grating; Rayleigh's criterion of resolution; absent spectra, dispersive Power of grating, Resolving power of Grating.	**8L**

V	**Polarization:** Phenomenon of double refraction; Ordinary and extra-ordinary rays; Nicol Prism; quarter wave plate and half wave plate; Production and analysis of Plane, Circularly and Elliptically Polarized Light; Optical Activity; Specific Rotation, Laurent half's half shade Polari meter.	**8L**

Reference / Text Books:

Text Books:

1. Concepts of Modern Physics – Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

Reference Books:

1. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
2. Engineering Physics-Malik HK and Singh AK (Mc Graw Hill)

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 To describe the classical relativity and wave mechanics problems.
CO2 To demonstrate the electromagnetic waves and their application in various processes
CO3 To calculate and solve the engineering problems of quantum mechanics.
CO4 To evaluate and grade the engineering problems of wave optics.
CO5 To prepare the classical physics & to prepare the ideas in solving the problems in their parent streams.
CO6 To prepare the Production and analysis of Plane

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(CSE,AIML,ME,CE,EE,AE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject :** Engineering Physics Lab
Course Code:SEAS-112P/ SEAS-122 P	**Title:** Engineering Physics Lab

Course Objectives: The objectives of studying this course are,
1. To understand the concept of wave length by the interference
2. To understand the concept of wave length by the diffraction.
3. To understand the concept of viscosity of liquid and flow of liquid.
4. To understand the energy band gap in the semiconductors.
5. To understand the concept of polarization.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To determine the wavelength of Sodium light by Newton's rings
Practical-2	To determine the wavelength of prominent lines of mercury by plane diffraction grating
Practical-3	To determine the focus length combination of two lenses separated by distance and verify the formula for the focal length of combination of lenses
Practical-4	To determine the wave length of sodium light with the help of Fresnel's bi-prism
Practical-5	To determine the coefficient of viscosity of a given liquid
Practical-6	To verify Stefan's law
Practical-7	Calibration of a volt meter with potentiometer
Practical-8	To determine the resistance per unit length and specific resistance of a given resistance using Carey Foster 's Bridge
Practical-9	To determine the energy bend gap of a given semiconductor material
Practical-10	To determine the Specific Rotation of the Cane sugar solution with the help of Polarimeter.

Reference / Text Books:
1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi).
2. Engineering Physics- Practical- Katiyar & Pandey (Wiley India).

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. To determine the wavelength of sodium light by Newton's ring experiment.

CO2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.

CO3. Understand measurement technology, usage of new instruments and real time applications in engineering studies.

CO4. To determine the viscosity of liquid.

CO5. To determine the emission of energy with respect the temperature and verify Stefan's law.

CO6. To determine the calibration of potential and draw the curve.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(CSE,AIML,ME,CE,EE,AE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Engineering Chemistry
Course Code:SEAS-113/123	**Title:** Engineering Chemistry

Course Objectives:
1. Student will be able to apply fundamental concepts of chemistry in different fields of Engineering.
2. Student will be able to identify compounds using different spectroscopic techniques
3. Student will be able to understand the basic principles of electrochemistry for different engineering applications
4. Student will be able to illustrate different types of impurities in water and its softening techniques
5. Student will be able to apply the concepts of determination of calorific values and analyze the coal
6. Student will be able to recall the basic knowledge of polymerization & and applications

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Atomic and Molecular Structure:** Molecular orbitals of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application	**8L**
II	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	**8L**
III	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system.	**8L**
IV	**Water Analysis:** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulon'smethos).	**8L**
V	**Polymers:** Basic concepts of Polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6, 6 and Terylene). General methods	**8L**

	of synthesis of organometallic compounds (Grignard reagent) and their applications.	

Reference / Text Books:

Text Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S.G lasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry By Fre W. Billmeyer

Reference Books:

1. Elementary Organic Spectroscopy By Y.R. Sharma
2. Principles of Physical Chemistry By Puri, Sharma, Pathania
3. Principles of Inorganic Chemistry By Puri, Sharma, Kalia
4. Concise Inorganic Chemistry By J.D. Lee

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Apply fundamental concepts of chemistry in different fields of Engineering
CO2 Identify compounds using different spectroscopic techniques.
CO3 Understand the basic principles of electrochemistry for different engineering applications
CO4 Illustrate different types of impurities in water and its softening techniques
CO5 Apply the concepts of determination of calorific values and analyze the coal
CO6 Recall the basic knowledge of polymerization and its applications

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(CSE,AIML,ME,CE,EE,AE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Engineering Chemistry Lab
Course Code: SEAS-113P/SEAS-123P	**Title:** Engineering Chemistry Lab

Course Objectives: The objectives of studying this course are,
1. Student will be able to Estimate different impurities present in water sample.
2. Student will be able to Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution
3. Student will be able to Identify iron concentration and percentage of available chlorine in supplied sample using titration methods.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/ 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	To determine total alkalinity in the given water sample.
Practical-2	To determine the temporary and permanent hardness in water sample using EDTA as standard solution.
Practical-3	To determine the available chlorine in bleaching powder solution.
Practical-4	To determine the chloride content in the given water sample by Mohr's method.
Practical-5	To determine the pH of the given solution using pH meter and pH-metric titration.
Practical-6	To determine the Equivalent weight of Iron by the chemical displacement method.
Practical-7	To determine the Viscosity of an addition polymer like polyester by Viscometer.
Practical-8	To find chemical oxygen demand of waste water sample by potassium dichromate
Practical-9	To determine the iron content in the given sample using external indicator
Practical-10	To determine the strength of given HCL solution by titrating against N/10 Standard Sodium hydroxide solution

Reference / Text Books:

1. Practical Chemistry B.Tech. Text Book, Dr. Usha Nakra and Laxmi Kant Sharma Dr. Vivek Pandey, Dr. T. L. Rajawat, Dr. Sama Jain, Dr. Monika Sharma, Dr. Virendra Singh (Neelkanth Publishers (P) Ltd.)

If the course is available as Generic Elective then the students of following departments may opt it. NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** Analyze the need, design and perform a set of experiments. **CO2.** Identify the structure of unknown/new compounds with the help of spectroscopy **CO3.** Identify iron concentration and percentage of available chlorine in supplied sample using titration methods. **CO4.** Determine molecular properties such as surface tension, viscosity, pH, conductance and concentration of solution **CO5.** Equipped with basic knowledge of polymer reinforced composites, applications of semiconductor photochemistry in energy harnessing and optical sensors. **CO6.** Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td colspan="2">Programme: B.Tech. (Aerospace Engineering)
Class: B.TECH(CSE,AIML,ME,CE,EE,AE)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 4
Practical: 0</td><td colspan="2">Subject: Learning Computers with Thinking and Programming in C</td></tr>
<tr><td>Course Code:SECS-111/121</td><td colspan="2">Title: Learning Computers with Thinking and Programming in C</td></tr>
<tr><td colspan="3">Course Objectives:
1. After studying this course students will be able to develop simple algorithms for arithmetic and logical problems.
2. After studying this course students will be able to translate the algorithms to programs &finally execution in C language.
3. After studying this course students will be able to implement conditional branching, iteration and recursion in C language.
4. After studying this course student will be able to decompose a problem into functions and synthesize a complete program using divide and conquer approach using C language.
5. After studying this course students will be able to use arrays, pointers and structures to develop algorithms and programs for implementation in C language.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/ 4</td></tr>
<tr><td colspan="3">L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Programming basics.** Conceptual Introduction to components of a computer system i.e. Memory, processor, I/O Devices, storage, operating system. Understanding assembler, compiler, interpreter, loader and linker. Understanding Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics of C language**. Core Structure of C program: writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language: Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.	**8L**
II	**Arithmetic expressions & Conditional Branching in C language**: Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively. Conditional Branching: Applying if and switch statements, nesting of it and else, use of break and default with switch	**8L**

III	**Loops & Functions in C language:** Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements. Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.	**8L**
IV	**Arrays & Basic Algorithms in C language**: Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions. Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.	**8L**
V	**Pointer& File Handling in C language**: Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.	**8L**

Reference / Text Books:

Text Books:

1. Let Us C By Yashwant P. Kanetkar.
2. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.

Reference Books:

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Programming in C by Kochan Stephen G. Pearson Education – 2015.
3. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
4. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication

If the course is available as Generic Elective then the students of following departments may opt it. NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 To understand the basic computer concepts and programming principles of C language.
CO2 To develop simple algorithms for arithmetic and logical problems.
CO3 To translate the algorithms to programs & execution (in C language).
CO4 To implement conditional branching, iteration and recursion.
CO5 To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO6 To use arrays, pointers and structures to develop algorithms and programs

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(CSE,AIML,ME,CE,EE,AE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Learning Computers with Thinking and Programming in C Lab
Course Code:SECS-111 P/SECS-121P	**Title:** Learning Computers with Thinking and Programming in C Lab

Course Objectives: The objectives of studying this course are,

1. After studying the above course the student will be able to implement algorithms and draw flowcharts for solving easy and complex Mathematical as well as engineering problems..
2. After studying the above course the student will be able to, understand and demonstrate programming language concepts by implementing programs in C language.
3. After studying the above course the student will be able to, design and develop programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage in computer language C.
4. After studying the above course the student will be able to, able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures in C language which will be latter helpful in understanding the concept of object oriented programming in C++.
5. After studying the above course the student will be able to, develop confidence for self-learning and ability for life-long learning needed for learning any computer language.

6. Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	**Contents**
Practical-1	Write a program to calculate the area of triangle using formula Area = √s (s- a) (s-b) (s-c) where s = (a+b+c)/ 2 Credit.
Practical-2	We input the basic salary of an employee through the keyboard. The Dearness allowance (DA) is 25% of the basic salary while the house rent allowance (HRA) is 15% of the basic salary. While the provident fund is deducted at the rate of 10% of the gross salary (BS+DA+HRA). Write a program in C to calculate the Net Salary.
Practical-3	Write a program in C to determine the roots of quadratic equation.
Practical-4	Write a program in C to find the largest of three numbers using then construct.
Practical-5	Write a program in C to receive marks of history, geography & civics from user & check its eligibility for course if a) Marks of history>40

	b) Marks of geography>50 c) Marks of civics>60 d) Total of history & civics marks>150 or Total of three subjects marks>200
Practical-6	Write a program in C to find the value of y for a particular value of n. The a, x, b, n is input by user if n=1 y=ax%b if n=2 y=ax2+b2 if n=3 y=a-bx ifn=4 y=a+x/b
Practical-7	Write a programi n C to construct a Fib on accessories up ton terms.
Practical-8	Write a program in C to find whether the number is Arm strong number or not.
Practical-9	Write a program in C to generate sum of series1!+2!+3!+ n!
Practical-10	Write a program in C to find the sum of following series1-X1/1!+X2/ 2 Credit Credit!-…………Xn/n!.
Practical-11	Write a program in Ctoprinttheentireprimenobetween1and 500.
Practical-12	Write a program in C to print out all the Arm strong number between 50 and 600.
Practical-13	Write a program in C to draw the following figure: 4 3 2 1 3 2 1 2 1 1
Practical-14	Write a program in C to receive a five-digit no and display as like12345: 1 2 3 4 5
Practical-15	Write a function in C that return sum of all the even digits of a given positive no entered through keyboard.
Practical-16	Write a program in C to print area of a trapezium using function & return its value to main function.
Practical-17	Write a program in C to calculate the factorial for given number using function.
Practical-18	Write a program in C to find sum of Fib on accessories using function.
Practical-19	Write a program in C to find the factorial of given number using recursion.
Practical-20	Write a program in C to find the sum of digits of a 5d igit number using recursion.
Practical-21	Write a program in C to calculate the GCD of given numbers using recursion.
Practical-22	Write a program in C to convert decimal number into binary number.
Practical-23	Write a program in C to convert binary number into decimal number.
Practical-24	Write a program in C to delete duplicate element in a list of 20 elements & display it on screen.
Practical-25	Write a program in C to merge two sorted array & no element is repeated during merging.

Practical-26	Write a program in C to evaluate the addition of diagonal elements of two square matrixes.
Practical-27	Write a program in C to find the transpose of a given matrix & check whether it is symmetric or not.
Practical-28	Write a program in C to print the multiplication of two N* N (Square) matrix.
Practical-29	Write a program in C to check whether the given string is a palindrome or not.
Practical-30	Write program in C to sort the array of character (String) in alphabetical order like STRING in GNIRTS.
Practical-31	Write a program in C to remove all the blank space from the string & print it, also count the no of characters.
Practical-32	Write a program in C to store the following string “zero”, “one” “five”. Print the no in words, given in figure as 3205.
Practical-33	Write a program in C to compare two given dates. To store a date use a structure that contains three members namely day, month and year. If the dates are equal then display message equal otherwise unequal.
Practical-34	Write a C program to copy & count the character content of one file says c.txt to another file d.txt.
Practical-35	Write a program in C to print all the prime number, between 2 to 200 in a file name prime. txt.
Practical-36	a) Write the following C program using pointer. b) To sort the list of numbers through pointer c) To reverse the string through pointer.
Practical-37	Write a program in C to find the largest no among 30 integers array using dynamic memory allocation.
Practical-38	Using Dynamic Memory Allocation, Write a program in C to find the transpose of given matrix.
Practical-39	Write a program in C to find the factorial of given number using command line argument.

If the course is available as Generic Elective then the students of following departments may opt it. NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Implementation of algorithms and drawing flowcharts for solving easy and complex Mathematical as well as Engineering problems.

CO2. Computer programming language concepts understanding and demonstration.

CO3. Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

CO4. Able to define data types and use them in simple data processing applications also he/she must

be able to use the concept of array of structures.
CO5. Development of confidence for self-education and ability for life-long learning needed for Computer language.
CO6. Understand the basics of file handling mechanisms

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(AE)		Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject: History Of Aviation**	
Course Code:SEAE-121	**Title: History Of Aviation**	
Course Objectives: 1. Study the basic concepts of flying. 2. Understand about the aircraft structures and materials. 3. Acquire the knowledge of aircraft power plants.		
Nature of Paper: Core		
Minimum Passing Marks/Credits: 40% Marks/ 4		
L: 3 T: 1 P: 0 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)		

Unit	Contents	No. of Lectures Allotted
I	**HISTORICAL EVALUATION:** History of Aviation, Early development of Airplanes, Biplanes and Monoplanes, history of Spaceflight, development of space vehicle. **CONFIGURATIONS:** Anatomy of flight vehicles, components of an Airplanes and their function, configuration of space vehicle, Earth's atmosphere and gravitational field, Bluff bodies V/S Streamlined body, Airfoil, lift generation, significance of L/D ratio, Aerodynamic forces.	**8L**
II	**AIRPLANE STRUCTURES AND MATERIALS:** General types of construction, Mono coque, semi-mono coque and geodesic constructions, Typical wing and fuselage structure. Metallic and non-metallic materials, Use of aluminum alloy, titanium, stainless steel and composite materials. Stresses and strains – Hooke's law – Stress – strain diagrams – elastic constants.	**8L**
III	**POWER PLANTS:** Basic ideas about piston, turboprop and jet engines – Use of propeller and jets for thrust production – Comparative merits, principles of operation of rocket, types of rockets and typical applications, Exploration into space. **PROPULSION:** Classification and essential features of propulsion, Jet propulsion, general characteristics of rocket engines, theory of propulsion, elementary gas dynamics, Spacecrafts and Aircraft performance.	**8L**
IV	**Introduction to IC engines**: IC Engine: Basic Components, Construction and Working of Two stroke and four stroke SI & CI engine, merits and demerits, scavenging process; Introduction to electric, and hybrid electric vehicles	**8L**

V	**INSTRUMENTS AND NAVIGATION:** Basic Instrumentation, Electronics (DC Electronics, AC Electronics, Semiconductors, Electro-Optics and Digital Electronics), Sensing devices, bridge circuits, Optical devices and Introduction to Computer Based Data Acquisition, Measurements in Aerodynamics, Flight Structures, Flight Control, Principles of Navigation, Celestial, Radio, and Inertial Navigation Schemes, Navigational and Guidance Requirements for Orbital, Planetary, and Atmospheric Entry Missions	**8L**

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
CO1 Learn the Atmospheric parameter changes with altitude
CO2 Ability to identify the types & classifications of components and control systems
CO3 An ability to differentiate the types of fuselage and constructions
CO4 Understand measurement technology, usage of new instruments and real time applications in engineering studies.
CO5 Understand the basic flight operation

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(CSE,ME,CE,EE/AE)	Year: I Semester: I/II
Credits Theory: 4 Practical: 0	**Subject:** Fundamentals of Electronics Engineering
Course Code:SEEC-111	**Title: F**undamentals of Electronics Engineering
Course Objectives: 1. To develop a strong foundation of concept of PN Junction and solid state devices 2. To present the Operational amplifier and its applications 3. To familiarize with digital electronics & the design of various digital circuits using logic gates 4. To introduce the various communication systems	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks / 4	
L: 3 T: 1 P: 0 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Overview of Semiconductors**, PN junction Diode, Zener Diodes, Diode Application: Half and Full Wave rectification, Clippers, Clampers Special Purpose two terminal Devices: Light-Emitting Diodes, Photo Diodes, Varactor Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**8L**
II	**BJT**: Transistor Construction, Operation, Amplification action (Common Base, Common Emitter, Common Collector) **Field Effect Transistor:** Construction, Operation and Characteristic of JFET and MOSFET (Depletion and Enhancement) Type	**8L**
III	**OP AMP:** Introduction, Op-amp symbol, terminals, packages, Block diagram Representation of op-amp- Ideal amp & practical op-amp – Open loop & closed loop configurations, characteristics of op-amp, Op-Amp Circuits: Inverting Amplifier, Non-inverting Amplifier, Voltage Follower, Summing Amplifier, scaling & averaging amplifiers, Integrator, Differentiator.	**8L**
IV	**Digital Electronics:** Number systems, Binary codes – Binary Arithmetic, Logic gates, Boolean algebra, laws and theorems, Simplification of Boolean expressions, Implementation of Boolean expressions using logic gates Standard forms of Boolean expression, K Map Minimization upto 4 Variables.	**8L**
V	**Fundamentals of Communication Engineering**: Block diagram of a basic communication system, Frequency spectrum, Need for modulation, Methods of modulation, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	**8L**

Reference / Text Books:

Text Books:

1. Robert L. Boylest and / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication

Reference Books:

1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, Stayabrata Jit, "Electronic Devices and Circuits", McGraw Hill
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford Uni Press India

If the course is available as Generic Elective then the students of following departments may opt it. NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	20
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

CO1 Understand the concept of PN Junction and devices.
CO2 Understand the concept of BJT, FET and MOFET
CO3 Understand the concept of Operational amplifier
CO4 Understand the Principles of digital electronics
CO5 Principles of various communication systems
CO6 Design rectifier & measure the waveform parameters

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:**B.TECH. (CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Fundamentals of Electronics Engineering Lab
Course Code:SEEC-111P/ SEEC-121P	**Title:** Fundamentals of Electronics Engineering Lab

Course Objectives: The objectives of studying this course are,
1. To introduce the concepts of electronic circuits and its components
2. To introduce the concepts of diodes & transistors
3. To impart the knowledge of various configurations, characteristics and applications.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
Practical-2	To verify the PN diode characteristics
Practical-3	To verify the Zener diode characteristics
Practical-4	To verify the BJT characteristics (either of the configurations)
Practical-5	Study of Logic Gate
Practical-6	Design and implementation of Adder and Subtract or using logic gates.
Practical-7	To determine the external characteristics of DC Shunt generator
Practical-8	Implement an Adder and Subtract or Circuit using Operational Amplifier
Practical-9	To study Full Wave Rectifier Circuit
Practical-10	Study of AM modulator and Demodulator

Reference / Text Books:

Text Books:
1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Pearson Education.
2. R. Muthusubramanian, S. Salivahanan, "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education, Reprint 2012.
3. George Kennedy, "Electronic Communication Systems", McGraw Publication.

Reference Books:
1. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
2. Jacob Millman, C.C. Halkias, Stayabrata Jit, "Electronic Devices and Circuits", McGraw Hill.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.**Conduct experiments illustrating the application of Fundamentals of semiconductor, electronic components/devices. **CO2**. Demonstrate the behavior of Principles of digital electronics. **CO3.**Apply the operation and discuss the performance of several fundamentally important op-amp circuits that have certain features or characteristics oriented to special applications. **CO4.** Analyze the concept with the working principles of forward and reverse bias characteristics. **CO5.** Demonstrate the basic skills in design and analysis of filter circuits, biasing circuits. **CO6.** Discriminate the principle, construction and operation of BJTs, FETs and MOSFETs.	

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td colspan="2">Programme: B.Tech. (Aerospace Engineering)
Class: B.TECH(CSE,ME,CE,EE,AE)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 4
Practical: 0</td><td colspan="2">Subject: Basic Electrical Engineering</td></tr>
<tr><td>Course Code:SEEE-111/121</td><td colspan="2">Title: Basic Electrical Engineering</td></tr>
<tr><td colspan="3">Course Objectives:
1. The objective of this course is to teach the students Introduction to Electrical Engineering.
2. To understand the fundamental concept of Electrical Engineering like DC Network, AC Network.
3. Measuring Instruments, Energy Conversion Devices.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/ 4</td></tr>
<tr><td colspan="3">L: 3
T: 1
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	**Circuit theory Concepts**-Mesh and nodal analysis; Network Theorems-Superposition theorem, Thevenin's theorem, Norton's theorem and Maximum Power Transfer theorem; Star Delta transformation..	**8L**
II	Sinusoidal and phasor representation of voltage and current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel; Apparent, active & reactive powers, Power factor; Series and parallel resonance; Bandwidth and quality factor.	**8L**
III	**Measuring Instruments:** Construction and principles of operation of voltage and current measuring instruments; introduction to power and energy meters. **Three Phase A.C. Circuits:** Star-Delta connections; Line and phase voltage/current relations; Three phase power and its measurement.	**8L**
IV	**Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and voltage regulation of single phase transformer. **D.C. Machines:** Principles of electromechanical energy conversion; Types of D.C. machines; E.M.F. equation; Losses and efficiency; applications of DC machines.	**8L**
V	**Three phase induction Motor:** Principle of operation; Types, slip-torque characteristics; Applications. **Synchronous Machines:** Principle of Operation of Alternator and synchronous motor. **Single phase Motors:** Principle of operation of induction motor.	**8L**

Reference / Text Books: **Text Books:** 1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International. 2. W.H. Hayt & J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill. 3. J. B. Gupta, "Electrical Engineering", Kataria and Sons. 4. BL Theraja , A Textbook of Electrical Technology - Volume I, S. Chand Publishing **Reference Books:** 1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill. 2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. 3. A Grabel, Basic Electrical Engineering, McGraw Hill. 4. Cotton H., Advanced Electrical Technology, Wheeler Publishing.	
If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: **CO1** Apply the concepts of KVL/KCL and network theorems in solving DC circuits. **CO2** Analyze the steady state behavior of single phase and three phase AC electrical circuits. **CO3** Identify the application areas of a single phase two winding transformer and calculate their efficiency. **CO4** Illustrate the working principles of induction motor, synchronous machine and employ them in different area of applications. **CO5** To make students capable of analyzing and solving the varieties of problems and issues coming up in the vast field of electrical measurements. **CO6** Illustrate the working principles of DC machine and employ them in different area of applications.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(CSE,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Basic Electrical Engineering Lab
Course Code:SEEE-111P/SEEE-121P	**Title:** Basic Electrical Engineering Lab
Course Objectives: The objectives of studying this course are, 1. Understand and gain knowledge about circuit laws and theorems. 2. Gain knowledge about time domain analysis of circuit transients. 3. Understand the concept of resonance in series and parallel circuits.	
Nature of Paper: Core/DSE/SEC/GE/AECC	
Minimum Passing Marks/Credits:50% Marks / 2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	**Contents**
Practical-1	To verify the Kirchhoff's current and voltage laws
Practical-2	To verify the Superposition theorem
Practical-3	To verify the Thevenin's theorem
Practical-4	To verify the Norton's theorem
Practical-5	To determine the external characteristics of DC Shunt generator
Practical-6	To measure current and speed for speed control of D.C. Shunt Motor
Practical-7	To measure the power in a 3-phase system by two-wattmeter method
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. J. B. Gupta, "Electrical Engineering", Kataria and Sons.

Reference Books:

1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.
2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
3. A Grabel, Basic Electrical Engineering, McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it. NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After the completion of the course the student will be able to

CO1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.

CO2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase.

CO3. Calculate efficiency of a single phase transformer and DC machine.

CO4. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

CO5. Understand 3 phase balanced and unbalanced, star and delta connected supply andload and to measure power in 3 phase circuits

CO6. Determination of efficiency of a single-phase transformer by direct load test.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(CSE,AIML,ME,CE,EE,AE)	Year: I Semester: I/II
Credits Theory: 2 Practical: 0	**Subject:** Professional Communication
Course Code: SEHU-111/121	**Title:** Professional Communication

Course Objectives:

1. To enhance one's ability to be fully self-aware by helping oneself to overcome all fears and insecurities and to grow fully from inside out and outside in.
2. Toincreaseone'sknowledgeandawarenessofemotionalcompetencyandemotionalintelligenceatplaceo fstudy/work.
3. To provide opportunity for realizing one's potential through practical experience.

Nature of Paper: AECC

Minimum Passing Marks/Credits: 40% Marks / 2

L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Listening** • Techniques of effective listening • Listening and comprehension • Probing questions • Barriers to listening **Speaking** • Pronunciation • Enunciation • Vocabulary • Fluency • Common Errors ***Reading*** • Techniques of effective reading • Gathering ideas and information from a given text a) Identify the main claim of the text b) Identify the purpose of the text c) Identify the context of the text d) Identify the concepts mentioned • Evaluating these ideas and information a) Identify the arguments employed in the text b) Identify the theories employed or assumed in the text	**8L**

	• Interpret the text a) To understand what a text says b) To understand what a text does c) To understand what a text means	
II	***Writing and different modes of writing*** • Clearly state the claims • Avoid ambiguity, vagueness, unwanted generalizations and oversimplification of issues • Provide background information • Effectively argue the claim • Provide evidence for the claims • Use examples to explain concepts • Follow convention • Be properly sequenced • Use proper signposting techniques	**8L**
III	• Be well structured a) Well-knit logical sequence b) Narrative sequence c) Category groupings • Different modes of Writing - a) E-mails b) Proposal writing for Higher Studies c) Recording the proceedings of meetings d) Any other mode of writing relevant for learners ***Effective use of Social Media*** • Introduction to social media websites • Advantages of social media • Ethics and etiquettes of social media • How to use Google search better • Effective ways of using Social Media • Introduction to Digital Marketing ***Non-verbal communication*** • Meaning of non-verbal communication • Introduction to modes of non-verbal communication • Breaking the misbeliefs • Open and Closed Body language • Eye Contact and Facial Expression • Hand Gestures • Do's and Don'ts • Learning from experts • Activities-Based Learning	**8L**
IV	***Resume Skills*** • Resume Skills : Preparation and Presentation a) Introduction of resume and its importance b) Difference between a CV, Resume and Bio data c) Essential components of a good resume	**8L**

	• Resume skills : common errors a) Common errors people generally make in preparing their resume b) Prepare a good resume of her/his considering all essential components ***Interview Skills*** • Interview Skills : Preparation and Presentation a) Meaning and types of interview (F2F, telephonic, video, etc.) b) Dress Code, Background Research, Do's and Don'ts c) Situation, Task, Approach and Response (STAR Approach) for facing an d) interview e) Interview procedure (opening, listening skills, closure, etc.) f) Important questions generally asked in a job interview (open and closed g) ended questions) • Interview Skills : Simulation a) Observation of exemplary interviews b) Comment critically on simulated interviews	
V	• Interview Skills : Common Errors a) Discuss the common errors generally candidates make in interview b) Demonstrate an ideal interview	**8L**

Reference / Text Books:

1. Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003.
2. Brown, Michele & Gyles Brandreth. How to Interview and be Inter viewed. London: Sheldon Press 1994.
3. Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977.
4. Collins, Patrick. Speak with Power and Confidence. New York: Sterling, 2009.
5. Hughes, Shirley. Professional Presentations: A Practical Guide to the Preparation and Performance of Successful Business Presentations. Sydney: McGraw-Hill, 1990.
6. Kratz, Abby Robinson. Effective Listening Skills. Toronto: ON: Irwin Professional Publishing, 1995.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	10
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	05
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:
CO1 The students will Gain Self Competency and Confidence.
CO2 They will be fluent speaker and proficient writer and enhance their LSRW Skills.
CO3 The students will demonstrate a fuller and deeper understanding of all the facets of Professional communication.
CO4 They will be able to enrich their vocabulary and their correct usage.
CO5 They will develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation.
CO6 The students will Gain Knowledge about the world of work**.**

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: B.Tech. (Aerospace Engineering)) **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Professional Communication Lab
Course Code: SEHU-111P/121P	**Title:** Professional Communication Lab

Course Objectives: The objectives of studying this course are,
1. Improve the dynamics of professional presentations.
2. Develop the ability to compeer professional occasions.
3. Enable to read newspaper for their communicative competence.
4. Equip with effective business correspondence.
5. Develop in them communication and social graces necessary for functioning.

Nature of Paper: Core/DSE/SEC/GE/AECC

Minimum Passing Marks/Credits:50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical 1	Group Discussion: Practice Based on Accurate and Current Grammatical Patterns
Practical 2	Intonation Pattern Practice: Rising, Falling, and Level Tones.
Practical 3	Communication Skills /Conversational Skills for Interviews/ Seminars/ Workshops with Emphasis on Kinesics/Para linguistics along with Promotion of Phonetic Script Skills.
Practical 4	Presentation Skills for Technical Paper / Project Reports / Professional Report based on Proper Stress and Intonation Mechanics.
Practical 5	Theme Presentation Practices Based on Linguistic Patterns
Practical6	***Digital Literacy*** • Role of Digital literacy in professional life • Trends and opportunities in using digital technology in workplace • Internet Basics • Introduction to MS Office tools a. Paint b. Office c. Excel d. Powerpoint

Reference / Text Books:
Text Books:

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.

3. J. B. Gupta, “Electrical Engineering”, Kataria and Sons. **Reference Books:** 1. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill. 2. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. 3. A Grabel, Basic Electrical Engineering, McGraw Hill.
If the course is available as Generic Elective then the students of following departments may opt it. NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:
Course Learning Outcomes: After the completion of the course the student will be able to **CO1.** Develop all-round personalities with a mature outlook to function effectively in different circumstances. **CO2**. Develop effective communication and presentation skills **CO3.** Learn corporate etiquette - organizing and managing professional events and will understand how reading enhances their communicative competency **CO4.** Conduct effective correspondence and prepare reports which produce results. **CO5.** Write logical sentences and paragraphs, use appropriate diction, grammar and punctuation. **CO6.** produce business documents for mailing to external recipients or intra-organizational circulation

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I / Semester-I/II

<table>
<tr><td colspan="2">Programme: B.Tech. (Aerospace Engineering))
Class: B.TECH(CSE,AIML,ME,CE,EE,AE)</td><td>Year: I
Semester: I/II</td></tr>
<tr><td>Credits
Theory: 2
Practical: 0</td><td colspan="2">Subject :Environment Studies</td></tr>
<tr><td>Course Code:SEHU-111/122</td><td colspan="2">Title: Environment Studies</td></tr>
<tr><td colspan="3">Course Objectives:
1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
3. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
6. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.</td></tr>
<tr><td colspan="3">Nature of Paper: AECC</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks / 2</td></tr>
<tr><td colspan="3">L: 2
T: 0
P: 0 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	**Introduction to environmental studies** • Multidisciplinary nature of environmental studies; • Scope and importance; Concept of sustainability and sustainable development.	**4L**
II	**Ecosystems** • What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**4L**
III	**Natural Resources: Renewable and Non-renewable Resources** • Land resources and land use change; Land degradation, soil erosion	

	and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & interstate). • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	**4L**
IV	**Biodiversity and Conservation** • Levels of biological diversity: genetic, species and ecosystem diversity; Bio geographic zones of India; Biodiversity patterns and global biodiversity hot spots • India as a mega-biodiversity nation; Endangered and endemic species of India • Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	**4L**
V	**Environmental Pollution** • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies.	**4L**
VI	**Environmental Policies & Practices** • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.	**4L**
VII	**Human Communities and the Environment** • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. • Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. • Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	**4L**

VIII	**Field work** Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site---Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems---pond, river, Delhi Ridge, etc.	**4L**

Reference / Text Books:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Rout ledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36--37.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	10
4) Research Project Report Seminar On Research Project Report	05
5) ESE	35
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

CO1. Gain in-depth knowledge on natural processes that sustain life, and govern economy.

CO2. Estimate and predict the consequences of human actions on the web of life, global economy and quality of human life.

CO3. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.

CO4. Acquire values and attitudes towards understanding complex environmental economic social challenges, and participate actively in solving current environmental problems and preventing the future ones.

CO5. Adopt sustainability as a practice in life, society and industry.

CO6. Develop real field experience.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH(CSE,AIML,ME,CE,EE)	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject**: Engineering Workshop Lab
Course Code: SEME-112P/ SEME-122P	**Title:** Engineering Workshop Lab
Course Objectives: The objectives of studying this course are, 1. To understand the importance of tools used in workshop. 2. To prepare various joints used in workshop. 3. To identify & apply the most appropriate tools for various applications. 4. To perform the various types of black smithy and sheet metal shop operations. 5. To prepare core and mould in foundry shop.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:50% Marks / 2	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Module -1	Carpentry Shop: Practical-1: To prepare half-lap corner joint. Practical-2: To prepare mortise &Tenon joint. Practical-3: To prepare a cylindrical pattern on woodworking lathe
Module -2	Fitting Bench Working Shop: Practical-1: To prepare a V-joint fitting Practical-2: To prepare a U-joint fitting Practical-3: To make a perfect square job
Module -3	Black Smithy Shop: Practical-1: To prepare a square rod from given circular rod Practical-2: To prepare a square S- shape from given circular rod Practical-3: To prepare a nail from given circular rod.
Module -4	Welding Shop: Practical-1: To prepare a butt welded joints using arc welding machine. Practical-2: To prepare a Lap welded joints using arc welding machine. Practical-3: To prepare a Lap welded joint using spot welding machine.
Module -5	Sheet-metal Shop: Practical-1: To make round duct of GI sheet using 'soldering' process. Practical-2: To prepare a tray of GI by fabrication
Module -6	Machine Shop: Practical-1: To prepare a bolt on the lathe machine as per given. Diagram. Practical-2: To prepare a job on the lathe machine as per given diagram.

Module -7	Foundry Shop: Practical-1: To prepare core as per given size. Practical-2: To prepare a mould for given casting.
Practical-8	To study running and speed reversal of a three phase induction motor and record speed in both directions.
Practical-9	To perform open circuit and short circuit test on a single phase transformer
Practical-10	To perform polarity test on a single phase transformer
Practical-11	Measurement of Power and power factor of Single phase AC circuits

Reference / Text Books:

Text Books:

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

Reference Books:

1. Business Communication, II Ed, OUP, by Meenakshi Raman & Prakash Singh, 2012.
2. Speak well----- orient black swan.
3. Everyday dialogues in English----- Robert J.Dixon.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to
CO1. Understand the tools used in workshop & their applications.
CO2. Prepare various joints used in carpentry, fitting and welding shop.
CO3. Identify & apply the most appropriate tools for various manufacturing operations like turning, facing and threading.
CO4. Perform the various types of black smithy and sheet metal shop operations.
CO5. Prepare core and mould in foundry shop.
CO6. Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I/II

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH	Year: I Semester: I/II
Credits Theory: 0 Practical: 2	**Subject:** Aerospace Engineering Graphics & Design Lab
Course Code: SEAE-111P / 121 P	**Title:** Engineering Graphics & Design Lab

Course Objectives: The objectives of studying this course are,
1. To study the standard and rules to be trailed by engineers for making precise drawings.
2. To understand the fundamental dimensioning practices that must be continued in the arrangement of drawings.
3. To draw the various types of projection of lines, planes and solids.
4. To apply the CAD for design.
5. To create the engineering models.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Module-1	Introduction to Engineering Drawing, Orthographic Projections: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Module-2	Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.
Module-3	Projections and Sections of Regular Solids: Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans they include: windows, doors. Prism, Cylinder, Pyramid, Cone – Auxiliary Views.
Module-4	Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.
Module-5	Computer Graphics: Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids].

Reference / Text Books:

Text Books:

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Charotar Publishing House
2. Engineering Drawing, Narayana, K.L. & P Kannaiah (2008), Scitech Publishers.

3. Engineering Drawing Paperback, P.S. Gill (Author) , S.K. Kataria& Sons. **Reference Books:** 1. Engineering Drawing and Computer Graphics, Shah, M.B. &Rana B.C. (2008), Pearson Education. 2. Engineering Graphics, Agrawal B. & Agrawal C.M. (2012), TMH Publication. 3. Engineering Graphics & Design, A.P. Gautametc, Khanna Publishing House.	
If the course is available as Generic Elective then the students of following departments may opt it. NO	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to. **CO1.** Understand the basic concepts and principles of engineering graphics and their significance. **CO2.** Understand the theory of projections and regular solids. **CO3**. Draw the various types of projection of lines, planes and solids. **CO4.** Apply the CAD for design. **CO5.** Creating the engineering models using solid modeling. **CO6.** Gain knowledge about orthographic and isometric projections.	

Foramt-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**		**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**		**Subject: Engineering Mathematics-III**
Course Code:SEAS-231		**Topic: Engineering Mathematics-III**
Course Objectives: 1. To make the students familiar with complex functions and its calculus. 2. To deal with applications, residues and conformal mapping. 3. To understand the concept and applications of integral transforms 4. To deal with numerical solutions of algebraic equations and differential equations 5. To understand the statistical aspect of functions		
Nature of Paper: Core		
Minimum Passing Marks/Credits: 40% Marks / 4		
L: 3 T: 1		
Unit	**Contents**	**No. of Lectures Allotted**
I	**Functions of a Complex Variable I**: Analytic functions; C-R equations and harmonic functions; Line integral in the complex plane; Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions; Liouvilles theorem.	08
II	Representation of a function by power series; Taylor's and Laurent's series; Singularities, zeroes and poles; Residue theorem, evaluation of real integrals; conformal mapping and bilineartrans formations.	08
III	**Integral Transforms:** Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z – Transform and its application to solve difference equations.	08
IV	**Numerical Techniques:** Solution of polynomial and transcendental equations Bisection method, Regula – Falsi method, Newton - Raphson method. **Interpolation:** Finite difference, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals; **Numerical Differentiation**, **Numerical Integration**; Trapezoidal, Simpson's 1/ 3 Credit and 3/8 rules. **Numerical solutions of first order differential equations** by Euler's method and 4th order Runge-Kutta method.	08

V	**Statistical Techniques:** Moments, Moment generating functions, Skewness, Kurtosis, Curve Fitting and Solution of Equations: Method of least squares and curve fitting of straight line and parabola, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	08

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	30
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	10
Total:	150

Prerequisites for the course: 12th Mathematics

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Understand and check the Analyticity of a complex function.
2. To apply the concept of Analytic functions in residue and conformal mappings.
3. To solve and apply the concepts of transforms in the area of engineering.
4. To solve numerically the Algebraic equations, Differential equations, and to differentiate & integrate numerically.
5. To understand and use the concept of statistical tools to analyze the different data.
6. To apply the knowledge of mathematics in solving various engineering problems.

Course Learning Outcomes:

CO1. Recognize the importance of wind tunnels in aerospace research and development.
CO2. Understand basic aerodynamics principles and aerodynamic forces.
CO3. Comprehend different airflow visualization techniques.
CO4. Identify how wind tunnel testing contributes to aerospace design improvements.
CO5. Discuss future trends in wind tunnel technology and their impact on aerospace innovation.
CO6. Reflect on the potential of virtual wind tunneling and sustainable aerospace solutions.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : III

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject: :** Fluid Mechanics
CourseCode:SEME-234	**Topic :** Fluid Mechanics

Course Objectives:

1. To make the students aware about the fundamental principles of fluid mechanics.
2. To enable the students to understand the problems of fluid mechanics and resolve those problems using the various laws of conservation.
3. To make the students such that they can analyze the energy losses and able to determine pressure drop in pipe flow problems
4. To develop the skill set so as to understand the functionality of various devices which work upon the principles of fluid mechanics
5. To enable the students to analyze the performance of various devices which work upon the principles of fluid mechanics.

Nature of Paper: Core

Minimum Passing Marks/Credits 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures
I	**Introduction:** Fluid and continuum; Physical properties of fluids: Viscosity, Compressibility, Surface Tension, Capillarity, vapour pressure; Cavitation; Classification of fluids including rheological classification**.** **Fluid Statics:** Pascal's Law; Pressure-density-height relationship; Pressure on plane surfaces; The Hydrostatic law; Total Pressure and Centre of pressure; Buoyancy; Measurement of pressure by manometers; Stability of immersed and floating bodies	09
II	**Laminar Flow:** Types of fluid flows, Steady and unsteady, Uniform and non-uniform, Laminar and Turbulent flows, 1-D,2-D,and 3-D flows, Steam lines, Path lines and Steak lines, Steam tube; Equation of motion for laminar flow through pipes, Stokes law, Turbulent Flow, Equation for turbulent flow, Eddy viscosity, Mixing concept and velocity distribution in turbulent flow, Acceleration of a fluid particle along a straight and curved path, Differential and Integral form of continuity equation, Rotation, Vortices and circulation, Elementary explanation of Stream function and velocity potential, Flow net characteristics.	09

III	**Fluid Dynamics-I:** Introduction to Naiver-Stokes equations; Euler's equation of motion along a streamline and its integration; Bernoulli's equation and its applications; Pitot tube; Flow through: Orifices, Mouthpieces, Nozzles, Notches, Wires; Free and forced vortex motion.	09
IV	**Fluid Dynamics-II**: Pipe bend problems related to combined application of energy and momentum equations; Determination of coefficients of discharge; Velocity and contraction and energy loss; Equation for velocity distribution over smooth and rough surfaces; Concept of equivalent length; Branched pipes; Pipes in series and parallel; Flow in sudden expansion, contraction; Water hammer.	09
V	**Boundary Layer Analysis:** Boundary layer thickness; Boundary layer over a flat plate; Laminar layer; Application of Von-Karman integral momentum equation; Turbulent boundary layer; Laminar sub-layer; Hydro-dynamically smooth and rough boundaries; Local and average friction coefficient; Total drag; Boundary layer separation and its control	09

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Facilitate electrical research and to introduce fundamental principles of circuit theory.
2. Familiar in applying circuit theorems to simplify and find solutions to electrical circuits.
3. Course makes them to analyze three phase circuits.
4. Able to apply graph theory such as incidence matrix, reduced incidence matrix, tie set and cut set matrix.
5. Able to solve and analyze transient response of RL, RC and RLC circuits to DC and AC excitation.
6. Familiar in applying Resonant circuits.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : III

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech (AE)**	**Year: II** **Semester: III**
Credits **Theory: 0** **Practical: 3**	**Subject:** Fluid Mechanics Lab
Course Code:SEME-234P	**Topic :** Fluid Mechanics Lab

Course Objectives: The objectives of studying this course are,

1. Calibrate and utilize Venturi meters and orifice meters for fluid flow measurement.
2. Analyze pipe flow losses in both rectangular and circular pipes.
3. Verify and apply Bernoulli's theorem in practical fluid flow scenarios.
4. Calculate Reynolds numbers to classify flow regimes and predict flow behavior.
5. Study the impact of jets on vanes to understand forces and moments involved.
6. Conduct performance tests on centrifugal pumps, reciprocating pumps, Pelton wheel turbines, and Francis turbines for efficiency evaluation.

Nature of Paper: Practical

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	**Calibration**: Calibration of Venturi meter and orifice meter.	3
Practical-2	**Pipe Flow Losses**: Determination of pipe flow losses in rectangular and circular pipes	3
Practical-3	**Bernoulli's Theorem**: Verification of Bernoulli's theorem.	3
Practical-4	**Reynolds Experiment**: Determination of Reynolds Number of fluid flow	3
Practical-5	**Impact of Jet on Vanes**: Study Impact of jet on Vanes.	3
Practical-6	**Centrifugal Pumps:** Performance test on centrifugal pumps.	3
Practical-7	**Reciprocating Pumps**: Performance test on reciprocating pumps.	3
Practical-8	**Pelton Wheel Turbine:** Performance test on piston wheel turbine.	3
Practical-9	**Francis Turbine**: Performance test on Francis turbine.	3

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Calibrate Venturimeters and orifice meters to accurately measure fluid flow rates.
2. Determine pipe flow losses in rectangular and circular pipes.
3. Verify Bernoulli's theorem and understand its application in fluid flow analysis.
4. Calculate Reynolds numbers to assess the nature of fluid flow.
5. Study the impact of jet on vanes and analyze the resulting forces and moments.
6. Perform performance tests on centrifugal pumps and reciprocating pumps

Format-3

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : III

Programme: B.Tech. (Aerospace Engineering) **Class:** Theory	Year: II Semester: III
Credits Theory: 4 Practical:	**Subject:** Aero Engineering Thermodynamics
Course Code: SEAE-233	**Title:** Aero Engineering Thermodynamics

Course Objectives:
The objectives of studying this course are,

1. To understand about energy interactions and its balance between system and surroundings.
2. To know about the laws of thermodynamics and their applications to various problems of thermodynamics.
3. To understand the application of I law of thermodynamics to various devices which work upon the law of energy conservation.
4. To examine the changes in the properties of a substance undergoing a process.
5. To be able to differentiate between high grade and low-grade energies and to learn the limitations of laws of thermodynamics

Nature of Paper: Theory

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	CONTENTS	No. of Lectures Allotted
UNIT- I	**Basic Concepts of Thermodynamics:** Definitions, system**,** control volume, surrounding, boundaries, universe; Types of systems; Macroscopic and microscopic viewpoints; Thermodynamic equilibrium; State, property, process; Cycle - Reversibility - Quasi - static process; Irreversible process; Causes of irreversibility; Types of work and heat. Zeroth law of thermodynamics: concept of temperature and its measurement	**9**
UNIT-II	**First Law of Thermodynamics**: Definition of work, displacement work and flow work. Joule experiment, First law of thermodynamics for closed system, Limitations of the first law. PMM-I. First law applied to a Process, applied to a flow system; Steady flow energy equation; Application of first law of thermodynamics, Steady flow energy equation	**9**
UNIT-III	**Second law of thermodynamics:** Kelvin-Plank and Clausius statements and Equivalence of the two statements, PMM-II, Thermal reservoir; Heat engine; Heat pump; Parameters of performance; Reversible and irreversible processes and their corollaries; Carnot's	**9**

	Principle / Theorem; Carnot cycle and its specialties;	
UNIT-IV	**Application of second law of thermodynamics and concept of Entropy**: Thermodynamic scale of temperature; Clausius Inequality; Entropy; Principle of entropy increase, entropy change of pure substance in different thermodynamics processes, T-ds equation. Statement of third law of thermodynamics. Energy equation; Availability and irreversibility; Thermodynamic potentials, Gibbs and Helmholtz Function	**9**
UNIT-V	**Introduction to IC Engine**: introduction to IC engine and classification to IC engine, engine component. 2 stroke and 4 stroke engine, introduction to Otto cycle and diesel engine. SI engine and CI engine and difference between SI and CI engine. Performance of parameters of IC engine, Heat balance sheet	**9**

If the course is available as Generic Elective then the students of following departments may opt it.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course: NIL

Course Learning Outcomes:
After studying the above course the student will be able,

1. To understand the various laws of thermodynamics and their limitations
2. To understand the energy interactions between the system and its surroundings
3. To understand the application of laws of thermodynamics to various devices.
4. To differentiate between high grade and low-grade energies.
5. To analyze the changes in the properties of a substance undergoing a process.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – II /Semester-II/III

Programme: B.Tech. (Aerospace Engineering) **Class:** B.TECH (AE)	Year: II Semester: II/III
Credits Theory: 0 Practical: 2	**Subject**: Aeromodelling Lab
Course Code:SEAE-236P	**Title:** Aeromodelling Lab

Course Objectives: The objectives of studying this course are,
1. Understand the basics of airfoil shapes and their effects on aerodynamics.
2. Determine the significance of center of gravity for stable flight.
3. Analyze flight paths to evaluate the impact of design choices on aircraft behavior.
4. Learn the principles behind aerodynamic forces and their application in aviation.
5. Study stability and control factors in aircraft design for better flight performance.
6. Explore different propulsion systems and their suitability for model aircraft.

Nature of Paper: Core/DSE/SEC/GE/AECC

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 2 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents
Practical-1	Investigate the impact of different airfoil shapes on lift and drag using model airplanes.
Practical-2	Study the stability of various aircraft designs by observing their behavior during flight.
Practical-3	To determine how the center of pressure changes with varying angles of attack for different airfoil profiles.
Practical-4	Compare different materials' effects on the weight and performance of model aircraft.
Practical-5	Examine how changing the wing placement affects flight characteristics without quantitative analysis
Practical-6	Investigate the interaction between control surfaces (ailerons, elevators) and their effect on flight control.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes: After the completion of the course the student will be able to

1. Identify the role of airfoil shapes in determining lift and drag properties.
2. Assess the importance of maintaining proper center of gravity for flight stability.
3. Analyze flight paths to make informed design decisions for improved aircraft performance.
4. Apply knowledge of aerodynamic forces to design more efficient paper airplanes.
5. Understand the impact of tail design and wing placement on aircraft stability and control.
6. Describe various propulsion methods and their relevance to model aircraft.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-III

Programme: UG(R) **Class: B-Tech**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 2**	**Subject: Strength of Material**
Course Code: SEME-235	**Title : Strength of Material**

Course Objectives: The objectives of studying this course are,

1. To develop the theoretical concept of stress and strain of solids.
2. To understand the mechanical behavior of the materials.
3. To enable students to find the bending moment and shear force at different cross section with different loading condition
4. To develop the ability in students to solve the numerical problems related to deflection, twisting moment and bending.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 2

L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Unit-I	**Stresses & Strains:** Rigid bodies and deformable solids, Tension, Compression and Shear Stresses, Deformation of simple and compound bars, Thermal stresses, Elastic constants, Volumetric strains, Stresses on inclined planes, principal stresses and principal planes, Mohr's circle of stress.	**12L**
Unit-II	**Shear Force & Bending Moment, Bending Stress:** Beams, transverse loading on beams, Shear force and bending moment in beams, In Cantilevers, Simply supported beams and over – hanging beams, Theory of simple bending, bending stress distribution, Shear stress in beams and distribution in different cross section,	**10L**
Unit-III	**Torsion:** Pure torsion, Power transmission by shaft, Comparison between solid and hollow shaft, Torsion formulation stresses and deformation in circular solid and hollow shafts, Stepped shafts, Deflection in shafts fixed at the both ends	**08L**
Unit-IV	**Deflection of Beams:** Slope and deflection of simple supported and cantilever beams, Double integration method, Area moment method, Macaulay's method, castigliano's and Maxwell theorem	**10L**
Unit-V	**Columns and Struts:** Classification, Euler's column theory, Slenderness ratio, Rankine Gordon Formula. Theory of failure, Thin cylinders & Spheres	**08L**

Text Books:

1.	Rajput R.K, *Strength of Materials*, S Chand & Company Ltd.

2.	Bear Jhonson, *Mechanics of Materials,* Tata McGraw-Hill.
Reference Books:	
1.	Timoshenko, S.P., Gere, M.J., Mechanics of Materials, C.B.S., Publishers, 1980.
2.	Ramamurtham, S., Strength of Materials, Dhanpat Rai Publications, 2005.
3.	Popov, E.P., Engineering Mechanics of Solids, Prentice-Hall, 1999.

If the course is available as Generic Elective then the students of following departments may opt it.
1. NA
2.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	**150**
Prerequisites for the course:	

Course Learning Outcomes:	After studying the above course the student will be able to,	**Level**
CO-1	Understand the concepts of various types of stress and strain induced in the specimen/bodies.	**K2**
CO-2	Apply shear force and bending moment diagrams to analyze the resistance offered by the beam and able to solve practical problems.	**K4**
CO-3	Acquire the basic knowledge of pure torsion and power transmission through shaft (Solid & Hollow).	**K2**
CO-4	Design a component as per the requirement of safety standard.	**K2**
CO-5	Analyze slender, long columns subjected to axial loads.	**K3**
CO-6	Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.	**K4**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**		**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject: Aero Engineering Thermodynamics**	
Course Code: SEAE-233	**Title : Aero Engineering Thermodynamics**	
Course Objectives: The objectives of studying this course are, 1. To learn about of I law for reacting systems and heating value of fuels 2. To learn about gas and vapor cycles and their first law and second law efficiencies. 3. To understand about the power plant components and steam turbines analysis 4. To learn about gas dynamics of air flow and steam through nozzles 5. To learn the about jet propulsion		
Nature of Paper: Core		
Minimum Passing Marks/Credits: 40% Marks / 4		
L: 3 T: 1 P: (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)		

Unit	Contents	No. of Lectures Allotted
Unit-I	Introduction to solid, liquid and gaseous fuels–Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy table, Introduction and Otto, Diesel and Dual cycles	**10L**
Unit-II	**Boilers:** Classifications, working of boilers, boiler mountings, accessories, Draught, and its calculations, air pre-heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance. **Condenser:** Classification of condenser, air leakage, condenser performance parameters.	**10L**
Unit-III	**Vapour Power cycles:** Vapor power cycles Rankine cycle with superheat, reheat and regeneration. Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Binary vapour cycle, Combined cycles, Co-generation.	**10L**
Unit-IV	**Steam and Gas Nozzles:** Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, choked flow, throat area, Nozzle efficiency, Effect of friction on nozzle, Super saturated flow. **Steam Turbines:** Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, Losses in steam turbines, Governing of turbines.	**10L**

Unit-V	**Gas Turbine:** Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with inter-cooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles. **Jet Propulsion:** Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.	**10L**

Text Books:

1. Basic and Applied Thermodynamics by P.K. Nag, mcgraw hill india.
2. Applied thermodynamics by Onkar Singh, New Age International.
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
4. Applied Thermodynamics by Venkanna And Swati, PHI

Reference Books:

1. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
2. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
3. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
4. Theory of Stream Turbine by WJ Kearton.

If the course is available as Generic Elective then the students of following departments may opt it.
1. NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After completing this course	**Level**
CO-1	The students will get a good understanding of various power cycles of gas and vapor cycles.	**K2**
CO-2	To understand different power producing machinaries.	**K2**
CO-3	To understand about the power plant components and steam turbines analysis.	**K2**
CO-4	They will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors.	**K4**
CO-5	They will be able to understand phenomena occurring in high-speed compressible flows.	**K2**
CO-6	Compare and contrast experimental results with theoretical trends, and to attribute observed discrepancies to either measurement error or modeling limitations.	**K4**

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: B.Tech. (Aerospace Engineering) **Class: B.Tech**	**Year: II** **Semester: III**
Credits **Theory: 4** **Practical: 0**	**Subject:** Flight Mechanics
Course Code:SEAE-232	**Topic:** Flight Mechanics

Course Objectives: The objectives of studying this course are,

1. Understand altitude and its definition in aviation.
2. Grasp the significance of the hydrostatic equation.
3. Relate geopotential and geometric altitudes.
4. Analyze pressure, temperature, and density altitudes.
5. Explore equations of motion for aircraft performance.
6. Evaluate thrust and power requirements for flight.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**The Standard Atmosphere:** Definition of Altitude, Hydrostatic Equation, Relation Between Geopotential and Geometric Altitudes, Pressure, Temperature, and Density Altitudes	09
II	**Elements of Airplane Performance- I** Equation of Motion, Thrust Required for Level, Unaccelerated Flight, Thrust Available and Maximum Velocity, Power Required for Level, Unaccelerated Flight	09
III	**Elements of Airplane Performance-II** Power Available and Maximum Velocity. Altitude Effects on Power Required and Available. Rate of Climb and Gliding Flight. Absolute and Service Ceilings and Time to Climb.	09
IV	**Principles of Stability and Control - I** Introduction. Definition of Stability and Control. Moment on the Airplane, Absolute Angle of Attack	09
V	**Principles of Stability and Control- II** Criteria for Longitudinal Static Stability Contribution of the Tail to Mcg. Neutral Point. Static Margin	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: After undergoing this course, the students will be able to:	

CO1.	Apply the concept of altitude effectively in aviation scenarios.
CO2.	Understand and utilize the hydrostatic equation in atmospheric analysis.
CO3.	Differentiate between geopotential and geometric altitudes.
CO4.	Calculate and interpret pressure, temperature, and density altitudes.
CO5.	Analyze equations of motion for aircraft performance evaluation.
CO6.	Evaluate thrust, power, and velocity requirements for various flight conditions.

Format-3

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : IV

Programme: B.Tech. (Aerospace Engineering) **Class: B.Tech**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject: Aerodynamics-I**
Course Code: SEAE-241	**Title : Aerodynamics-I**

Course Objectives: The objectives of studying this course are,

1. Understand the principles of aerodynamics and its practical applications in engineering.
2. Analyze incompressible flow around airfoils and determine lift and drag characteristics.
3. Explore wing theory and lift generation on finite wings, and identify methods to reduce induced drag.
4. Introduce the basics of compressible flow and its relevance in aerodynamics.
5. Study viscous flow phenomena, boundary layer theory, and the role of drag in aerodynamic design.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Aerodynamics and Fundamental Concepts** Overview of Aerodynamics and its significance, Properties of fluids and fluid flow, Conservation laws in fluid dynamics.	09
II	**Incompressible Flow and Airfoil Theory** Steady and unsteady flow around airfoils, Lift and drag characteristics of airfoils, Introduction to circulation and Kutta-Joukowski theorem	09
III	**Wing Theory and Lift Generation** Lift generation on finite wings, Influence of wing planform and aspect ratio on lift, induced drag and its reduction techniques	09
IV	**Compressible Flow and Shock Waves** Basics of compressible flow and its relevance, Compressible flow equations and Mach number, Introduction to normal and oblique shock waves	09
V	**Viscous Flow, Drag, and Experimental Methods** Viscous flow phenomena and boundary layer theory, Skin friction drag and pressure drag, Introduction to wind tunnel testing and measurement techniques	09

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	20
Seminar On Research Project Report	--
5) ESE	100
Total:	150
Prerequisites for the course:	
Course Learning Outcomes: After undergoing this course, the students will be able to:	
CO1. Grasp the fundamentals of aerodynamics and its practical applications. CO2. Analyze airfoil behavior, lift, and drag characteristics. CO3. Understand wing theory and lift generation on finite wings. CO4. Comprehend compressible flow and shock wave concepts. CO5. Evaluate viscous flow and its influence on boundary layers and drag. CO6. Apply experimental methods for studying aerodynamics in practical scenarios.	

IIMTU-NEP IMPLEMENTATION
Year : II / Semester : IV

Programme: B.Tech. (Aerospace Engineering) **Class: B.Tech**	**Year: II** **Semester: IV**
Credits **Theory: 4** **Practical: 0**	**Subject: Aircraft Structure - I**
Course Code: SEAE-242	**Title : Aircraft Structure - I**

Course Objectives: The objectives of studying this course are,

1. Introduce aircraft structural components and their roles, emphasizing analysis and design principles.
2. Understand different load types and their effects on aircraft structures.
3. Analyze stress and strain distribution in aircraft structures, including axial, shear, and bending stress.
4. Perform deflection analysis for beams and columns in aircraft structures.
5. Study fatigue's impact on aircraft structures, estimating fatigue life and fracture mechanics principles.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Aircraft Structures:** Overview of aircraft structural components and their functions, Introduction to structural analysis and design principles, Load types and their effects on aircraft structures:	09
II	**Static Structural Analysis:** Stress and strain analysis in aircraft structures: Axial, shear, and bending stress distribution in beams, Deflection analysis of beams and columns:	09
III	**Fatigue and Fracture Mechanics:** Introduction to fatigue and its effects on aircraft structures, Fatigue life estimation methods and fatigue testing, Fracture mechanics principles and crack growth analysis:	09
IV	**Buckling and Stability Analysis:** Buckling analysis of columns and beams under axial loads, Stability analysis of aircraft structures, Introduction to finite element analysis (FEA) in stability analysis:	09

V	**Aircraft Structural Design:** Introduction to structural design considerations, Material selection and properties for aircraft structures, Design and analysis of aircraft structural components (e.g., wings, fuselage):	09

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1. Class tasks/ Sessional Examination 2. Presentations /Seminar 3. Assignments	30
4. Research Project Report 5. Seminar On Research Project Report	20
6. ESE	
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1. Understand aircraft structural components and their functional roles.
CO2. Analyze effects of different loads on aircraft structures.
CO3. Perform stress and strain analysis in aircraft structures, including axial, shear, and bending stresses.
CO4. Evaluate deflection in beams and columns within aircraft structures.
CO5. Estimate fatigue life and analyze fracture mechanics principles in relation to aircraft structures.
CO6. Analyze stability through buckling of columns and beams.

IIMTU- NEPIMPLEMENTATION
Year: II / Semester: IV

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	**Year : II** **Semester: IV**
Credits **Theory: 4** **Practical:0**	**Subject : Aerospace Propulsion -I**
Course Code: SEAE-243	**Title : Aerospace Propulsion -I**

Course Objectives: The objectives of studying this course are,

1. Grasp the fundamentals of space propulsion systems and their relevance in space missions.
2. Understand the working principles and characteristics of axial flow compressors and their components.
3. Comprehend the role of centrifugal compressors and their key elements in propulsion systems.
4. Analyze the operation and efficiency of axial turbines in the context of space propulsion.
5. Recognize the significance of nozzles in propulsion, including their types and optimization

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Space Propulsion** Overview of space propulsion systems and their importance Fundamentals of rocket propulsion and space mission requirements Key challenges and considerations in space propulsion design	09
II	**Axial Flow Compressor** Axial Flow Compressor Introduction. Angular Momentum. Work and compression characteristic performance of a single axial compressor stage. Efficiency of the compressor and degree of reaction	09
III	**Centrifugal Compressor** Introduction of Centrifugal Compressor. Stage dynamics. Inducer Impeller and Diffuser	09
IV	**Axial Turbine** Introduction of Axial Turbine. The Effect of Cooling on Turbine Efficiency Turbine Blade Losses.	09

V	**Nozzle** Introduction of Nozzle Types of Nozzle. Nozzle Mechanism and Optimization.	09

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Mathematics, Physics

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1. Demonstrate an understanding of space propulsion principles and their application in space missions.

CO2. Assess the performance characteristics and efficiency of axial flow compressors.

CO3. Evaluate the dynamics and components of centrifugal compressors in propulsion.

CO4. Analyze the efficiency and losses associated with axial turbines in space propulsion.

CO5. Design and optimize nozzles for efficient propulsion systems.

CO6. Apply the knowledge gained to contribute to the design and analysis of space propulsion systems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-V

<table>
<tr><td colspan="2">Programme: B.Tech. (Aerospace Engineering)
Class: B-Tech</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical:2</td><td colspan="2">Subject: Aerodynamics -I Lab</td></tr>
<tr><td colspan="2">Course Code: SEAE-241P</td><td colspan="2">Title : Aerodynamics -I Lab</td></tr>
<tr><td colspan="4">Course Objectives: The objectives of studying this course are,
1. Understand the behaviour of flow properties over different models using subsonic wind tunnel.
2. Demonstrate experimentally the pressure distribution over circular, symmetric and cambered air foils and evaluate lift and drag.
3. Illustrate flow visualization studies at low speeds over different aerodynamic bodies.</td></tr>
<tr><td colspan="4">Nature of Paper: Practical</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 50% Marks / 4</td></tr>
<tr><td colspan="4">L: 1
T: 1
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">List of Experiments
1. Calibration of subsonic wind tunnel
2. Pressure Distribution-Cylinder
3. Pressure Distribution-Symmetric Airfoil
4. Pressure Distribution-Cambered Airfoil
5. Force measurement using wind tunnel balance.
6. Flow over a Flat Plate
7. Flow visualization studies in low speed over cylinder
8. Flow Visualization Studies - Airfoil Flow visualization studies in low speed over airfoil at different angles of incidence.
9. Wake analysis over a cylinder and air foils
10. Blower Test Rig; Efficiency of blower test rig for 3 different vane settings.
11. Axial Flow Compressor; Efficiency of axial flow compressor Centrifugal Flow Compressor</td><td>10</td></tr>
<tr><td colspan="4">Evaluation/Assessment Methodology</td></tr>
<tr><td colspan="3"></td><td>Max. Marks</td></tr>
<tr><td colspan="3">1) Class tasks/ Sessional Examination
2) Presentations /Seminar
3) Assignments
4) Research Project Report
Seminar On Research Project Report
5) ESE</td><td>30

20</td></tr>
</table>

BOS

Total:	**50**
Prerequisites for the course: Physics, Chemistry	
Course Learning Outcomes:	
Course Outcomes:	After studying the above course the student will be able,
CO-1	Understand fundamentals and know the non-dimensionalization of aerodynamic forces and moments; familiar with air foil no men cloture and air foil characteristics.
CO-2	Understand conform a lampping and Jowkows kitrans formation of air foil to a circular cylinder
CO-3	Understand plane potential flow and apply to aerodynamic problems of academic and practical interest.
CO-4	Understand the concept of Flow Visualization Studies-Air foil Flow visualization studies in low speed over air foil at different angles of incidence.
CO-5	Understand the working principal of Axial Flow Compressor
CO-6	Understand the working principal of Centrifugal Flow Compressor

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-IV

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	**Year: II** **Semester: IV**
Credits **Theory:** **Practical: 2**	**Subject: Aerospace Structure Lab**
Course Code: SEAE-242P	**Title : Aerospace Structure Lab**
Course Objectives:	The objectives of studying this course are,

1.	Determine young's modulus of steel using mechanical extensor meters.
2.	Determine young's modulus of steel using Electrical extensor meters.
3.	Find the deflection of beam sat various end condition
4.	Verify Maxwell's reciprocal theorem and principle of superposition

Nature of Paper: Practical
Minimum Passing Marks/Credits: 50% Marks / 2
L: 3 T: 1 P: 0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents
I	**List of Experiments** 1. Determination of Young's modulus of steel using mechanical extensor meters. 2. Determination of Young's modulus of aluminium using electrical extensor meters 3. Deflection of beams with various end conditions. 4. Verification of Maxwell's Reciprocal theorem & principle of superposition 5. Column-Testing and South-well's plot. 6. Shear cent relocation for open sections and closed sections 7. Unsymmetrical bending of beams 8. Stresses in circular discs and beams using photo elastic techniques 9. Vibrations of beams 10. Wagner beam-Tension field beam

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20
Total:	**50**

Prerequisites for the course:

Course Outcomes:	After studying the above course the student will be able to,
CO-1	Understand the basic concepts of material and science and real experience getting to

	determine a young's modulus value of Aluminium.
CO-2	Understand the difference of accuracy and precision value from both mechanical and electrical extensor meter.
CO-3	Determine the deflection of simply supported beams and better understand of types of beams and application.
CO-4	Understand the concept of Unsymmetrical bending of beams
CO-5	Understand the Stresses in circular discs and beams using photo elastic techniques
CO-6	Understand the concept of Vibrations of beams

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: B.Tech. (Aerospace Engineering) **Class: B.Tech.**		**Year: II** **Semester: IV**
Credits **Theory:** **Practical:2**	**Subject: Aircraft Structure Lab**	
Course Code: SEAE-242P	**Title : Aircraft Structure Lab**	
Course Objectives:	The objectives of studying this course are,	
1.	Study air craft piston engine, and jet engines	
2.	Study about forced Convective Heat transfer	
3.	Study about free Convective heat transfer	
4.	Study Combustion performance in a jet engine combustion chamber	
Nature of Paper: Practical		
Minimum Passing Marks/Credits: 50% Marks / 2		
L: T: P: 2 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)		

Unit	List Of Experiments	No. of Lectures Allotted
	1. Study of an aircraft piston engine and jet engines and its components 2. Study of forced convective heat transfer. 3. Study of free convective heat transfer. 4. Cascade testing of a model of axial compressor blade row 5. Determination of heat of combustion of aviation fuel 6. Combustion performance studies in a jet engine combustion chamber 7. Study of free jet 8. Study of wall	10

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20
Total:	**50**
Prerequisites for the course:	
Course Learning Outcomes:	

Course Outcomes:	After completing this course
CO-1	Gain knowledge about the various systems of air craft piston engine, jet engines and

	show the system son the engines available in the Lab
CO-2	Understand the concept of forced convective heat transfer and perform experiment on the heat transfer apparatus
CO-3	Understand the concept of free convection heat transfer and perform experiment on the heat transfer apparatus
CO-4	Understand and apply the Determination of heat of combustion of aviation fuel
CO-5	Understand and apply the Determination of heat of combustion of aviation fuel
CO-6	Understand the concept of Study of wall

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**		**Year: III** **Semester: V**
Credits **Theory: 4** **Practical: 0**	**Subject: Aerospace Structure -II**	
Course Code: SEAE-352	**Title : Aerospace Structure -II**	

Course Objectives: The objectives of studying this course are,
1. Understand how forces impact structures.
2. Grasp stability and balance concepts.
3. Familiarity with aircraft and spacecraft design.
4. Develop awareness of space-specific challenges.
5. Prioritize safety and structural integrity.

Nature of Paper: THEORY

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Structural Behavior:** Introduction to types of stresses: Tension, Compression, Shear, Forces and their effects on materials: Deformation and failure, Material properties: Strength, stiffness, and their significance. Safety factors and their role in designing structures.	09
II	**Stability and Support** Basics of stability: Why structures don't tip over. Column behavior: Introduction to Euler's buckling concept. Beam behavior: How beams bend and bear loads. Stability in different contexts: Aerospace, architecture, and more.	09
III	**Wings and their Design** Lift and its importance: How wings make aircraft fly. Wing components: Ailerons, flaps, and their functions. Wing structure: Exploring spars, ribs, and their roles. Balancing act: Designing wings for stability and efficiency.	09
IV	**Aircraft Structures** Fuselage fundamentals: Role of the aircraft body. Empennage elements: Tail design and its significance. Landing gear basics: Supporting the aircraft on the ground. Structural integrity: Ensuring safety during flight and impact.	09

V	**Spacecraft Structures** Challenges of space: Extreme conditions and impacts. Designing for launch and re-entry: Structural considerations. Materials for space: Lightweight and durable choices. Spacecraft components: Instruments, solar panels,	09

If the course is available as Generic Elective then the students of following departments may opt it.

Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Outcomes: After studying the above course the student will be able to,
CO1: Identify stress effects on different materials.
CO2: Apply stability principles in various contexts.
CO3: Analyze aircraft components and their roles.
CO4: Recognize challenges in spacecraft structure.
CO5: Evaluate safety factors in design considerations.
CO6: Demonstrate awareness of structural integrity.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

<table>
<tr><td colspan="2">Programme: B.Tech. (Aerospace Engineering)
Class: B-Tech</td><td colspan="2">Year: III
Semester: V</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical:0</td><td colspan="2">Subject: Aerodynamics –II</td></tr>
<tr><td colspan="2">Course Code: SEAE-351</td><td colspan="2">Title : Aerodynamics –II</td></tr>
<tr><td colspan="4">Course Objectives: The objectives of studying this course are,
1. Understand the basics of compressible flow in aerodynamics.
2. Recognize the behavior and effects of shock waves.
3. Explore flow processes involving expansion waves, Rayleigh, and Fan no flow.
4. Gain familiarity with differential equations governing compressible flow.
5. Grasp the fundamentals of transonic flow behavior around wings.</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks / 4</td></tr>
<tr><td colspan="4">L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">One Dimensional Compressible Flow
Introduction to compressible flow in aerodynamics.
Key concepts of Mach number and sonic velocity.
Basic understanding of compressible flow equations.
Applications of one-dimensional compressible flow in aerospace.</td><td>09</td></tr>
<tr><td>II</td><td colspan="2">Normal, Oblique Shocks
Introduction to shock waves and their formation.
Behavior of normal and oblique shock waves.
Influence of shock waves on flow properties.
Applications of shock waves in aerodynamics.</td><td>09</td></tr>
<tr><td>III</td><td colspan="2">Expansion Waves, Rayleigh and Fanno Flow
Exploring expansion waves and their characteristics.
Introduction to Rayleigh and Fanno flow processes.
Understanding heat addition and friction effects in flow.
Applications of expansion waves and flow processes in real-world</td><td>09</td></tr>
<tr><td>IV</td><td colspan="2">Differential Equations of Motion for Steady Compressible Flow
Overview of governing equations for compressible flow.
Exploring the terms and significance of equations.
Introduction to Mach angle and isentropic flow.
Applications of differential equations in aerodynamic analysis</td><td>09</td></tr>
</table>

V	**Transonic Flow Over Wing** Basics of transonic flow behavior around wings. Introduction to drag divergence and Mach effects. Influence of shock waves in transonic flow. Applications of transonic flow analysis in wing design	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Mathematics, Physics

Course Learning Outcomes: After undergoing this course, the students will be able to:

CO1. Recognize the role of compressible flow in aerospace applications.
CO2. Identify and describe the characteristics of shock waves.
CO3. Understand the impact of expansion waves and flow processes on aerodynamics.
CO4. Apply differential equations to analyze compressible flow scenarios.
CO5. Explore the behavior of transonic flow around wings and its implications.
CO6. Analyze transonic flow behavior around wings, considering the influence of shock waves and Mach effects.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-V

Program B.Tech. (Aerospace Engineering) **Class:B-Tech**	**Year: III** **Semester: V**
Credits **Theory: 0** **Practical:3**	**Subject: Aerodynamics -II Lab**
Course Code: SEAE-351P	**Title : Aerodynamics -II Lab**

Course Objectives:
1. Develop simulation model using heuristic method.
2. Analysis of Simulation models using input analyzer, and output analyzer.
3. Explain Verification and Validation of simulation model.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks / 2

L:0
T:0
P:3(In Hours/Week)
Theory-0 Hr. =0 Credit
Practical-3 Hrs.=2 Credit (3Hrs./Week=2Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	To Study the concept of Mach numbers and their significance in compressible flow behavior.	3
Practical-2	To Study the process of shock wave formation and its impact on airflow.	3
Practical-3	To Study the behavior and properties of expansion and compression waves.	3
Practical-4	To Study the effects of heat addition on airflow using Rayleigh flow process.	3
Practical-5	Explore the impact of friction on airflow using Fan no flow process.	3
Practical-6	To Study the characteristics of isentropic flow and its application in	3
Practical-7	Analyze the behavior of transonic airflow around wing profiles.	3
Practical-8	Study the interactions of shock waves in different flow conditions	3
Practical-9	Investigate the concept of Mach angle and sonic velocity in compressible flow.	

If the course is available as Generic Elective then the students of following departments may Opt it. **Not applicable**

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations/Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report	20
5) ESE	30

Total:	50
Prerequisites for the course:	
Course Learning Outcomes: CO1. Demonstrate theoretical knowledge of compressible flow principles and their relevance in aerodynamics. CO2. Analyze and interpret shock wave behavior, expansion waves, and their effects on airflow. CO3. Apply theoretical concepts to understand heat addition and friction effects on airflow in practical contexts. CO4. Interpret isentropic flow characteristics and its significance in aerodynamic analysis. CO5. Evaluate transonic flow behavior and its impact on wing profiles and airfoil design. CO6. Demonstrate understanding of shock wave interactions and their effects on different flow conditions.	

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: V

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	**Year: III** **Semester: V**
Credits **Theory: 4** **Practical:0**	**Subject: Propulsion -II**
Course Code: SEAE-353	**Title : Propulsion -II**

Course Objectives: The objectives of studying this course are,

1. Grasp the fundamentals of space propulsion systems and their relevance in space missions.
2. Understand the working principles and characteristics of axial flow compressors and their components.
3. Comprehend the role of centrifugal compressors and their key elements in propulsion systems.
4. Analyze the operation and efficiency of axial turbines in the context of space propulsion.
5. Recognize the significance of nozzles in propulsion, including their types and optimization

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Space Propulsion** Overview of space propulsion systems and their importance Fundamentals of rocket propulsion and space mission requirements Key challenges and considerations in space propulsion design	09
II	**Axial Flow Compressor** Axial Flow Compressor Introduction. Angular Momentum. Work and compression characteristic performance of a single axial compressor stage. Efficiency of the compressor and degree of reaction	09
III	**Centrifugal Compressor** Introduction of Centrifugal Compressor. Stage dynamics. Inducer Impeller and Diffuser	09
IV	**Axial Turbine** Introduction of Axial Turbine. The Effect of Cooling on Turbine Efficiency Turbine Blade Losses.	09

V	**Nozzle** Introduction of Nozzle Types of Nozzle. Nozzle Mechanism and Optimization.	09

If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course: Mathematics, Physics

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1.	Demonstrate an understanding of space propulsion principles and their application in space missions.
CO2.	Assess the performance characteristics and efficiency of axial flow compressors.
CO3.	Evaluate the dynamics and components of centrifugal compressors in propulsion.
CO4.	Analyze the efficiency and losses associated with axial turbines in space propulsion.
CO5.	Design and optimize nozzles for efficient propulsion systems.
CO6.	Apply the knowledge gained to contribute to the design and analysis of space propulsion systems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VI

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 0**	**Subject: Avionics System**
Course Code: SEAE-361	**Title : Avionics System**

Course Objectives: The objectives of studying this course are,

1. Introduce avionics systems' role in aerospace engineering.
2. Understand avionics hardware and software basics.
3. Explore avionics system architecture and integration.
4. Study flight and engine instrumentation systems.
5. Learn about flight control and autopilot systems.
6. Understand navigation and communication systems.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Avionics Systems** Overview of avionics systems and their significance in aerospace engineering**,** Basic principles of avionics hardware and software**,** Avionics system architecture and integration	09
II	**Aircraft Instrumentation Systems** Introduction to aircraft instrumentation systems, Flight instruments: airspeed, altimeter, attitude indicator, Engine instruments: temperature, pressure, fuel quantity	09
III	**Flight Control Systems** Principles of flight control systems**,** Mechanical, hydraulic, and electric flight control systems**,** Autopilot systems and automated flight control	09
IV	**Navigation Systems** Navigation principles and requirements, Inertial navigation systems (INS) and GPS navigation.	09
V	**Communication Systems** Communication principles and requirements, Radio communication systems: VHF, HF, and SATCOM	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course:	

Course Outcomes:

After studying the above course the student will be able to,

CO-1 Recognize avionics' importance in aerospace.
CO-2 Understand avionics hardware and software.
CO-3 Grasp system architecture and integration.
CO-4 Identify flight and engine instrumentation.
CO-5 Familiarity with flight control and autopilot systems.
CO-6 Comprehend navigation and communication concepts.

IIMTU-NEP IMPLEMENTATION
Year-III / Semester-VI

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech.**	**Year: III** **Semester: VI**
Credits **Theory: 4** **Practical: 2**	**Subject: High Speed Aerodynamics**
Course Code: SEAE-362	**Title : High Speed Aerodynamics**

Course Objectives:
The objectives of studying this course are,
1. Study the basic governing equations of compressible flows and its parameters.
2. Study the effects of Shock and Expansion waves on aero dynamic characteristics.
3. Learn about the experimental methods to study about compressible flows.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks / 4

L: 4
T: 1
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**ONEDIMENSIONALCOMPRESSIBLEFLOWS** Review of Thermodynamics. Definition of Compressibility, Review of Governing equations. Stagnation conditions, Speed of sound, Mach number, flow regimes, shock waves. Alternative forms of Energy equations, Normal shock relations, Hugono it equation, One dimensional flow with heat addition and one dimensional flow with friction	10
II	**OBLIQUE SHOCK AND EXPANSION WAVES** Oblique shock Relations. Supersonic over a wedge Θ-β-M relations strong and weak shock solutions, Shock polar. Regular reflection from a solid boundary. Pressured election diagrams, Intersections of shock wave. Expansion waves. Prandtl – Meyer Expansion. Shock Expansion theory. Detached shock in front of blunt body. Expansion. Shock Expansion theory. Detached shock in front of blunt body.	10
III	**SUBSONICCOMPRESSIBLEANDSUPERSONICLINEARISEDFLOWOVER AIRFOIL** Introduction - Velocity potential equation –small perturbation equation - Prandtl-Glauert compressibility corrections - Critical Mach number - Drag divergence Mach number-Arearule-Super critical air foil. Linearized supersonic pressure coefficient-Improved compressibility correction factors, Application to airfoil. Conical flows physical aspects, Delta Wing Aerodynamics.	10
IV	**FLOWTHROUGHNOZZLESANDVARIABLEAREADUCTS** Area-velocity relation, Isentropic flow through Convergent – Divergent nozzles.	10

	Choked flow conditions. Normal shock. Under and Over expansion conditions. Flow through diffusers–wave reflections from a free boundary. Method of Characteristics Application to supersonic wind tunnels and rocket engine. **Governors:** Introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor	
V	**EXPERIMENTALAERODYNAMICS** Model testing in wind tunnels and types of wind tunnels. Pressure, Temperature, Velocity measurements – Hotwire and Laser – Doppler anemometer. Force measurements – Wind tunnel balances. Scale effects and corrections, wall interferences, Flow visualization techniques-schileren and shadow graph methods.	10

Evaluation/Assessment Methodology	
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	**150**

Prerequisites for the course:

Course Outcomes:	After studying the above course the student will be able,
CO-1	Understand the compressible flow parameters effecting flow behaviour.
CO-2	Able to design nozzle, diffuser and variable area ducts to obtain required aerodynamic outputs.
CO-3	Develop cam profile for followers executing various types of motions
CO-4	Understand the high speed aerodynamic
CO-5	Apply dynamic force analysis for slider crank mechanism and balance rotating &reciprocating masses in machines

Format-3

IIMTU- NEPIMPLEMENTATION
Year: III / Semester: VI

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	Year: III Semester: VI
Credits Theory: 3 Practical: 0	**Subject: Universal Human Values and Professional Ethics**
Course Code: UVE-601	**Title : Universal Human Values and Professional Ethics**

Course Objectives: The objectives of studying this course are,

1. To reinstate the rich cultural legacy and human values of which we are the custodians.
2. To focus on professional ethics which are broader indicators of desirable actions vis-à-vis undesirable actions?
3. To lay down broader guidelines of values and ethics for internal and external stakeholders.
4. To suggest operational guidelines for value-based and ethical practices in the higher educational institutions leading to implementation and monitoring.
5. To indicate the outcomes of creating a value-based and ethical culture in HEIs.
6. To suggest indicative reinforcement programmes for nurturing human values and ethics in HEIs.

Nature of Paper: AEC

Minimum Passing Marks/Credits: 40% Marks / 3

L: 3
T: 0
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction - Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	09

II	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as aninstrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam	09
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva*as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!.	09
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co- existence (*Sah-astitva*) of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.	09
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human for Conduct, Basis Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco- friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and	09
If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**		

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	10
2) Presentations /Seminar	
3) Assignments	5
4) Research Project Report Seminar On Research Project Report	
5) ESE	35
Total:	50
Prerequisites for the course:	

Course Learning Outcomes: After undergoing this course, the students will be able to:

1. The learning process for holistic development
2. Impeccable governance
3. Effective institutional management
4. Well laid system of rewards and chastisement
5. Institutional climate where 'rights' enjoy and 'wrongs' are discouraged.
6. Understand Harmony in the Nature and Existence

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III /Semester: VI

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	**Year: III** **Semester: VI**
Credits: 2 **Practical: 2**	**Subject: Avionics System Lab**
Course Code: SEAE-361P	**Title : Avionics System Lab**

Course Objectives:
1. Understand communication protocols' principles and select suitable ones.
2. Analyze navigation methods for optimal selection based on flight conditions.
3. Grasp radar modes for effective aircraft surveillance.
4. Comprehend fly-by-wire concepts for advanced control systems.
5. Consider integration and reliability for ethical avionics design.

Minimum Passing Marks/Credits: **50% Marks / 2**

L: 0
T: 0
P: 3 (n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

S.No	Experiment's List	No. of Labs Allotted
Practical-1	To study basic components and functions of avionics systems in modern aircraft.	03
Practical-2	To study various communication protocols used in avionics systems, such as ARINC 429, MIL-STD-1553, and Ethernet.	03
Practical-3	To study principles of navigation systems, including GPS, inertial navigation, and radio-based systems like VOR and ILS.	03
Practical-4	To study concepts behind fly-by-wire systems and analyze different control laws in modern aircraft.	03
Practical-5	To study the theoretical aspects of radar systems, their modes, and their applications in aircraft surveillance.	03
Practical-6	To study the fundamentals of electronic warfare systems, including radar jamming and countermeasures.	03
Practical-7	To study workings of autopilot systems and flight management	03
Practical-8	To Analyze the theory behind various cockpit displays like HUD, PFD, and MFD, and their contributions to pilot situational awareness.	03
Practical-9	To study theoretical challenges of integrating complex avionics systems and the importance of reliability in aviation electronics.	03

If the course is available as Generic Elective then the students of following departments may opt it. NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Out comes: After studying the above course the student will be able to, **CO-1** Master avionics systems: protocols, navigation, radar, flight control, and ethics. **CO-2** Proficiently choose communication protocols for avionics systems. **CO-3** Expertly select navigation methods for specific flight conditions. **CO-4** Accurately interpret radar data for effective aircraft surveillance. **CO-5** Understand advanced flight control concepts, including fly-by-wire. **CO-6** Apply ethics to avionics design, addressing integration and reliability for safety.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV / Semester: VII

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	**Year: III** **Semester: VI**
Credits **Theory: 0** **Practical: 2**	**Subject : Computer Aided Engineering Simulation Lab**
Course Code: SEAE-362P	**Title : Computer Aided Engineering Simulation Lab**

Course Objectives: The objectives of studying this course are,

1. Understand the basics of Computational Fluid Dynamics (CFD) and its applications.
2. Learn to use ANSYS software for setting up and analyzing fluid flow simulations.
3. Acquire hands-on experience in interpreting CFD simulation results.
4. Gain insights into fluid behavior, heat transfer, and pressure distribution.
5. Develop foundational skills in using simulation tools for fluid dynamics analysis

Nature of Paper: Practical

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 3 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Practical	Contents	No. of Lectures Allotted
Practical-1	Study fluid flow patterns and pressure distribution around a cylinder	03
Practical-2	Analyze lift, drag, and airflow behavior over an airfoil shape	03
Practical-3	Observe how heat transfers and fluid flow in a heated pipe	03
Practical-4	Explore fluid acceleration and pressure changes in a convergent-	03
Practical-5	Study heat transfer through fluid convection in a closed enclosure	03
Practical-6	Analyze separation and reattachment of fluid flow over a step.	03
Practical-7	Observe airflow patterns and pressures around a simple building structure.	03
Practical-8	Study aerodynamic behavior and drag forces on a simplified vehicle model	03
Practical-9	Analyze fluid temperature changes and heat transfer in a heat exchanger.	03

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	0
3) Assignments	
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

1. Perform basic fluid flow simulations using ANSYS CFD.
2. Interpret fluid flow patterns, pressure distribution, and heat transfer in simulation results.
3. Apply CFD techniques to analyze simple fluid dynamics problems.
4. Understand the significance of CFD in engineering design and analysis.
5. Utilize simulation tools to make informed decisions for fluid flow optimization.
6. Develop fundamental skills for further exploration of advanced CFD simulations

Format-3

IIMTU-NEP IMPLEMENTATION
Year: III / Semester: VII

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	**Year: IV** **Semester: VII**
Credits **Theory: 4** **Practical: 0**	**Subject: Rocket Missile Designing**
Course Code: SEAE-471	**Title : Rocket Missile Designing**

Course Objectives: The objectives of studying this course are,
1. Understand the fundamental principles of rocket propulsion.
2. Differentiate between various types of rocket engines.
3. Grasp the roles of key rocket engine components.
4. Comprehend propellant chemistry and thermodynamics.
5. Gain awareness of rocket performance and challenges

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks / 4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures
I	**Introduction to Rocket Propulsion** Basics of rocket propulsion. Differentiating rockets from other propulsion systems. Components overview: propellant, combustion chamber, nozzle.	09
II	**Propellant Chemistry and Thermodynamics** Exploring propellant types: liquid, solid, hybrid. Chemical reactions for propellant combustion. Thermodynamic principles behind rocket engines. Balancing energy release and efficiency.	09
III	**Rocket Engine Components** Major parts: combustion chamber, nozzle, turbopumps. Roles of oxidizers and fuels in combustion. Thrust vector control mechanisms. Engine cooling techniques and materials	09
IV	**Types of Rocket Engines** Differentiating between liquid, solid, and hybrid engines. Advantages and limitations of each engine type. Applications of various rocket propulsion systems. Engine choices for specific mission requirements	09

V	Analyzing rocket thrust and specific impulse. Factors affecting rocket performance. Challenges in rocket propulsion: efficiency, safety, environmental impact. Exploring future trends in rocket propulsion	09

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Outcomes:

After studying the above course the student will be able to,

CO-1 Recognize core concepts of rocket propulsion.
CO-2 Classify and understand different rocket engine types.
CO-3 Identify functions of major rocket engine components.
CO-4 Explain propellant chemistry and its impact on performance.
CO-5 Analyze factors influencing rocket performance and challenges.
CO-6 Apply knowledge to predict rocket engine behavior and challenges.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: IV/ Semester: VII

Programme: B.Tech. (Aerospace Engineering) **Class: B-Tech**	Year: **IV** Semester: **VII**
Credits: 2 Theory: 0 Practical: 2	**Subject : Advance Designing Lab**
Course Code: SEAE-471P	**Title : Advance Designing Lab**

Course Objectives: The objectives of studying this course are,
1. Learn basic 3D modeling using sketching, extrusion, and filleting in CATIA V5 and SolidWorks.
2. Understand assembly techniques with constraints and mates in both software.
3. Master 2D sketching and application of constraints for accurate designs.
4. Explore parametric modeling by modifying dimensions and observing changes.
5. Familiarize yourself with wireframe design in CATIA V5.
6. Develop the skill to create detailed 2D engineering drawings with dimensions and annotations.

Minimum Passing Marks/Credits: 50% Marks / 2

L: 0
T: 0
P: 3(n Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	Create complex 3D models and assemblies.	03
Practical-2	Master parametric design with constraints.	03
Practical-3	Explore advanced surface modeling.	03
Practical-4	Simulate mechanical assemblies.	03
Practical-5	Design sheet metal components.	03
Practical-6	Create realistic renderings.	03
Practical-7	Perform structural and fluid simulations.	03
Practical-8	Evaluate designs for manufacturability.	03
Practical-9	Learn advanced assembly techniques.	03
Practical10	To perform computation of square root of a given number	03

Prerequisites for the course:

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total	**50**

Course Out comes: After studying the above course the student will be able to, **CO-1** Proficiency in intricate 3D modeling and assemblies. **CO-2** Mastery of parametric design principles. **CO-3** Skill in creating curved and sleek surfaces. **CO-4** Expertise in simulating mechanical assemblies. **CO-5** Practical sheet metal design competency. **CO-6** Proficiency in design simulation and analysis.

School of Engineering & Technology

ACADEMIC HANDBOOK

POSTGRADUATE DEGREE COURSE
In
MECHANICAL ENGINEERING
(Specialization: Production Engineering)

EVALUATION SCHEME

POSTGRADUATE DEGREE COURSE In
MECHANICAL ENGINEERING (Specialization: Production Engineering)

First Year, Semester-I

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		External	Internal	Total
01	MTPE-111	Theory Of Metal Cutting	3	0	0	4	70	30	100
02	MTPE -112	Advanced Casting and Welding Technologies	3	0	0	4	70	30	100
03	MTPE -113	Advanced CAD	3	0	0	4	70	30	100
04	MTPE -114	Elective-I	3	0	0	4	70	30	100
05	MTPE -112P	Advanced Casting and Welding Technologies Lab	0	0	3	2	30	20	50
		Total	**12**	**0**	**3**	**18**	**310**	**140**	**450**

*** Electives to be selected from the following list**

Elective-I	**MTPE -114A**	Machine Tool Design
	MTPE -114B	Advance Manufacturing Processes

M.TECH Production First Year, Semester-II

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		External	Internal	Total
01	MTPE -121	Optimization Techniques and Applications	3	0	0	4	70	30	100
02	MTPE -122	Automation in Manufacturing	3	0	0	4	70	30	100
03	MTPE -123	Production & Operations Management	3	0	0	4	70	30	100
04	MTPE -124	Elective-II	3	0	0	4	70	30	100
05	MTPE -126P	Production Engineering Lab	0	0	3	2	30	20	50
06	NECC-125	MOOCs (SWAYAM/NPTEL)	--	--	4	2	--	50	50
		Total	**12**	**0**	**07**	**20**	**310**	**190**	**500**

*** Electives to be selected from the following list**

Elective-II	**MTPE 124A**	Intelligent Manufacturing Systems
	MTPE -124B	Industrial Robotics
	MTPE -124C	Computer Aided Manufacturing

Second Year, Semester-III

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		External	Internal	Total
01	MTPE -231	Elective-III	3	1	0	4	70	30	100
02	MTPE -232	Elective-IV	3	1	0	4	70	30	100
03	MTPE -233	Seminar	-	-	12	4	-	200	200
04	MTPE -234	Dissertation (Phase-I)	-	-	24	6	120	80	200
05	NECC-235	MOOCs (SWAYAM/NPTEL)	--	--	4	2	--	50	50
		Total	**06**	**0**	**40**	**20**	**260**	**390**	**650**

*** Electives to be selected from the following list**

Elective-III	**MTPE -231A**	Simulation, Modelling & Analysis
	MTPE -231B	Quality Engineering In Manufacturing
Elective-IV	**MTPE -232A**	Rapid Prototyping Technologies
	MTPE -232B	Design and Manufacture of MEMS & Micro system

**** Seminar should be presented on a very recent topic on any technological domain.**

*****Dissertation (Phase-I):** The aim of dissertation phase-I is students to analyses independently any problem posed to them. The work may be analytical, experimental, design or combination of these. A report will submitted in the department for the evaluation of the student performance on the basis of external and internal examination.

Second Year, Semester-IV

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		External	Internal	Total
01	MTPE -241	Dissertation (Phase-II)	0	0	16	8	120	80	200
02	MTPE -242	Comprehensive Viva	0	0	8	4	60	40	100
		Total	**0**	**0**	**24**	**12**	**180**	**120**	**300**

Format-1

Format-1

CBCS: Statement of Credit distribution	
College/School: School of Engineering & Technology Programme: M.Tech Duration: 4 Semester Annual/Semester: Semester	Credit range: 72-80 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr) or	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	18	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)			DSE-I(4)		
II	20	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)		SEC-1(2)	DSE-II(4)		
Provision to change the core papers							
III	20			SEC-1(2)	DSE-III(4) DSE-IV(4)		Seminar-1 (04) Dissertation Phase-I(06)
IV	12						Comprehensive Viva(04) Dissertation Phase-II(08)
Total Credits	**70**	06(Th)*4(Cr) = 24 02 (Pr)*2(Cr) = 04 **Total = 28**		2*2= 04 **= 04**	4(Th)*4(Cr)= 16 **= 16**		04+06 = 10 04+08 = 12 **=22**

Format-2

Format-2

IIMTU-NEP Implementation: (M.Tech Production Engineering)

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES M.Tech TE	FIRST YEAR	SEMESTER -I	i) C1 (Th.4 Cr.)	4	3	40	**Theory Of Metal Cutting**	5		
			ii) C2(Th.4 Cr.).	4 2	3 3	40 24	**Advanced Casting and Welding Technologies** **Advanced Casting and Welding Technologies Lab**	5		
			iii)C3 (Th.4 Cr.+P 1Cr)	4	3	40	**Advanced CAD**	5		
			iv) DSE-I (Th.4 Cr.)	4	3	40	**Machine Tool Design** **Advance Manufacturing Processes**	5		
		SEMESTER - II	i) C4 (Th.4 Cr.)	4	3	40	**Optimization Techniques and Applications**	5		
			ii) C5(Th.4 Cr.).	4	3	40	**Automation in Manufacturing**	5		
			iii)C6 (Th.4 Cr.+P 1Cr)	4 2	3 3	40 30	**Production & Operations Management** **Production Engineering Lab**	5		
			iv) DSE-II (Th.4 Cr.) v) SEC-1	4 2	3 -	40 -	**Intelligent Manufacturing Systems** **Industrial Robotics** **Computer Aided Manufacturing** **MOOCS/ Swayam**	5		

* Industrial Training of 4 Weeks/5Weeks to be completed between the semester break

Programme Outcome:

PO_1

PO_2

PO_3

Programme Specific Outcome:

PSO_1

PSO_2

PSO_3

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES M.Tech TE	**SECOND YEAR**	**SEMESTER -III**	i) DSE-III	4	4	40	**Simulation, Modelling & Analysis** **Quality Engineering In Manufacturing**	5		
			ii) DSE-IV	4	4	40	**Rapid Prototyping Technologies** **Design and Manufacture of MEMS & Micro system**	5		
			iii) SEC-2	4	8	50	**Dissertation(Phase-I)/SYNOPSIS**			
			iv) SEC-3	2	4	60	**Seminar**			

			vii) SEC-4	2	4		**MOOCS/Swayam**			
		SEMESTER -IV	i) SEC-5	8	16	80	**Dissertation(Phase-II)**			
			ii) SEC-6	4	8	40	**Comprehensive Viva**			

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

Programme Outcome:

PO_1

PO_2

PO_3

Programme Specific Outcome:

PSO_1

PSO_2

PSO_3

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-I

Programme: PG **Class: M. Tech. (Production)**	Year: 1 Semester: I
Credits Theory: 4 Practical:0	**Subject: Theory Of Metal Cutting**
Course Code: MTPE-111	**Title : Theory Of Metal Cutting**

Course Objectives:

1. To understand the fundamental knowledge and principles involves in material removal processes.
2. The students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc.
3. To demonstrate the fundamentals of machining processes and machine tools.
4. To develop knowledge and importance of metal cutting parameters.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks/04

L: 3
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3 Credits)

Unit	Contents	No. of Lectures Allotted
I	**Mechanics of Metal Cutting**: Mechanism of chip formation, Orthogonal & Oblique cutting, types of chips, built-up edge, Determination of shear plane angle, forces on the chips, forces in orthogonal cutting, Merchant circle diagram and analysis, Theory of Lee & Shaffer, coefficient of friction, power & energy relationship, velocity relationship, shear-strain, factors affecting forces and power, problems.	8
II	**Single Point Cutting Tool:** Various systems of specifications, single point cutting tool geometry and their inter-relation. Theories of formation of built-up edge and their effect, design of single point contact tools throwaway inserts. **Multipoint Cutting Tool:** Drill geometry, design of drills, Rake& Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, milling cutters, cutting speed &feed machining time- design – from cutters	8
III	**Grinding:** Introduction of grinding process and its types, mechanics of grinding, Shapes and Size of a Grinding Wheel, Various Elements of a Grinding Wheel, Parameters affecting Grinding Operation, Grinding Fluids, Defects and Remedies in Grinding, Balancing of Grinding Wheel, Effect of grinding conditions on wheel wear and grinding ratio. Cylindrical grinding and centerless grinding processes and its mechanics.	8
IV	**Tool Life and Tool Wear:** Theories of tool wear – adhesion, abrasive and diffusion wear mechanisms, forms of wear, Tool life criteria and machinability index.	8

	Friction analysis: Types of sliding contact, real area of contact, laws of friction and nature of frictional force in metal cutting. Effect of tool angle, Economics, cost analysis, mean co-effect of friction.	
V	**Cutting Temperature**: Sources of heat in metal cutting, influence of metal conditions, Temperature distribution, zones, experimental techniques, analytical approach. Use of tool- work thermocouple for determination of temperature. Temperature distribution in Metal Cutting. **Cutting fluids:** Functions of cutting fluids, types of cutting fluids, properties, selection of cutting fluids**.** **Cutting tool materials:** Historical developments, essential properties of cutting tool materials, types, composition and application of various cutting tool materials, selection of cutting tool materials.	8

TEXT BOOKS:

1. Metal Cutting Principles/ MC Shaw / Oxford and IBH Publications, New Delhi, 1969
2. Fundamentals of Machining /Boothryd/ Edward Amold publishers Ltd 1975
3. 'Tool Design' by David Son / Lacain/ Goud, Tata Me Graw Hill
4. Fundamentals of Tool Design by Wilson fw , ASTME PHI 2010

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Apply cutting mechanics to metal machining based on cutting force and power consumption.	**K3**
CO2: Operate lathe, milling machines, drill press, grinding machines, etc.	**K3**
CO3: Select cutting tool materials and tool geometries for different metals.	**K2**
CO4: Select appropriate machining processes and conditions for different metals.	**K2**
CO5: Learn machine tool structures and machining economics.	**K2**
CO6: Write simple CNC programs and conduct CNC machining.	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

Programme: PG **Class: M. Tech. (Production)**	Year: 1 Semester: I
Credits Theory: 4 Practical: 0	**Subject: Advanced Casting And Welding Technologies**
Course Code: MTPE-112	**Title : Advanced Casting And Welding Technologies**
Course Objectives: 1. Study of various metal casting and joining processes 2. Control of parameters for sound casting and welding 3. Understand thermal and fluid transfer mechanism during these processes 4. To learn metallurgical effects of casting and joining	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks/04	
L: 3 T: 0 P: 0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Laser Beam Welding:** Types of lasers, equipment, power calculation, applications, dual laser beam welding, use of fiber optics in LBW. **Friction Stir Welding**; Details of process and process parameters, specific applications. **Electron Beam Welding**; The interaction of electron beam with matter, mode of heat generation, mode of energy losses, details of the equipment, product design for EBW, case studies. **Ultrasonic Welding**; Propagation of ultrasonic waves in matter, mode of joint formation, joint types and design of product for ultrasonic welding, details of equipment and case studies cutting and gauging, flame cutting plasma arc welding, laser assisted cutting.	8
II	**Heat flow in Welding:** Significance, theory of heat flow cooling rate determination, selection of welding parameters based on heat flow analysis, residual stresses and distortion. Joint design, analysis of fracture and fatigue of welded joints. Automated welding systems.	8
III	Investment casting, shell moulding, squeeze casting, vacuum casting, counter-gravity flow-pressure casting, directional and monocrystal solidification, squeeze casting, semisolid metal casting, rheocasting.	8
IV	Solidification Gating and Risering, Nucleation and grain growth, solidification of pure metals, short and long freezing range alloys. Gating and risering desing calculations, Fluidity and its measurement.	8
V	**CAE Of Welding And Casting:** Design of weldment, application of finite element method in welding – determination of distortion in	8

	weldments, modeling of temperature distribution – case studies. Design for casting, application of finite element method in casting- determination of hot spots, location of turbulence and other defects, modeling of flow in molds, modeling of heat transfer in castings- case studies.	

TEXT BOOKS:

1. Ravi B, "Metal Casting: Computer Aided Design and Analysis" Prentice Hall ,2005.
2. Richard L Little, "Welding and Welding Technology" Tata McGraw Hill, 2004.

REFERANCE BOOKS:

1. John Campbell, "Casting Practice" Elsevier Science Publishing C0.,2004
2. Larry Jeffus, "Welding Principles and Applications" Delmar Publishers, 2004.
3. John Campbell "Casting Butterworth Heinemann, 2003.
4. KlasWeman, :Welding Processes Handbook", 2003.
5. Howard B Cary, "Modern Welding Technology" Prentice Hall, 2002
6. Larry Jeffus, " Welding for Collision Repair", Delmar Publishers, 1999
7. ASM Hand Book "Casting", ASM International 1998.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Disseminate the knowledge of principles, operations and applications of different casting and welding processes	**K2**
CO2: Analyze the effects of process parameters on the quality of cast and weld products.	**K3**
CO3: Select the NDT techniques for the evaluation of cast and weld components	**K2**
CO4: Apply the knowledge of welding in Heavy Engineering and nuclear industries.	**K3**
CO5: Analyze and access the use of casting processes in manufacturing and understand the working of various casting processes	**K3**
CO6: Understand the basics of metal cutting and working of different types of machine tools.	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

Programme: PG **Class: M. Tech. (Production)**	Year: I Semester: I
Credits Theory: 4 Practical: 0	**Subject: Advanced CAD**
Course Code: MTPE-113	**Title : Advanced CAD**

Course Objectives:

1. To impart fundamental knowledge to students in the latest technological topics on Computer Aided Design to broaden and deepen their capabilities.
2. To impart the fundamental knowledge on Finite Element Methods to analyze the real life design in the industry.
3. To inculcate the ability to work with inter-disciplinary groups in professional, industry and research organizations.
4. To design and validate technological solutions to defined problems and communicate clearly and effectively for the practical application of their work.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks /04

L: 3
T: 0
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Unit	Contents	No. of Lectures Allotted
I	**INTRODUCTION TO CAD:** Definition of Cad, Design Criteria, Design Tool, Cad Tools, Design Analysis, Functional Areas CAD, and CAD Softwares and their efficient use. GEOMETRIC MODELLING: Interpolation and Extrapolation of Curves, Properties of Splines, Wire Frame Modeling: Wire Frame Entities and Modeling. SYNTHETIC CURVES: Hermite, Bezier and B-spline Curves and their properties.	8
II	**SURFACE MODELING:** Analytic and Synthetic surfaces. Planar rule, surface of revolution, Tabulated cylinder. **SYNTHETIC SURFACE:** Bi cubic, Bezier, B-spline and NURBS Surfaces.	8
III	**ADVANCED SURFACES:** Coons, Blending, Sculptured Surfaces. Surface Manipulation, Displaying Segmentation, Trimming, intersection. **TRANSFORMATIONS:** 2-D and 3-D Transformations, Homogeneous Transformation and Concatenation.	8
IV	**3-D MODELLING:** B-Rep, C-Rep, Cell Decomposition, Spatial occupancy and Enumeration, Primitive Instancing. **GRAPHICS STANDARDS:** IGES, STEP, ACIS and DXF. **DESIGN APPLICATIONS:** Mechanical Tolerances, Mass Properties, Mechanical Assembly, Finite Element Modeling (Mesh).	8

V	**COLLOBORATIVE-ENGINEERING:** Collaborative Design, Mockup Design, Morphology, Behavioural and Feature Based Modeling and Analysis, Sensitivity analysis, Conceptual, Bottom up and Top down Design Approach.	8

TEXT BOOKS:
1. CAD/CAM Theory and Practice - lbrahim Zeid, 2nd Edition, Mc Graw Hill international.

REFERENCE BOOKS:
1. Mathematical Elements for Computer Graphics – David Rosers, 2nd Edition Tata Mc Graw Hill 2002.
2. CAD/CAM, Principles and Applications, 3rd Edition Tata Mc Graw Hill 2010.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Understand the basic fundamentals of computer aided design and computer devices.	**K2**
CO2: To learn 2D & 3D transformations of the basic entities like line, circle, etc. and coordinate system	**K3**
CO3: To understand the different geometric modeling techniques like solid modeling, surface modeling, and to visualize how the components look like before its manufacturing or fabrication.	**K2**
CO4: Apply the knowledge of welding in Heavy Engineering and nuclear industries.	**K3**
CO4: To learn at least one high end design software	**K2**
CO5: To learn the design analysis through Finite Element Method.	**K2**
CO6: Explain fundamental and advanced features of CNC machines	**K2**

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-I

Programme: PG **Class: M. Tech. (Production)**	Year: I Semester: I
Credits Theory: 4 Practical: 0	**Subject: Machine Tool Design**
Course Code: MTPE-114A	**Title : Machine Tool Design**
Course Objectives: 1. Study of various machine internal parts 2. Dynamics of machining by varying parameters 3. Automation of machine parts	
Nature of Paper: Elective-I	
Minimum Passing Marks/Credits: 40% Marks/04	
L: 3 T: 0 P: 0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)	

Unit	Contents	No. of Lectures Allotted
I	Kinematics of Machine Tools:- shaping of geometrical and real surfaces, Developing and designing of kinematic schemes of machine tools, kinematics structures of lathe, drilling, milling, grinding, gear shaping and gear hobbing machines. Kinematic design of speed and feed boxes. Productivity loss. Stepped and stepless regulation, clutched drive.	8
II	Strengths and Rigidity of Machine tool Structures: Basic principles of design for strength. Different types of structures. Overall compliance of machine tools. Design of beds, bases, columns, tables, cross rail for various machines. Various types of guide ways, their relative advantages. Materials for machine tool components including plastic guide way (PTFE)	8
III	Analysis of Spindles, Bearings, and Power Screws: Design of spindles subjected to combined bending and torsion. Layout of bearings. Pre-loading. Anti-friction slide ways. Rolling contact hydrodynamic, hydrostatic, Hydrodynamic design of Journal bearings, Magneto bearings. Machine Tool Vibrations: Effect of vibrations on machine tool. Free and Forced vibrations. Machine tool chatter.	8
IV	Computer- Aided Programming: General information, APT programming, Examples apt programming probkms (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors introduction to CAD/CAM software, automatic Tool Path generation.	8
V	Tooling for CNC Machines: Interchangeable tooling system, present and qualifies tools, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers. DNC Systems and Adaptive Control; Introduction, type of DNC systems, advantages arid disadvantages of DNC, adaptive control with optimization, Adaptive control with constrains,	8

	Adaptive control of machining processes like turning, grinding.	

TEXT BOOKS:

1. N.K. Mehta, Machine Tool Design and Numerical Control, Tata McGraw Hill, 1997.
2. Sen and Battacharya, Principles of Machine Tools, Central book publishers, Calcutta 1995.
3. SK BASU " Machine Tool Design"
4. McGraw "CAD/CAM"
5. Yorenkoren "Computer Control " Manufacturing Systems"

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Students will be able to apply various design aspects of spindles and bearings	**K2**
CO2: Students will be able to identify various parts of machine tools	**K2**
CO3: Students will be able to reduce vibration and chatter developing on machine tools	**K3**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-I

Programme: PG **Class: M. Tech. (Production)**	Year: I Semester: I
Credits Theory: 4 Practical: 0	**Subject: Advanced Manufacturing Processes**
Course Code: MTPE-114B	**Title : Advanced Manufacturing Processes**

Course Objectives:

1. The objective of the course is to provide the students the knowledge of modern manufacturing processes such as Ultrasonic machining, Abrasive machining processes, Electrochemical machining, Electro discharge machining & their modifications into hybrid processes. Also to introduce them to advanced topics such as Laser beam welding/machining, Electron beam welding/machining & state of art in various research areas.

Nature of Paper: Elective-I

Minimum Passing Marks/Credits: 40% Marks/04

L: 3
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Unit	Contents	No. of Lectures Allotted
I	**Surface treatment:** Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating, Electro forming, Chemical vapour deposition, thermal spraying, lon implantation, diffusion coating, Diamond coating and cladding.	8
II	**Non-Traditional Machining:** Introduction, need AJM, Parametric Analysis, Process capabilities, USM-Mechanics of Cutting, models, Parametric Analysis, WJM – principles, equipment, generators, analysis of R-C circuits, MRR, Surface finish, WEDM.	8
III	**Laser Beam Machining** – Principles of working, equipment, Material removal rate, Process parameters, performance characterization, applications. Plasma Arc Machining – Principles of working, equipment, Material removal rate, Process Parameters, performance characterization, applications Electron Beam Machining – Principle of working equipment, Material removal rate, Process performance characterization, applications Electro Chemical Machining – Principle of working, equipment, Material removal rate, Process parameters, performance characterization, applications	8
IV	**Processing of ceramics:** Applications characteristics, classification Processing of particulate ceramics, Powder preparations, consolidation, Drying, sintering, Hot compaction, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.	8

V	**Fabrication of Microelectronics devices:** Crystal growth and wafer preparation, Film deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in microelectronics, surface mount technology, Integrated circuits economics. E-Manufacturing, nanotechnology, and micromachining, High speed Machining	8

TEXT BOOKS:

1. Manufacturing Engineering and Technology, Kalpakijian, Adisson Wesley 1995
2. Process and Materials of Manufacturing RA Lindburg 4th edition PHI 1990
3. Foundation of MEMS/Chang Liu/ Pearson, 2012
4. Advanced Machining Processes VKJin, Allied Publications.
5. Introduction to Manufacturing Processes, John A Schey, Mc Graw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Students will be able to categorize different material removal, joining processes as per the requirements of material being used to manufacture end product.	**K2**
CO2: Students will be able to select material processing technique with the aim of cost reduction, reducing material wastage & machining time.	**K2**
CO3: Students will be able to identify the process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.	**K2**
CO4: Students will be able to combine & develop novel hybrid techniques from the state of art techniques available.	**K3**
CO5: Students will be able to perform process analysis taking into account the various responses considered in a process.	**K2**
CO6: Design and validate technological solutions to defined problems and write clearly and effectively, for the practical utilization of their work	**K4**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-I

Programme: PG **Class: M. Tech. (Production)**	Year: 1 Semester: I
Credits Theory: 0 Practical: 2	**Subject: Advanced Casting And Welding Technologies Lab**
Course Code: MTPE-112P	**Title : Advanced Casting And Welding Technologies Lab**

Course Objectives:
1. Study of various metal casting and joining processes
2. Control of parameters for sound casting and welding
3. Understand thermal and fluid transfer mechanism during these processes
4. To learn metallurgical effects of casting and joining

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/02

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Practical	Contents	No. of Lectures Allotted
I	**Welding:** 1. Study of arc characteristics in simulated MMA welding; arc gap-arc voltage relationship; recording of voltage oscillograms and its study. 2. Study of heat flow and temperature distribution in welding 3. Study of characteristics of TIG/MIG welding 4. Ultrasonic/dye penetrant inspection or computer simulation of welding heat flow/analysis of arcvoltage pattern.	12
II	**Casting:** 1. Practice on CAD of gating and risering 2. Experiment to determine the effect of moulding variables in sand moulds 3. To determine the effect of mould additive on the properties of castings 4. To determine the characteristics of base sands.	12

TEXT BOOKS:
1. Ravi B, "Metal Casting: Computer Aided Design and Analysis" Prentice Hall, 2005.
2. Richard L Little, "Welding and Welding Technology" Tata McGraw Hill, 2004.

REFERANCE BOOKS:
1. John Campbell, "Casting Practice" Elsevier Science Publishing C0.,2004
2. Larry Jeffus, "Welding Principles and Applications" Delmar Publishers, 2004.
3. John Campbell "Casting Butterworth Heinemann, 2003.
4. KlasWeman, :Welding Processes Handbook", 2003.

5. Howard B Cary, "Modern Welding Technology" Prentice Hall, 2002
6. Larry Jeffus, "Welding for Collision Repair", Delmar Publishers, 1999
7. ASM Hand Book "Casting", ASM International 1998.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1. Practical file record	10
2. Quiz	5
3. Viva	5
4. End Semester Practical Examination	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:

1. The student will be having the capability of selecting suitable welding and casting processes for a given material.
2. The student will be able to identify/control the appropriate process parameters, and possible defects of welding/casting processes so as to remove them.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I /Semester-II

Programme:PG **Class: M. Tech. (Production)**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject: Optimization Techniques and Applications**
Course Code: MTPE-121	**Title : Optimization Techniques and Applications**

Course Objectives:
To enable the student to
1. Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.
2. Learn classical optimization techniques and numerical methods of optimization.
3. Know the basics of different evolutionary algorithms.
4. Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks/04

L: 3
T: 0
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3 Credits)

Unit	Contents	No. of Lectures Allotted
I	**Single Variable Non-Linear Unconstrained Optimization:** One dimensional Optimization methods:-Uni-modal function, elimination methods, Fibonacci method, golden section method, interpolation methods – quadratic & cubic interpolation methods.	8
II	**Multi variable non-linear unconstrained optimization:** Direct search method – Univariant method - pattern search methods – Powell's- Hook - Jeeves, Rosenbrock search methods- gradient methods, gradient of function, steepest decent method, Fletcher Reeves method, variable metric method.	8
III	**Linear Programming** – Formulation – Sensitivity analysis. Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints. Simulation – Introduction – Types- steps – application – inventory – queuing – thermal system	8
IV	**Integer Programming**- Introduction – formulation – Gomory cutting plane algorithm – Zero or one algorithm, branch and bound method **Stochastic Programming**: Basic concepts of probability theory, random variables- distributions-mean, variance, correlation, co variance, joint probability distribution- stochastic linear, dynamic programming.	8

V	**Geometric Programming:** Polynomials – arithmetic - geometric inequality – unconstrained G.P-constrained G.P **Non Traditional Optimization Algorithms:** Genetics Algorithm-Working Principles, Similarities and Differences between Genetic Algorithm & Traditional Methods. Simulated Annealing- Working Principle-Simple Problems.	8

Text Books:

1. Optimization theory & Applications / S.S.Rao / New Age International.
2. Optimization for Engineering Design, Kalyanmoy Deb, PHI

Reference Books:

1. S.D.Sharma / Operations Research
2. Operation Research / H.A.Taha /TMH
3. Optimization in operations research / R.LRardin
4. Optimization Techniques /Benugundu & Chandraputla / Pearson Asia.
5. Optimization Techniques theory and practice / M.C.Joshi, K.M.Moudgalya/ Narosa Publications

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.	**K2**
CO2: Use classical optimization techniques and numerical methods of optimization.	**K2**
CO3: Describe the basics of different evolutionary algorithms.	**K2**
CO4: Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas.	**K3**
CO5: Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems.	**K2**
CO6: Ability to go in research by applying optimization techniques in problems of Engineering and Technology.	**K2**

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-II

Programme: PG **Class: M. Tech. (Production)**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject: Automation In Manufacturing**
Course Code: MTPE-122	**Title : Automation In Manufacturing**

Course Objectives:
1. Describe the basic concepts of automation in manufacturing systems.
2. Acquire the fundamental concepts of automated flow lines and their analysis.
3. Classify automated material handling, automated storage and retrieval systems.
4. Illustrate adaptive control systems and automated inspection methods

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /04

L: 3
T: 0
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Automation:** Automation in Production Systems-Automated Manufacturing Systems, Computerized Manufacturing Support Systems, Reasons for Automation, Automation Principles and Strategies. Manufacturing operations, Production Concepts and Mathematical Models. Costs of Manufacturing Operations, , Basic Elements of an Automated Systems, Advanced Automation Functions, Levels of automation.	8
II	**Introduction to Material Handling**, Overview of Material Handling Equipment, Considerations in Material Handling System Design, The 10 Principles of Material Handling. Material Transport Systems, Automated Guided Vehicle Systems, Monorails and other Rail Guided Vehicles, Conveyor Systems, Analysis of Material Transport Systems. Storage Systems, Storage System Performance, Storage Location Strategies, Conventional Storage Methods and Equipment, Automated Storage Systems, Engineering Analysis of Storage Systems. Automatic data capture-overview of Automatic identification methods, bar code technology, other ADC technologies.	8
III	**Manual Assembly Lines** - Fundamentals of Manual Assembly Lines, Alternative Assembly Systems, Design for Assembly, Analysis of Single Model Assembly Lines, Line balancing problem, largest candidate rule, Kilbridge and Wester method, and Ranked Positional Weights Method, Mixed Model Assembly Lines, Considerations in assembly line design.	8
IV	**Transfer lines, Fundamentals of Automated Production Lines**, Storage Buffers, and Applications of Automated Production Lines. Analysis of Transfer Lines with no Internal Storage, Analysis of Transfer lines with Storage Buffers.	8

V	**Automated Assembly Systems, Fundamentals of Automated Assembly Systems**, Design for Automated Assembly, and Quantitative Analysis of Assembly Systems - Parts Delivery System at Work Stations, Multi- Station Assembly Machines, Single Station Assembly Machines , Partial Automation.	8

Text Books:

1. Automation, Production systems and computer integrated manufacturing, Mikel P. Groover/ Pearson Eduction.

Reference Books:

1. CAD CAM : Principles, Practice and Manufacturing Management / Chris Mc Mohan, Jimmie Browne / Pearson edu. (LPE)
2. Automation, Buckinghsm W, Haper & Row Publishers, New York, 1961
3. Automation for Productivity, Luke H.D, John Wiley & Sons, New York, 1972.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Illustrate the basic concepts of automation in machine tools.	**K2**
CO2: Analyze various automated flow lines, Explain assembly systems and line balancing methods.	**K3**
CO3: Describe the importance of automated material handling and storage systems.	**K3**
CO4: Interpret the importance of adaptive control systems, automated inspection systems.	**K2**
CO5: Describe the importance of automated material handling and storage systems.	**K3**
CO6: Interpret the importance of adaptive control systems, automated inspection systems.	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-II

Programme: PG **Class: M. Tech. (Production)**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject: Production And Operations Management**
Course Code: MTPE-123	**Title : Production And Operations Management**
Course Objectives: 1. To develop an understanding of how the operations, have strategic importance and can provide a competitive advantage in the workplace. 2. To understand the relationship between operations and other business functions. 3. To understand techniques of location and facility planning; line balancing; job designing; and capacity plan in operations management.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:40% Marks /04	
L: 3 T: 0 P: (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)	

Unit	**Contents**	**No. of Lectures Allotted**
I	Operation Management – Definition – Objectives – Types of production systems – historical development of operations management – Current issues in operation management. Product design – Requirements of good product design – product development – approaches – concepts in product development – standardization – simplification – Speed to market – Introduction to concurrent engineering.	8
II	Alue engineering – objective – types of values – function & cost – product life cycle- steps in value engineering – methodology in value engineers – FAST Diagram – Matrix Method. Location – Facility location and layout – Factors considerations in Plant location- Comparative Study of rural and urban sites – Methods of selection plant layout – objective of good layout – Principles – Types of layout – line balancing.	8
III	Aggregate Planning – definition – Different Strategies – Various models of Aggregate Planning – Transportation and graphical models. Advance inventory control systems push systems – Material Requirement – Terminology – types of demands – inputs to MRP- techniques of MRP – Lot sizing methods – benefits and drawbacks of MRP –Manufacturing Resources Planning (MRP –II), Pull systems – Vs Push system – Just in time (JIT) philosophy Kanban System – Calculation of number of Kanbans Requirements for implementation JIT – JIT Production process – benefits of JIT.	8

IV	Scheduling – Policies – Types of scheduling – Forward and Backward Scheduling – Grant Charts – Flow shop Scheduling – n jobs and 2 machines, n jobs and 3 machines – job shop Scheduling – 2 jobs and n machines – Line of Balance.	8
V	Project Management – Programming Evaluation Review Techniques (PERT) – three times estimation – critical path – probability of completion of project – critical path method – crashing of simple nature.	8

TEXT BOOK:

1 "Operations Management " by E.S. Buffs

REFERANCE BOOKS:

1. Operations Management Theory and Problems - Joseph G. Monks.
2. Production Systems Management - James I. Riggs.
3. Production and Operations Management - Chary.
4. Operations Management - Chase
5. Production and Operation Management - Panner Selvam
6. Production and Operation Analysis – Nahima

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.	**K2**
CO2: Analyze and evaluate various facility alternatives and their capacity decisions, develop a balanced line of production & scheduling and sequencing techniques in operation environments.	**K3**
CO3: Develop aggregate capacity plans and MPS in operation environments.	**K3**
CO4: Plan and implement suitable materials handling principles and practices in the operations.	**K2**
CO5: Plan and implement suitable quality control measures in Quality Circles to TQM.	**K2**
CO6: Strategic thinking and decision making to analyse the enterprise as a whole with a specific focus on production delivery processes	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-II

Programme: PG **Class: M. Tech. (Production)**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject: Intelligent Manufacturing System**
Course Code: MTPE-124A	**Title : Intelligent Manufacturing System**
Course Objectives: 1. planning manufacturing systems 2. computer integrated manufacturing and enterprise integration 3. group Technology 4. knowledge based systems	
Nature of Paper: Elective-II	
Minimum Passing Marks/Credits:40% Marks /04	
L: 3 T: 0 P: (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)	

Unit	Contents	No. of Lectures Allotted
I	Computer Integrated Manufacturing Systems – Structure and functional areas of CIM system - CAD, CAPP, CAM, CAQC, ASRS. Advantages of CIM. Manufacturing Communication Systems – MAP/TOP, OSI Model, Data Redundancy, Top-down and Bottom-up Approach, Volume of Information. Intelligent Manufacturing – System Components, System Architecture and Data Flow, System Operation	8
II	Components of Knowledge Based Systems – Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Interference Engine, Knowledge Acquisition.	8
III	Machine Learning – Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks - Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing	8
IV	Automated Process Planning – Variant Approach, Generative Approach, Expert Systems for Process Planning, Feature Recognition, Phases of Process planning Knowledge Based System for Equipment Selection (KBSES) – Manufacturing system design, Equipment Selection Problem, Modeling the Manufacturing Equipment Selection Problem, Problem Solving approach in KBSES, Structure of the KBSES.	8
V	Group Technology: Models and Algorithms – Visual Method, Coding Method, Cluster Analysis Method, Matrix Formation – Similarity Coefficient Method, Sorting-based Algorithms, Bond Energy Algorithm, Cost Based method, Cluster Identification Method, Extended CI Method.Knowledge	8

	Based Group Technology - Group Technology in Automated Manufacturing System, Structure of Knowledge based system for group technology (KBSGT) – Data Baswe, Knowledge Base, Clustering Algorithm.	

Text Books:

1. Intelligent Manufacturing Systems, Andre Kusaic.
2. Artificial Neural Networks, Yagna Narayana
3. Automation, Production Systems and CIM, Groover M.P.
4. Neural Networks, Wassarman.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: assess the performance of manufacturing systems	**K3**
CO2: develop a systematic approach for design and implementation of manufacturing systems	**K6**
CO3: suggest new procedures to improve the productivity of existing manufacturing systems	**K5**
CO4: utilise online collaboration tools to work in complex teams	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-II

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech. (Production)</td><td>Year: I
Semester: II</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: Industrial Robotics</td></tr>
<tr><td colspan="2">Course Code: MTPE-124B</td><td>Title : Industrial Robotics</td></tr>
<tr><td colspan="3">Course Objectives:
1. To provide knowledge on the various robotic systems with the help of mathematical models.
2. To introduce the control aspects of non-linear systems.
3. To learn the concepts of non-linear observer design.</td></tr>
<tr><td colspan="3">Nature of Paper: Elective-II</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits:40% Marks /04</td></tr>
<tr><td colspan="3">L: 3
T: 0
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction: Automation and Robotics, Robot anatomy, robot configuration, motions joint notation work volume, robot drive system, control system and dynamic performance, precision of movement.
Control System And Components: basic concept and modais controllers control system analysis, robot activation and feedback components. Positions sensors, velocity sensors, actuators sensors, power transmission system.</td><td>8</td></tr>
<tr><td>II</td><td>MOTION ANALYSIS ANI) CONTROL: Manipulator kinematics, position representation forward transformation, homogeneous transformation, manipulator path control, robot dynamics, configuration of robot controller</td><td>8</td></tr>
<tr><td>III</td><td>END EFFECTORS: Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design. SENSORS: Desirable features, tactile, proximity and range sensors, uses sensors in robotics.
MACHINE VISION: Functions, Sensing and Digitizing-imaging, Devices, Lighting techniques, Analog to digital single conversion, image storage, Image processing and Analysis-image data reduction, Segmentation feature extraction. Object recognition, training the vision system, Robotics application.</td><td>8</td></tr>
<tr><td>IV</td><td>ROBOT PROGRAMMING: Lead through programming, Robot programming as a path in space, Motion interpolation, WAIT, SINONAL AND DELAY commands, Branching capabilities and Limitations. ROBOT LANGUAGES: Textual robot Janguages, Generation, Robot language structures, Elements in function.</td><td>8</td></tr>
</table>

V	**ROBOT CELL** DESGIN AND CONTROL: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Inter locks, Error detect ion, Work eel 1 controller. **ROBOT** APPLICATION: Material transfer, Machine loading/unloading. Processing operation, Assembly and Inspection, Feature Application.	8

Text Books:

1. Industrial robotics, Mikell P.Groover/McGraw Hill.Robotics, K.S.Fu / McGraw Hill.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Describe the characteristics of a robotic system from its dynamic model.	**K3**
CO2: Analyze the stability of robotic systems with the help of theorems.	**K4**
CO3: Illustrate the various task space control schemes available.	**K5**
CO4: Discuss about the various Non Linear Control schemes.	**K2**

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-II

Programme: PG **Class: M. Tech. (Production)**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject: Computer Aided Manufacturing**
Course Code: MTPE-124C	**Title : Computer Aided Manufacturing**

Course Objectives:
To Introduce the students to the standard terminologies, conventions, processes, operations, design and operational characteristics of key hardware components, programming techniques, applications, merits and demerits of Computer Numerical Controlled (CNC) machines.

Nature of Paper: Elective-II

Minimum Passing Marks/Credits:40% Marks /04

L: 3
T: 0
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Unit	Contents	No. of Lectures Allotted
I	Compute-Aided Programming: General information, APT programming, Examples Apt programming probkms (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors .Introduction to CAD/CAM software, Automatic Tool Path generation.	8
II	Tooling for CNC Machines: Interchangeable tooling system, preset and qualified toois, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers. DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages arid disadvantages of DNC, adaptive control with optimization, Adaptive control with constrains, Adaptive control of machining processes like turning, grinding.	8
III	Post Processors for CNC: Introduction to Post Processors: The necessity of a Post Processor, the general structure of a Post Processor, the functions of a Post Processor, DAPP — based- Post Processor: Communication channels and major variables in the DAPP — based Post Processor, th creation of a DAPP — Based Post Processor.	8
IV	Micro Controllers: Introduction, Hardware components, I/O pins, ports, external memory:, counters, timers and serial data I/O interrupts. Selection of Micro Controllers Embedded Controllers, Applications and Programming of Micro Controllers. Programming Logic Controllers (PLC' s): Introduction, Hardware components of PLC, System, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC's in CNC Machines.	8

V	Computer Aided Process Planning, Hybrid CAAP System, Computer Aided Inspection and quality control, Coordinate Measuring Machine, Limitations of CMM, Computer Aided Testing, Optical Inspection Methods, Artificial Intelligence and expert system: Artificial Neural Networks, Artificial Intelligence in CAD, Experts systems and its structures.	8

Text Books:

1. Computer Control of Manufacturing Systems / Yoram Koren / Mc Graw Hill. 1983. 2. Computer Aided Design Manufacturing – K. Lalit Narayan, K. Mallikarjuna Rao and M.M.M. Sarcar, PHI, 2008.

Reference Books:

1. Systems approach to Computer Integrated Design and Manufacturing – Nana Singh, John Wiley, 1996.
2. Computer Aided Manufacturing – Tien Chien Chang, Richrad A. Wysk and Hsu-Pin Wang, Pearson Third Editon, 2012.
3. Computer Numerical Control, Operations and Programming – Jon Stenerson, Kelly Cuman, PHI.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Apply the concepts of machining for the purpose of selection of appropriate machining centers, machining parameters, select appropriate cutting tools for CNC milling and turning equipment, set-up, program, and operate CNC milling and turning equipment.	**K3**
CO2: Create and validate NC part program data using manual data input (MDI) and automatically using standard commercial CAM package for manufacturing of required component using CNC milling or turning applications.	**K6**
CO3: Produce an industrial component by interpreting 3D part model/ part drawings using Computer Aided Manufacturing technology through programming, setup, and ensuring safe operation of Computer Numerical Control (CNC) machine tools	**K5**
CO4: Understand the CAM software and its programming	**K2**
CO5: Use the CAM software and prepare CNC part programs.	**K2**
CO6: Execute the part program and machine the component as per the production drawing.	**K2**

IIMTU-NEP IMPLEMENTATION
Year-I/ Semester-II

Programme: PG **Class: M. Tech. (Production)**	Year: I Semester: II
Credits Theory: 0 Practical: 2	**Subject: Production Engineering Lab**
Course Code: MTPE-126P	**Title : Production Engineering Lab**

Course Objectives:
1. To develop an understanding of how the operations, have strategic importance and can provide a competitive advantage in the workplace.
2. To understand the relationship between operations and other business functions.
3. To understand techniques of location and facility planning; line balancing; job designing; and capacity plan in operations management

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks/02

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Practical	Contents	No. of Lectures Allotted
I	Study of the morphology of chips produced from different materials sand machining processes.	3
II	Experiments on TIG and MIG welding to find out the mechanical properties of metals.	3
III	Study of cutting ratio/chip thickness ratio in simulated orthogonal cutting with different materials and tool geometry.	3
IV	Evaluations of tool face temperature with thermocouple method.	3
V	Roughness of machined surface. Influence of tool geometry and feed rate.	3
VI	Study of the construction and operating parameters of metal spinning Lathe.	3
VII	Study of the water hammer equipment and hydrostatic extrusion setup.	3
VIII	Extrusion of cylindrical billets through dies of different included angles and exit diameters.	3
IX	Effect of tool geometry on chip flow direction in simulated orthogonal cutting conditions.	3
X	Practice and study of blanking and punching process and their characteristic features on mechanical press with existing dies.	3

REFERANCE BOOKS:

1. Production Systems Management - James I. Riggs.
2. Production and Operations Management - Chary.

3. Operations Management - Chase 4. Production and Operation Management - Panner Selvam 5. Production and Operation Analysis - Nahima	
If the course is available as Generic Elective then the students of following departments may opt it. NA	
Evaluation/Assessment Methodology	
	Max. Marks
1. Practical file record 2. Quiz 3. Viva 4. End Semester Practical Examination	10 5 5 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: Upon successful completion of this course, the students will be able to: 1. The student will be having the capability of selecting suitable manufacturing processes to manufacture the products optimally. 2. The student will be able to develop simplified manufacturing processes with the aim of reduction of cost and manpower. 3. The student will be able to identify/control the appropriate process parameters, and possible defects of manufacturing processes so as to remove them.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II/ Semester-III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech. (Production)</td><td colspan="2">Year: II
Semester: III</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td colspan="2">Subject: Simulation, Modeling & Analysis</td></tr>
<tr><td colspan="2">Course Code: MTPE-231A</td><td colspan="2">Title : Simulation, Modeling & Analysis</td></tr>
<tr><td colspan="4">Course Objectives:
1. Define the basics of simulation modeling and replicating the practical situations in organizations
2. Generate random numbers and random variates using different techniques.
3. Develop simulation model using heuristic methods.
4. Analysis of Simulation models using input analyzer, and output analyzer
5. Explain Verification and Validation of simulation model.</td></tr>
<tr><td colspan="4">Nature of Paper: Elective-III</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits:40% Marks / 04</td></tr>
<tr><td colspan="4">L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Introduction: Simulation a tool, advantages and disadvantages of simulation, areas of application, systems and system environment, components of a system, discrete and continuous systems, discrete event system simulation.
General Principles: Concepts in discrete event simulation, time advance algorithm, manual simulation using event scheduling, basis properties and operations.</td><td>8</td></tr>
<tr><td>II</td><td colspan="2">Models In Simulation: Terminology and concepts, statistical models: queuing systems; inventory systems; reliability and maintainability, limited data, discrete distributions: Bernoulli distribution; Bionomial distribution; Geometric distribution, continuous distribution: Uniform distribution; Exponential distribution; Gamma distribution; Normal distribution; Weibull distribution; Triangular Distribution; Lognormal distribution, poisson process,</td><td>8</td></tr>
<tr><td>III</td><td colspan="2">Queueing Models: Characteristics of queuing systems, the calling population, system capacity, arrival process, service mechanism, queuing notations, long run measures of performance of queuing systems, server utilization in G/G/1/∞/∞ queues, server utilization in G/G/C/∞/∞ queues, server utilization and system performance, costs in queuing problems, Larkovian models.</td><td>8</td></tr>
<tr><td>IV</td><td colspan="2">Random Number Generation: Properties of random numbers, Pseudo random numbers, techniques of generating random numbers, tests of random numbers.</td><td>8</td></tr>
</table>

	Random Variate Generation: Inverse transform technique, Direct transformation for the Normal and Lognormal distribution, Convolution Method, Acceptance rejection technique.	
V	**Input Modelling And Validation:** Steps in the development of model, data collection, Distribution identification, Parameter estimation, Goodness of Fit Tests,selecting input models without data, verification and validation of simulation models.	8

Text Books:

1. Simulation Modelling and Analysis by Law and Kelton, Mc Graw Hill.
2. Simulation Model Design& execution by Fishwich, Prentice Hall.
3. Discrete event system simulation by Banks, Carson, Nelson and Nicol.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Describe the role of important elements of discrete event simulation and modeling paradigm.	**K3**
CO2: Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.	**K6**
CO3: Develop skills to apply simulation software to construct and execute goal-driven system models.	**K5**
CO4: Interpret the model and apply the results to resolve critical issues in a real world environment.	**K2**
CO5: Develop skills to apply simulation software to construct and execute goal-driven system models.	**K4**
CO6: Interpret the model and apply the results to resolve critical issues in a real world environment.	**K2**

Format-3

IIMTU-NEP IMPLEMENTATION
Year – II /Semester-III

Programme: PG **Class: M. Tech. (Production)**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject:** Quality Engineering In Manufacturing
Course Code: MTPE -231B	**Title: :** Quality Engineering In Manufacturing

Course Objectives:

1. Demonstrate the approaches and techniques to assess and improve process and/or product quality and reliability.
2. Introduce the principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring.

Nature of Paper: Elective-III

Minimum Passing Marks/Credits: 40% Marks/ 4

L: 3
T: 0
P: 0
Theory - 4
Practical- 0 1Hrs.=1Credit (3Hrs./Week=2Credits)

Unit	Contents	No. of Lectures Allotted
I	**Quality Value and Engineering:** An overall quality system, quality engineering in production design, quality engineering in design of production processes. Loss Function and Quality Level: Derivation and use of quadratile loss function, economic consequences of tightening tolerances as a means to improve quality, evaluations and types tolerances.(N-type,S-type and L-type)	**8**
II	Tolerance Design and Tolerancing: Functional limits, tolerance design for N-type. L-type and S-type characteristics, tolerance allocation fbr multiple components. Parameter and Tolerance Design: Introduction to parameter design, signal to noise ratios, Parameter design strategy, some of the case studies on parameter and tolerance designs.	**8**
III	Analysis of Variance (ANOVA): NO-way ANOVA, One-way ANOVA, Two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.	**8**
IV	Orthogonal Arrays: Typical test strategies, better test strategies, efficient test strategies, steps in designing, conducting and analyzing an experiment. Interpolation of Experimental Results: Interpretation methods, percent contributor, estimating the mean.	**8**
V	ISO-9000 Quality System, BDRE, 6.-sigma, Bench making, Quality circles Brain Storming — Fishbone diagram — problem analysis.	**8**

Reference / Text Books:
Text Books:
1. Taguchi Techniques for Quality Engineering / Phillip J. Ross / McGraw Hill, Intl. II Edition, 1995.

Reference Books:
2. Quality Engineering in Production systems I G. Taguchi, A. Elsayed et al / Mc.Graw Hill Intl. Edition, 1989.
3. Taguchi Methods explained: Practical steps to Robust Design / Papan P. Bagchi I Prentice Hall md. Pvt. Ltd., New Delhi.
4. Design of Experiments using the Taguchi Approach/Ranjit K. Roy, John wiley & sons. Inc. 2001.

If the course is available as Generic Elective then the students of following departments may opt it.
NO

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
Upon completion of this course the student will be able to:
1. Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability.
2. Use control charts to analyze for improving the process quality.
3. Acquire basic knowledge of total quality management

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II/ Semester-III

Programme: PG **Class: M. Tech. (Production)**	Year: II Semester: III
Credits: Theory: **4** Practical:	**Subject: Rapid Prototyping Technologies**
Course Code: MTPE-232A	**Title : Rapid Prototyping Technologies**
Course Objectives: To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields	
Nature of Paper: Elective-IV	
Minimum Passing Marks/Credits:40% Marks /04	
L: 3 T: 1 P: (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)	

Unit	Contents	No. of Lectures Allotted
I	Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages and Limitations of Rapid Prototyping, Commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes, Process Chain.	8
II	Liquid-based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopo l ymers, photo po l ymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.	8
III	Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs. RT, Need for RT. Rapid Tooling Classification: Indirect Rapid Tooling Methods: Spray Metal Deposition, RTV Epoxy Tools, Ceramic tools, Investment Casting, Spin Casting, Die casting, Sand Casting, 3D Keltool process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.	8

IV	Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Rapid Prototyping Software's: Features of various RP software's like Magic's, Mimics, Solid View, View Expert, 3 D View, Velocity 2 , Rhino, STL View 3 Data Expert and 3 D doctor.	8
V	RP Applications: Application – Material Relationship, Application in Design , Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules.	8

TEXT BOOKS:

1. Rapid prototyping: Principles and Applications - Chua C.K., Leong K.F. and LIM C.S, World Scientific publications , Third Edition, 2010.

REFERANCE BOOKS:

1. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer , 2001
2. Whalers Report 2000 – Terry Wohlers, Wohlers Associates, 2000 Rapid Prototyping &Manufacturing – Paul F.Jacobs, ASME Press, 1996.

If the course is available as Generic Elective then the students of following departments may opt it.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Generating a good understanding of RP history, its development and applications. Expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.	**K3**
CO2: Students will be exposed to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.	**K6**
CO3: Students gain knowledge to develop prototypes	**K5**
CO4: Students learn the concepts of rapid tool processing	**K2**
CO5: Explain direct metal laser sintering, LOM and fusion deposition modeling processes	**K2**
CO6: Demonstrate solid ground curing principle and process	**K3**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II/ Semester-III

Programme: PG **Class: M. Tech. (Production)**	Year: II Semester: III
Credits: Theory: **4** Practical:	**Subject:** Design And Manufacturing of MEMS and Micro Systems
Course Code: MTPE-232B	**Title :** Design And Manufacturing of MEMS and Micro Systems

Course Objectives:

1. To introduce students to the basics MEMS and Microsystems
2. To help the students to design MEMS based structures
3. To make students understand the various methods of fabrication

Nature of Paper: Elective-IV

Minimum Passing Marks/Credits:40% Marks /04

L: 3
T: 1
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (3Hrs./Week=3Credits)

Unit	Contents	No. of Lectures Allotted
I	**Overview and working principles of MEMS and Microsystems:** MEMS & Microsystems, Evolution of Micro fabrication, Microsystems & Microelectronics, Microsystems & miniaturization, Applications of MEMs in Industries, Micro sensors, Micro actuation, MEMS with Micro actuators Micro accelerometers, Micro fluidics	8
II	**Engineering Science for Microsystems Design and Fabrication:** Atomic structure of Matter, Ions and Ionization, Molecular Theory of Matter and Intermolecular Forces, Doping of Semiconductors, The Diffusion Process, Plasma Physics, Electrochemistry, Quantum Physics.	8
III	**Engineering Mechanics for Microsystems Design:** Static Bending of Thin plates, Mechanical Vibration, Thermo mechanics , Fracture Mechanics, Thin-Film Mechanics, Overview of Finite Element Stress Analysis	8
IV	**Thermo Fluid Engineering & Microsystems Design:** Overview of Basics of Fluid Mechanics in Macro and Mesoscales, Basic equations in Continum Fluid Dynamics, Laminar Fluid Flow in Circular Conduits, Computational Fluid Dynamics, Incompressible Fluid Flow in Micro conduits, Fluid flow in Sub micrometer and Nano scale, Overview of Heat conduction in Solids, Heat Conduction in Multilayered Thin films and in solids in sub micrometer scale, Design Considerations, Process Design Mechanical Design, Mechanical design using FEM, Design of a Silicon Die for a Micro pressure sensor.	8
V	**Materials for MEMS & Microsystems and their fabrication:** Substrates and Wafers, Active substrate materials, Silicon as a substrate material, Silicon compounds, Silicon Piezoresistors, Gallium Arsenide, Quartz, Piezoelectric Crystals and Polymers, Photolithography, Ion implantation, Diffusion and	8

	oxidation, Chemical and Physical vapor deposition, etching, Bulk micro manufacturing, Surface Micromachining, The LIGA Process.	

TEXT BOOKS:

1. Tia-Ran Hsu, MEMS & Microsystems. Design & Manufacturing, TMH 2002
2. Foundation of MEMS/ Chang Liu/Pearson, 2012

REFERANCE BOOKS:

1. Maluf, M., “An Introduction to Microelectromechanical Systems Engineering”. Artech House, Boston 2000
2. Trimmer , W.S.N., “Micro robots and Micromechnaical Systems”, Sensors & Actuators, Vol 19, 1989
3. Trim., D.W., “Applied Partial Differential Equations”., PWS-Kent Publishing, Boston, 1990

If the course is available as Generic Elective then the students of following departments may opt it.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:	**Level**
CO1: Students will be able to understand the basics of MEMS and analyze a MEMS based structure.	**K2**
CO2: Students will be able to understand the construction, working and applications of different MEMS structures	**K3**

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II/Semester-III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech. (Production)</td><td colspan="2">Year: II
Semester: III</td></tr>
<tr><td colspan="2">Credits
Theory: 0
Practical: 4</td><td colspan="2">Subject: SEMINAR</td></tr>
<tr><td colspan="2">Course Code: MTPE-233</td><td colspan="2">Title : SEMINAR</td></tr>
<tr><td colspan="4">Course Objectives: To share information, research findings or expertise on a particular topic or subject matter with a targeted audience.</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 50% Marks /4</td></tr>
<tr><td colspan="4">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 0
Practical- 1 Hrs.=1 Credit (3Hrs./Week=3 Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td></td><td colspan="2">Seminar should be presented on a very recent topic on any technological domain. It should consist of following components: Topic name, introduction, literature reviews, methodology, discussion and conclusion.</td><td>60</td></tr>
<tr><td colspan="4">If the course is available as Generic Elective then the students of following departments may opt it.
NA</td></tr>
<tr><td colspan="4">Evaluation/Assessment Methodology</td></tr>
<tr><td colspan="4">Max. Marks</td></tr>
<tr><td colspan="3">1) Internal</td><td>200</td></tr>
<tr><td colspan="3">Total:</td><td>200</td></tr>
<tr><td colspan="4">Prerequisites for the course:</td></tr>
<tr><td colspan="4">Course Learning Outcomes:
1. Able to share research findings, insights, and knowledge with faculty, and the academic community.
2. Able to demonstrating the seminar topic and showing the proficiency in the chosen area of study.
3. Improve the ability to effectively express the complex technical information to a diverse audience.</td></tr>
</table>

IIMT UNIVERSITY — MEERUT (U.P.) — Transforming Education System, Transforming Lives
UGC Approved Section 2f & 12B

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech. (Production)</td><td colspan="2">Year: II
Semester: III</td></tr>
<tr><td colspan="2">Credits
Theory: 0
Practical: 6</td><td colspan="2">Subject: Dissertation (Phase-I)</td></tr>
<tr><td colspan="2">Course Code: MTPE-234</td><td colspan="2">Title : Dissertation (Phase-I)</td></tr>
<tr><td colspan="4">Course Objectives:</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 50% Marks / 6</td></tr>
<tr><td colspan="4">L: 0
T: 0
P: 24 (In Hours/Week)
Theory - 0
Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td colspan="2">No. of Lectures Allotted</td></tr>
<tr><td></td><td>1. Selection of the topic: This is the initial step in the research process. It involves identifying a subject or area of interest to investigate.
2. Literature reviews: This involves examining existing research, studies, and scholarly works related to your topic.
3. Finding the research gaps: These gaps represent opportunities for your research. Formulate clear and specific research objectives or research questions based on these gaps.</td><td colspan="2">50</td></tr>
<tr><td colspan="4">If the course is available as Generic Elective then the students of following departments may opt it.NA</td></tr>
<tr><td colspan="4">Evaluation/Assessment Methodology</td></tr>
<tr><td colspan="3"></td><td>Max. Marks</td></tr>
<tr><td colspan="3">1) Internal
2) External</td><td>80
120</td></tr>
<tr><td colspan="3">Total:</td><td>200</td></tr>
<tr><td colspan="4">Prerequisites for the course:</td></tr>
<tr><td colspan="4">Course Learning Outcomes:
1. Able to well-defined research topic that aligns with the academic or professional interests and is suitable for investigation. This is the foundation upon which your research will be built.
2. Able to identify key theories, concepts, and methodologies relevant to the selected research.
3. Able to formulate the objectives to complete the research.</td></tr>
</table>

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: PG **Class: M. Tech. (Production)**	Year: II Semester: IV
Credits Theory: 0 Practical: 8	**Subject: Dissertation (Phase-II)**
Course Code: MTPE-241	**Title : Dissertation (Phase-II)**
Course Objectives: Completinon of the results, discussion and conclusion of the final project report.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks / 8	
L: 0 T: 0 P: 16 (In Hours/Week) Theory - 0 Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)	

Unit	Contents	No. of Lectures Allotted
	1. Complation of the project 2. Submission of the dissertation report	80

If the course is available as Generic Elective then the students of following departments may opt it.NA

Evaluation/Assessment Methodology

	Max. Marks
1) Internal 2) External	80 120
Total:	200

Prerequisites for the course:

Course Learning Outcomes:

1. Project report serve as a well documented of the project which offering a reference for the future researchers.

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: PG **Class: M. Tech. (Production)**	Year: II Semester: IV	
Credits Theory: 0 Practical: 4	**Subject: Comprehensive Viva**	
Course Code: MTPE -242	**Title : Comprehensive Viva**	
Course Objectives: Evaluation of the project report to ensure that the studends have well understanding of their research field.		
Nature of Paper: Core		
Minimum Passing Marks/Credits: 50% Marks /4		
L: 0 T: 0 P: 8 (In Hours/Week) Theory - 0 Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)		
Unit	**Contents**	**No. of Lectures Allotted**
	1. Presentation and submission of the well completed research report.	40
If the course is available as Generic Elective then the students of following departments may opt it.NA		
Evaluation/Assessment Methodology		
		Max. Marks
1) Internal 2) External		40 60
	Total:	100
Prerequisites for the course:		
Course Learning Outcomes: 1. Able to demonstrate satisfactory level of knowledge, understanding, and the ability to effectively communicate their ideas and findings. 2. A successful viva is typically a prerequisite for the awarding of an M.Tech. degree.		

School of Engineering & Technology

ACADEMIC HANDBOOK

Master of Technology (M.Tech)
Power Electronics & Drive

Evaluation Scheme

Master of Technology (M.Tech) Power Electronics & Drive

FIRST YEAR, SEMESTER-I

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1.	SETEE-111	Operational Research	3	1	0	30	20	0	100	0	150	4
2.	SEPED-112	Electric Drives	3	1	0	30	20	0	100	0	150	4
3.	SEPED-113	Power Converter-I	3	1	0	30	20	0	100	0	150	4
4.	SEPED-114 - SEPED-116	Departmental Elective-I	3	1	0	30	20	0	100	0	150	4
5.	SEPED-112P	Electric Drives Lab	0	0	2	0	0	20	0	30	50	2
Grand Total			**12**	**03**	**02**	**120**	**80**	**20**	**400**	**30**	**650**	**18**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical

Applied Science Courses(Core)	Operational Research
Engineering Courses (Core)	Electric Drives, Power Converter-I, Electric Drives Lab
Discipline Specific Electives I	1. SEPED-114 –Advanced Control Systems 2. SEPED-115 –Digital Signal Processing 3. SEPED-116- Neural Networks & Fuzzy logic

FIRST YEAR, SEMESTER-II

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1.	SEPED-121	Power Semiconductor Controlled Electric Drive	3	1	0	30	20	0	100	0	150	4
2.	SEPED-122	Power Converter-II	3	1	0	30	20	0	100	0	150	4
3.	SEPED-123	Power Semiconductor Devices	3	1	0	30	20	0	100	0	150	4
4.	SEPED-124 - SEPED-126	Departmental Elective-II	3	1	0	30	20	0	100	0	150	4
5.	SEPED-122P	Power Converter Lab	0	0	2	0	0	20	0	30	50	2
6.	NECC-125	MOOCS/ Swayam	0	0	4	0	0	50	0	0	50	2
Grand Total			**12**	**04**	**06**	**120**	**80**	**70**	**400**	**30**	**700**	**20**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC-Non-credit Course

Engineering Courses (Core)	Power Semiconductor Controlled Electric Drive, Power Converter-II, Power Semiconductor Devices, Power Converter Lab
Skill Enhancement Courses-SEC	NECC-125- MOOCS/ Swayam
Discipline Specific Electives II	1. SEPED-124 –Power Converter Applications 2. SEPED-125 –Non-Conventional Energy Sources & Energy Converters 3. SEPED-126- Digital Control Systems

SECOND YEAR, SEMESTER-III

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1.	SEPED-231 - SEPED-233	Departmental Elective-III	3	1	0	30	20	0	100	0	150	4
2.	SEPED-234 - SEPED-236	Departmental Elective-IV	3	1	0	30	20	0	100	0	150	4
3.	SEPED-237	Seminar	0	0	4	0	0	20	0	30	50	2
4.	SETEE-238	Synopsis/ Dissertation Proposal	0	0	8	0	0	50	0	100	150	4
5.	NECC-235	MOOCS/ Swayam	0	0	4	0	0	50	0	0	50	2
Grand Total			**06**	**02**	**16**	**60**	**40**	**120**	**200**	**130**	**550**	**16**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC-Non-credit Course

Skill Enhancement Courses-SEC	NECC-235- MOOCS/ Swayam
Discipline Specific Electives III	1. SEPED-231 - Facts 2. SEPED-232 –HVDC Transmission Systems 3. SEPED-233- Electric & Hybrid Vehicles
Discipline Specific Electives IV	1. SEPED-234 –Mechatronic Systems 2. SEPED-235 –Power Quality 3. SEPED-236- Optimization Techniques
Research Project	Synopsis/ Dissertation Proposal

STUDY & EVALUATION SCHEME
SECOND YEAR, SEMESTER-II

S. No	Subject Code	Subject Name	Evaluation Scheme									
			Periods			Internal Marks			External Marks		Total Marks	Credits
			L	T	P	CT	TA	IP	ET	EP		
1.	SEPED-241	Comprehensive Viva	0	0	8	0	0	80	0	120	200	4
2.	SEPED-242	Dissertation (Final)	0	0	16	0	0	150	0	250	400	8
Grand Total			**0**	**0**	**24**	**0**	**0**	**230**	**0**	**370**	**600**	**12**

L- Lecture, T- tutorials, P- Practical (Labs), CT- Class Test (Sessionals), TA- Teacher's Assessment (Assignments, Tutorials), IP- Internal Practical, ET- External Theory, EP- external Practical, NC-Non-credit Course

Research Project	Comprehensive Viva, Dissertation (Final)

Format-1

Format-1

CBCS: Statement of Credit distribution	
College/School: School of Engineering & Technology Programme: M.Tech Duration: 4 Semester Annual/Semester: Semester	Credit range: 72-80 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr) or	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	18	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)			DSE-I(4)		
II	20	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)		SEC-1(2)	DSE-II(4)		
Provision to change the core papers							
III	20			SEC-1(2)	DSE-III(4) DSE-IV(4)		Seminar-1 (04) Dissertation Phase-I(06)
IV	12						Comprehensive Viva(04) Dissertation Phase-II(08)
Total Credits	**70**	06(Th)*4(Cr) = 24 02 (Pr)*2(Cr) = 04 **Total = 28**		2*2= 04 **= 04**	4(Th)*4(Cr)= 16 **= 16**		04+06 = 10 04+08 = 12 **=22**

Format-2

Format-2

IIMTU-NEP Implementation: (M.Tech Power Electronics & Drive)

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES M.Tech TE	**FIRST YEAR**	**SEMESTER -I**	i) C1 (Th.4 Cr.)	4	4	40	**Operational Research**	5		
			ii) C2(Th.4 Cr.).	4	4	40	**Power Converter-I**	5		
			iii)C3 (Th.4 Cr.+P 1Cr)	4 2	4 3	50 24	**Electric Drives** **Electric Drives Lab**	5		
			iv) DSE-1 (Th.4 Cr.)	4	4	45	**Advanced Control Systems** **Digital Signal Processing** **Neural Networks & Fuzzy logic**	5		
		SEMESTER - II	i) C4 (Th.4 Cr.)	4	4	40	**Power Semiconductor Controlled Electric Drive**	5		
			ii) C5(Th.4 Cr.).	4	4	40	**Power Semiconductor Devices**	5		
			iii)C6 (Th.4 Cr.+P 1Cr)	4 2	4 3	50 24	**Power Converter-II** **Power Converter Lab**	5		

			iv) DSE-2 (Th.4 Cr.) v) SEC-1	4 2	4 -	45 -	**Power Converter Applications** **Non-Conventional Energy Sources & Energy Converters** **Digital Control Systems** **MOOCS/ Swayam**	5		

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

Programme Outcome:

PO_1 [ANNEXTURE-1]
PO2 [ANNEXTURE-1]
PO3 [ANNEXTURE-1]

Programme Specific Outcome:

PSO1 [ANNEXTURE-2]
PSO2 [ANNEXTURE-2]
PSO3 [ANNEXTURE-2]

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES M.Tech PED	**SECOND YEAR**	**SEMESTER -III**	i) DSE-3	4	4	40	**Facts** **HVDC Transmission Systems** **Electric & Hybrid Vehicles**	5		
			ii) DSE-4	4	4	45	**Mechatronic Systems** **Power Quality** **Optimization Techniques**	5		
			iii) SEC-2	4	8	50	**Dissertation(Phase-I)/SYNOPSIS**			
			iv) SEC-3	2	4	60	**Seminar**			
			vii) SEC-4	2	4		**MOOCS/Swayam**			
		SEMESTER -IV	i) SEC-5	8	16	80	**Dissertation(Phase-II)**			
			ii) SEC-6	4	8	40	**Comprehensive Viva**			

<table>
<tr><td colspan="2">* Industrial Training of 4 Weeks/5Weeks to be completed between the semester break</td></tr>
<tr><td>Programme Outcome:
PO$_1$ [ANNEXTURE-1]
PO2 [ANNEXTURE-1]
PO3 [ANNEXTURE-1]</td><td>Programme Specific Outcome:
PSO1 [ANNEXTURE-2]
PSO2 [ANNEXTURE-2]
PSO3 [ANNEXTURE-2]</td></tr>
<tr><td>ANNEXTURE-1
<u>Program Outcomes:</u>
PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and
Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities</td><td>ANNEXTURE-2
<u>Program Specific Outcomes:</u>
PSO1: Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronics circuits, control systems, electrical machines and Power system.
PSO2: Apply the appropriate techniques and modern engineering hardware and software tools in electrical engineering to engage in life-long learning and to successfully adapt in multi-disciplinary environments.
PSO3: Aware of the impact of professional engineering solutions in societal, environmental context, professional ethics and be able to communicate effectively.</td></tr>
</table>

with an understanding of the limitations. **PO6: The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. **PO7: Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. **PO8: Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. **PO9: Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. **PO10: Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. **PO11: Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. **PO12: Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: I

<table>
<tr><td colspan="2">Programme: PG
Class: M-Tech: Power Electronics & Drive</td><td colspan="2">Year: 1
Semester: I</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td colspan="2">Subject: Operations Research</td></tr>
<tr><td colspan="2">Course Code:</td><td colspan="2">SETEE-111</td></tr>
<tr><td colspan="4">Course Objectives: The objectives of studying this course are,
1. The course introduces to solve the problems using special solution algorithms and using CPM, LINGO, GAMS and PERT techniques.</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="4">L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><th>Unit</th><th colspan="2">Contents</th><th>No. of Lectures Allotted</th></tr>
<tr><td>I</td><td colspan="2">Introduction to Operations Research (OR):
Introduction to Foundation mathematics and statistics, Linear Programming (LP), LP and allocation of resources, LP definition, Linearity requirement, Maximization Then Minimization problems. Graphical LP Minimization solution.</td><td>08</td></tr>
<tr><td>II</td><td colspan="2">Introduction, Simplex method definition, formulating the Simplex model. Linear Programming – Simplex Method for Maximizing. Simplex maximizing example for similar limitations, Mixed limitations Example containing mixed constraints, Minimization example for similar limitations.</td><td>08</td></tr>
<tr><td>III</td><td colspan="2">Sensitivity Analysis: Changes in Objective Function, Changes in RHS, The Transportation Model, Basic Assumptions, Solution Methods: Feasible Solution: The Northwest Method, The Lowest Cost Method; Optimal Solution:</td><td>08</td></tr>
<tr><td>IV</td><td colspan="2">The Stepping Stone Method, Modified; Distribution (MODI) Method. The Assignment Model:- Basic Assumptions, Solution Methods:-Different Combinations Method, Short-Cut Method (Hungarian Method)</td><td>08</td></tr>
<tr><td>V</td><td colspan="2">MSPT:- The Dijkestra algorithm, and Floyd's Algorithm {Shortest Route Algorithm}</td><td>08</td></tr>
<tr><td colspan="4">If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Analyze any real life system with limited constraints and depict it in a model form.
CO2	Convert the problem into a mathematical model.
CO3	Solve the mathematical model manually as well as using soft resources
CO4	Understand variety of problems such as assignment, transportation, travelling salesman etc.
CO5	Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained
CO6	Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: I

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: I
Credits Theory: 4 Practical: 0	**Subject: Electric Drives**
Course Code: **SEPED-112**	
Course Objectives: The objectives of studying this course are, 1. This course will help students to learn about a variable speed drive will require increased investment cost, this will in most cases very quickly be balanced by large energy savings compared to fixed speed drives.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: : 40% Marks //4	
L: 3 T: 1 P: 0 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Basic drive components, classification and operating modes of electric drive, nature and types of mechanical loads, review of speed-torque characteristics of electric motor and load, joint speed torque characteristics	08
II	**Energy conservation in Electric Drive:** Losses in electric drive system and their minimization energy, efficient operation of drives. Load equalization. Electric Braking Plugging, dynamic and regenerative braking of dc and ac motors	08
III	**Dynamics of Electric Drive System:** Equation of motion, equivalent system of motor-load combination, stability considerations, electro-mechanical transients during starting and braking, calculation of time and energy losses, optimum frequency of starting.	08
IV	**Traction Drive:** Electric traction services, duty cycle of traction drive, calculation of drive rating and energy consumption, desirable characteristic of traction drive and suitability of electric motors, control of traction drive. **Estimation of Motor Power Rating:** Heating and cooling of electric motors, load diagrams, classes of duty, reference to Indian standards, estimation of rating of electric motors for continuous, short time and intermittent rating.	08
V	**Special Electric Drive:** Servo motor drive, step motor drive, linear induction motor drive,	08

<table>
<tr><td></td><td>permanent magnet motor drive.
Selection of electric drive:
Selection criteria of electric drive for industrial application, case studies related to steel mills, paper mills, textile
mills and machine tool etc.</td><td></td></tr>
<tr><td colspan="3">If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable</td></tr>
</table>

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1 Investigate dynamics of electrical drives, their nature and classification, applying concepts of steady-state stability and deriving condition for steady state operating point.

CO2 Examine various applications in industrial and domestic areas where use of electric drives are essential

CO3 Classify types of electric drives systems based on nature of loads, control objectives, performance and reliability.

CO4 Combine concepts of previously learnt courses such as, electrical machines, Control and power electronics to cater to the need of automations in industries.

CO5 Identify the critical areas in application levels, and derive typical solutions.

CO6 Design and justify new control and power conversion schemes for implementing alternative solutions considering the critical and contemporary issues

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: I

Programme: PG **Class: M-Tech: Power Electronics & Drive**	**Year: 1** **Semester: I**
Credits Theory: 4 Practical: 0	**Subject: Power Converter-I**
Course Code:	**SEPED-113**
Course Objectives: The objectives of studying this course are, 1. This course will help students to learn about a variable speed drive will require increased investment cost, this will in most cases very quickly be balanced by large energy savings compared to fixed speed drives.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 40% Marks /4	
L: 3 T: 1 P: 0 (in Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Power Semiconductor Devices:** Structure, Characteristics, ratings and protection of SCR, triac and Gate Turn Off thyristor.	10
II	**AC Voltage Controllers:** Single phase ac voltage controller feeding resistive and resistive-inductive loads sequence control, three phase ac voltage controllers.	10
III	**Cyclo-Converter:** Single phase and three phase Cyclo-converters, circulation and non-circulating current operations, performance characteristics, control of harmonics, voltage and frequency control, control circuit	10
IV	**Line Commutated Converters:** Single and three phase Fully controlled and half controlled converters, performance characteristics, effect of source inductance, discontinuous current operation, inverter operation, power factor improvement techniques, sequence control, 12-pulse converters, dual converter, triggering circuit.	10

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Select an appropriate power semiconductor device and design a power converter for the required application
CO2	Determine the power circuit configuration needed to fulfill the required power conversion with applicable constraints
CO3	Design the control circuit and the power circuit for a given power converter
CO4	Compare , model and simulate the performance of various line commutated converters
CO5	Explain the application of cycloconverter and dual converters
CO6	Analyze, model and simulate advanced converters such as multi level inverters, choppers etc.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: I

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: I
Credits Theory: 4 Practical: 0	**Subject: Advanced Control Systems**
Course Code:	**SEPED-114**

Course Objectives: The objectives of studying this course are,

1. This course will help students to learn about the state space analysis applied to control system using matrices and different methods of analyzing nonlinear as well as discrete control systems.

Nature of Paper: Departmental Elective-I

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**States Space Analysis:** Review of the state space representation of continuous linear time invariant system, conversion of state variable models to transfer functions and vise-versa, transformation of state variable, solution of state equations, state and output controllability and observability.	10
II	**Analysis of Nonlinear Systems:** Common physical non linearities, singular points, phase plane analysis, limit cycle, describing function method and stability analysis, jump resonance, linearization of nonlinear system. Lyapunov stability, methods for generating Lyapunov function, statement of lure problem, circle criterion, Popov criterion.	10
III	**Analysis of Discrete System:** Discrete time signals and systems, z-transformation, modeling of sample hold circuit, pulse transfer function, solution of difference equation by z-transform method , stability analysis in z-plane	10
IV	Basic concepts of optimal control, adaptive control and robust control system.	10

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Identify, Formulate and obtain transfer function models, solve discrete control engineering problems, use the techniques, tools and skills related to discrete signals to solve complex control engineering problems
CO2	Apply the concepts of state space, controllability and observability, pole placement technique, optimal & adaptive control and Liapunov stability
CO3	Analyze and obtain state space models, solution of state equation, state feedback controllers and observers, stability of linear nonlinear systems using phase plane and linear & nonlinear Liapunov method
CO4	Assess and design of state feedback controllers and observers, using pole placement for continuous and discrete systems.
CO5	Perform analysis for stability of linear time-invariant, continuous & discrete time control systems using both classical & state space methods
CO6	Design controllers to meet specifications and requirements using pole placement method

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: I

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: I
Credits Theory: 4 Practical: 0	**Subject: Digital Signal Processing**
Course Code:	**SEPED-115**

Course Objectives: The objectives of studying this course are,

1. This course will make students conversant with the designing of analog and digital FIR filters using various digital signal processing techniques.

Nature of Paper: Departmental Elective-I

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction: Motivation, advantages and applications of digital signal processing, review of A/D and D/A conversion, quantization noise.	08
II	Discrete Time Signals and Systems: Representation of discrete signals, linear time invariant system, FIR and HR system, stability and causality of the systems, systems described by difference equations, solution of difference equations Realization of Digital Systems: Block diagram and signal flow representations, matrix representation, direct, cascade, parallel, lattice and ladder realization of HR systems, direct, cascade and lattice realization of FIR systems.	08
III	Fast Fourier Transform: Introduction to discrete Fourier transform and fast Fourier transform, circular and linear convolutions, FFT algorithms, Radix-2, Radix-4 and split radix algorithms, applications of FFT algorithms.	08
IV	FIR Digital Filter Design: Properties of linear phase FIR filter, frequency sampling design techniques, window design techniques (Uniform window, Hamming window, kaisc window), optimal FIR filter design.	08
V	FIR Filter Design: Characteristics of proto type analog filter, comparison of HR and FIR filters, impulse invariant transformation and bilinear transformation, design of digital, Butterworth, Chebyshev and elliptic filters, introduction to digital signal	08

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Differentiate the types of systems and signals
CO2	Analyze the properties of DFT and compute the DFT using FFT algorithm
CO3	Design analog and digital filters and construct parallel and cascaded form of filters
CO4	Distinguish the various digital signal processors
CO5	Configure and use Digital Input / Output lines and ADCs
CO6	Configure and use Event Managers for PWM generation

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: I

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: I
Credits Theory: 4 Practical: 0	**Subject: Neural Networks And Fuzzy System**
Course Code:	**SEPED-116**

Course Objectives: The objectives of studying this course are,

1. This course will make students conversant with the designing and implement of neural and fuzzy programs for real-world scientific, engineering, and financial applications.

Nature of Paper: Departmental Elective-I

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**A. Neural Networks :** **Basics :** Simple neuron, nerve structure and synapse, concept of neural network multilayer nets, auto-associative and heteroassociative nets, neural network tools (NNTs), artificial neural network (ANN) and traditional computers. **Neural Dynamics :** Neurons as functions, neuronal dynamic systems, signal functions, activation models	10
II	**Synaptic Dynamics :** Learning in neural nets, Unsupervised and supervised learning, signal hebbian learning competitive learning, differential hebbian learning, differential competitive learning single layer perception models, the back propagation algorithm. **Applications :** Applications in load flow study, load forecasting detection of faults in distribution system and steady state stability, neural network simulator, applications in electric drive control.	10
III	**B. Fuzzy System :** **Basics :** Fuzzy sets and systems, basic concepts, fuzzy sets and crisp sets, fuzzy set theory and operations, fuzzy entropy theorem, fuzzy and crisp relations, fuzzy to crisp conversions.	10
IV	**Fuzzy Associative Memories :** Representation of fuzzy sets, membership functions, basic principle of interference in fuzzy logic, fuzzy IF-THEN rules, fuzzy systems and	10

	algorithms, approximate reasoning, forms of fuzzy implication, fuzzy inference engines, fuzzification/defuzzification **Applications :** Fuzzy control system design and its elements, fuzzy logic controller applications of fuzzy control in electric drive, power system, measurement and instrumentation.	

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1	Ability to contrive optimum NN architecture for specific engineering problem
CO2	Competency in applying NN technology in control problems
CO3	Skill in framing fuzzy rules & employing fuzzy technique in solving engineering problems.
CO4	Dexterity in contriving neuro –fuzzy based solutions
CO5	Know-how of applying ANN & fuzzy Logic toolbox for solving problems.
CO6	Evaluate and quantify the advantages offered by ANNs and Fuzzy systems over the conventional control strategies

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: I

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year:I Semester: I
Credits Theory: 0 Practical:2	**Subject: Electric Drives Lab**
Course Code:	**SEPED-112P**

Course Objectives: The objectives of studying this course are,
1. To understand the concept of thyristors
2. To understand the concept of 3-phase induction motor drive.

Nature of Paper: Core

Minimum Passing Marks/Credits: : 50% Marks //2

L:0
T:0
P:2(In Hours/Week)
Theory - 0
Practical- 3

Practical	Contents
Practical-1	Torque-speed c/s of a separately excited DC motor drive fed by a two-pulse center-tapped thyristor rectifier and 6-pulse fully controlled rectifier.
Practical-2	Study of a four-quadrant separately excited DC motor drive.
Practical-3	Implementation of center spaced space vector modulation with DSP - TMS320LF2407 for V/Hz control of induction motor drives.
Practical-4	Implementation of discontinuous space vector modulation with DSP - TMS320LF2407 for V/Hz control of induction motor drives.
Practical-5	Study of V/f control operation of 3Φ induction motor drive.
Practical-6	Study of AC Single phase motor-speed control using TRIAC.
Practical-7	Study of thyristors-controlled DC Drive.

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	--
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:
CO1. To determine the voltage an frequency from three phase induction motor..
CO2. To determine the phase angle and draw waveform of thyristors.
CO3. Set up control strategies to synthesize the voltages in dc and ac motor drives.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: II

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: II
Credits Theory: 4 Practical: 0	**Subject: Power Semiconductor Controlled Electric Drive**
Course Code:	**SEPED-121**

Course Objectives: The objectives of studying this course are,

1. This course will impart knowledge to the students regarding the different control schemes used for the controlling of DC and AC drives and the implementation of these schemes of DC and AC drives using microprocessor.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0 (in Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**1. Introduction:** Solid state controlled electric drive – concept, elements and salient features; power converter motor system, closed loop control of electric drives, sensing of speed and current, performance parameters.	10
II	**2. Control of D.C. Drives:** Control of d.c. separately and series excited motor drives using controlled converters (single phase and three phase) Choppers Static ward Leonard control scheme Solid state electric braking schemes Closed loop control of solid-state dc drives.	10
III	**3. Control of A.C. motor drives:** Operation of induction and synchronous motor drives from voltage source and current source inverters, slip power recovery, pump drives using ac line controllers, self-controlled synchronous motor drive, vector control of induction and synchronous motor drives, closed loop schemes, brushless dc motor drive, switched reluctance motor drive.	10
IV	**4. Microprocessor Control of Electric Drive:** Functions of microprocessor in electric drive control, salient features of microprocessor control, microprocessor based control schemes for d.c., induction and synchronous motor drives, applications.	10

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Capability in testing & harnessing typical characteristics of power semiconductor devices.
CO2	Specify the appropriate power circuit configuration amongst the phase controlled rectifiers and choppers for the speed control of DC motor drives for four-quadrant operation with current limit
CO3	Design static Scherbius and Kramer drives to implement slip power recovery schemes
CO4	Implement synchronous motor drives with fixed frequency and variable frequency sources
CO5	Implement speed control schemes for Brushless D.C. motors and Permanent Magnet Synchronous motors
CO6	At the end of the course the students will be able to work with these drives in industries.

IIMTU-NEP IMPLEMENTATION
Year: 1/Semester: II

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: II
Credits Theory: 4 Practical: 0	**Subject: Power Convertor-II**
Course Code:	**SEPED-122**

Course Objectives: The objectives of studying this course are,

1. This course imparts knowledge to the students regarding hard switched power electronic devices such as power transistor, MOSFET, IGBT etc.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0(In Hours/Week) Theory – 1Hr=1 credit
Practical- 2 Hrs.=1Credit(4Hrs./Week

Unit	Contents	No. of Lectures Allotted
I	**Power Semiconductor Devices:** Structure, characteristics and ratings of Power Transistor, MOSFET, Insulated Gate Bipolar Transistor (IGBT) and MOS – Controlled Thyristors (MCT); drive and Snubber circuits.	10
II	**DC – DC Converters:** Review of chopper fundamentals, step down chopper with resistive and resistive – inductive loads with continuous and discontinuous current operations, step up chopper, commutation techniques, impulse commutated and resonant pulse chopper, multiquadrant and multiphase choppers. Switching mode regulators: Buck, Boost, Buck – Boost, Cuk and fly back regulators.	10
III	**DC – AC Inverters:** Single phase and three phase voltage source and current source inverters, commutation methods, voltage and frequency control, harmonic reductions.	10
IV	**Resonant Inverters:** Classification, series and parallel resonant inverters, load resonant inverters, zero voltage switching and zero current switching resonant inverters, resonant dc link inverters.	10

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report 5) Seminar On Research Project Report 6) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1 Capability in designing isolated converters.

CO2 Ability to dynamic analysis of power Converters.

CO3 Competency in operation of resonant converter.

CO4 Know-how of multilevel converter.

CO5 To design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems.

CO6 Design the control circuit and the power circuit for a given power converter.

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: II

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: II
Credits Theory: 4 Practical: 0	**Subject: Power Semiconductor Devices**
Course Code:	**SEPED-123**

Course Objectives: The objectives of studying this course are,

1. This course will make students conversant with the objective of engineering continuing education is to help practicing engineers stay current with technological advances relevant to their current or future job assignments.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0(In Hours/Week) Theory – 1Hr=1 credit
Practical- 2 Hrs.=1Credit(4Hrs./Week

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** General overview of power semiconductor devices and their desirable characteristics. Comparison of power semiconductor devices. **Power Diodes:** General purpose diode, fast recovery diode schottky diode, diode snubbers.	08
II	**Power Bipolar Junction Transistors:** Physical structure and device operation, static V-I and switching characteristics, secondary breakdown and safe operating area, snubber circuits, base drive control. **Power MOSFETS:** Physical structure and device operation, static V-I and switching characteristics, operating limitations and safe operating area, gate series and snubber circuits.	08
III	**Thyristors:** Physical structure and device operation, two transistor analogy, static V-I and switching characteristics , age characteristics, firing circuits, snubber circuits series and parallel operation **GTO(Gate Turn Off) Thyristors:** Physical structure and device operation, static V-I and switching characteristics, drive and snubber circuits	08
IV	**Insulated Gate Bipolar Transistors:** Physical structure and device operation, static V-I and switching characteristics, safe operating area, drive and snubber, circuit.	08
V	**Special Power Devices:** Physical structure, device operation and static V-I characteristics of reverse conducting thyristor, field controlled Thyristors , MOS controlled Thyristors **Triacs:** Physical structure and device operation	08

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

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UGC Approved Section 2f & 12B

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Proficiency utilizing harnessing typical parameters of power semiconductor devices.
CO2	Capability in testing & harnessing typical characteristics of power semiconductor devices
CO3	Competency in Triggering & Protective mechanism of semiconductor devices
CO4	Know-how & aptitude towards future Trends in Power Devices
CO5	Distinguish the types of power semiconductor devices, and analyze their switching characteristics
CO6	Construct and demonstrate the operation of controlled rectifiers, and analyze its characteristics and performance parameters of controlled rectifiers

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1/ Semester: II

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: II
Credits Theory: 4 Practical: 0	**Subject: Power Converter Applications**
Course Code:	**SEPED-124**
Course Objectives: The objectives of studying this course are, 1. This course will make students conversant with the objective of engineering continuing education is to help practicing engineers stay current with technological advances relevant to their current or future job assignments.	
Nature of Paper: Departmental Elective-II	
Minimum Passing Marks/Credits: 40% Marks /4	
L: 3 T: 1 P: 0(In Hours/Week) Theory – 1Hr=1 credit Practical- 2 Hrs.=1Credit(4Hrs./Week	

Unit	Contents	No. of Lectures Allotted
I	**Electric Utility Applications:** A. **HVDC Transmission:** Schematic diagram, modes of operation, control characteristics, twelve pulse converters, converter faults and protection, harmonic filters and power factor correction capacitors. B. **Static VAR Control:** Concept of static VAR control, Thyristors controlled VAR compensation techniques, series compensation, synchronous link converter based VAR compensation, unified power flow controller (UPFC). C. **Interconnection of Renewable Energy Sources to the Utility Grid:** Photo voltaic array interconnection, wind and small hydro interconnections.	10
II	**Industrial Applications:** Concept of resistance and induction heating, high frequency inverters for induction heating, ac voltage controllers for resistance heating and illumination control, electric welding control.	10
III	**Power Supplies:** Switched mode dc power supplies, UPS, aircraft power supplies.	10
IV	**Power Generation:** Excitation control of synchronous generators.	10
If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**		

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Formulate and analyze a power electronic design at the system level and assess the performance.
CO2	Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus
CO3	Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.
CO4	Analyze the Power Electronic Application requirements.
CO5	Develop improved power converters for any stringent application requirements.
CO6	Improvise the existing control techniques to suit the application

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1/Semester: II

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: II
Credits Theory: 4 Practical: 0	**Subject: Non-Conventional Energy Sources & Energy Converters**
Course Code:	**SEPED-125**

Course Objectives: The objectives of studying this course are,

1. This course is designed for the development of self study and seminar delivery skills in Non-conventional Energy Sources.

Nature of Paper: Departmental Elective-II

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0(In Hours/Week) Theory – 1Hr=1 credit
Practical- 2 Hrs.=1Credit(4Hrs./Week

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Various non-conventional energy resources-importance, classification, relative merits and demerits	08
II	**Solar Energy:** Solar photovoltaic's: Introduction, solar radiation & its relation with photovoltaic effect. Solar cell material; silicon mono & poly crystalline, raw material other than silicon. Different types of solar cell construction and design, flat plate arrays:-optimal system sizing & protection. Photovoltaic concentration, photovoltaic systems-standalone, PV-hybrid, grid-interactive. Stationary and tracking panels, maximum power point tracking, energy storage, converter & inverter systems & their control. Application-water pumping & power plants, cost & economics, recent developments.	08
III	**Solar thermal:** Thermal characteristics of solar radiation, solar collectors: -materials, types, focusing. Solar thermal power plant-layout and arrangement, solar cooling, recent Developments.	08
IV	**Wind Energy:** Wind power and its sources, site selection criterion, wind characteristics, momentum theory, Classification of wind machines. Wind mills-different design & their control, wind generators-different types, wind farms & grid. Wind generation in India. Issues of wind integrations-intermittent supply, economics, governmental regulations & subsidies. Wind penetration & its effects, economic issues, recent developments, international scenario.	08
V	**Fuel Cell:** Basic construction & principle of operation of fuel cell, Gibbs-Helmholtz equations, thermodynamic free energy and conditions of equilibrium,	08

	classification of fuel cell, different types of fuel cell:-direct type-low or medium temperature alkaline type, low temperature ion exchange membrane, direct high temperature fuel cells, Redox fuel cells, operation characteristic. Fuel cell power plants & its integration with wind and solar photovoltaic systems, smart grids.	

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1	Differentiate the various types of renewable energy systems.
CO2	Demonstrate the generation of electricity from various Non-Conventional sources of energy, have a working knowledge on types of fuel cells.
CO3	. Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation.
CO4	Explore the concepts involved in wind energy conversion system by studying its components, types and performance.
CO5	Illustrate ocean energy and explain the operational methods of their utilization.
CO6	Acquire the knowledge on Geothermal energy.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1^{st} / Semester: II

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 1 Semester: II
Credits Theory: 4 Practical: 0	**Subject: Digital Control System**
Course Code:	**SEPED-126**
Course Objectives: The objectives of studying this course are, 1. This course will make students conversant with the objective of engineering continuing education is to help practicing engineers stay current with technological advances relevant to their current or future job assignments.	
Nature of Paper: Departmental Elective-II	
Minimum Passing Marks/Credits: 40% Marks /4	
L: 3 T: 1 P: 0(In Hours/Week) Theory – 1Hr=1 credit Practical- 2 Hrs.=1Credit(4Hrs./Week	

Unit	Contents	No. of Lectures Allotted
I	**Signal Processing in Digital Control:** Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, Z – transform and inverse Z- transform, modeling of sample hold circuit, pulse transfer function, solution of difference equation by Z- transform method, stability on the z-plane and jury stability criterion, bilinear transformation, Routh Stability Criterion on plane.	16
II	**Design of Digital Control Algorithms:** Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.	12
III	**State Space Analysis and Design:** State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and absorbability, design control system with state feedback, stability analysis using Lyapunov stability theorem, optimal digital control system.	12
If the course is available as Generic Elective then the students of following departments may opt it. **Not applicable**		

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1 Understand the analysis techniques for digital control systems.

CO2 Explores and practices different analysis in different parlance.

CO3 Apply and analyze/compare techniques to understand design of digital controllers.

CO4 Analyze practical digital control systems and get a grip on its working.

CO5 Design digital controllers for Power Electronic Systems.

CO6 Describe the dynamics of a Linear, Time Invariant and Causal digital systems through difference equations.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: 1 / Semester: II

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year:I Semester: II
Credits Theory: 0 Practical:2	**Subject: Power Converter Lab**
Course Code:	**SEPED-122P**

Course Objectives: The objectives of studying this course are,
1. To understand the concept of full converters.
2. To understand the concept of wave IGBT.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 3
T: 1
P: 0(In Hours/Week) Theory – 1Hr=1 credit
Practical- 2 Hrs.=1Credit(4Hrs./Week

Practical	Contents
Practical-1	Single phase, three phase Semi converters and Full converters,
Practical-2	DC-DC Choppers using SCRs and Self communicating Devices.
Practical-3	Single phase and three phase inverters using IGBTs,
Practical-4	AC-AC voltage regulators.

If the course is available as Generic Elective then the students of following departments may opt it.**Not applicable**

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	--
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:
CO1. To determine the Single phase, three phase Semi converters and Full converters.
CO2. To determine the phase angle and draw waveform of IGBT.
CO3. Illustrate the functioning of rectifiers and firing circuits.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject: FACTS**
Course Code:	**SEPED-231**

Course Objectives: The objectives of studying this course are,

1. To impart advanced knowledge about the FACTS – systems involving their applications in long Bulk power Transmission line, in distribution systems, in custom Power and improving stability & voltage profile in power system.

Nature of Paper: Departmental Elective-III

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0(In Hours/Week) Theory – 1Hr=1 credit
Practical- 2 Hrs.=1Credit(4Hrs./Week

Unit	Contents	No. of Lectures Allotted
I	**Basic Issues Involved in Bulk Power Transmission:** Angle stability, voltage stability, power flow control and sub-synchronous resonance (SSR).	08
II	**Basic Issues Involved in Power distribution Systems:** Harmonics, load unbalance, poor power factor and voltage interruptions.	08
III	**Introduction of Basic FACTS devices:** SVC, STATCOM, TCSC, SSSC and UPFC. Introduction to concepts of Custom Power (CP) devices	08
IV	**Introduction to CP devices:** DSTATCOM, DVR, UPQC. Modeling of SVC, STATCOM, TCSC, SSSC and UPFC.	08
V	**Case Study** DSTATCOM in Current Control Mode: Reference current generation techniques. DSTATCOM in voltage control Mode: Reference voltage generation, Dereference voltage generation.	08

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1 Describe the concept of FACTS, Reactive power control and discuss the various types of compensation techniques, and classify the various types of FACTS devices.

CO2 Illustrate the characteristics and applications of static VAR compensator, and apply modeling of SVC for stability studies.

CO3 Describe the functional operation and applications of TCSC, and apply modeling of TCSC for power flow & stability studies.

CO4 Describe the principle, operation of STATCOM & UPFC

CO5 Classify & Discuss the various FACTS controller interactions

CO6 Explain and apply coordination of controllers using linear control techniques & Genetic algorithms.

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject: HVDC Transmission Systems**
Course Code:	**SEPED-232**

Course Objectives: The objectives of studying this course are,

1. To provide an in-depth understanding of the different aspects of D.C. Transmission system design and analysis. At the end student will be able to design commercial transmission systems.

Nature of Paper: Departmental Elective-III

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0(In Hours/Week)
Theory - 6
Practical- NIL

Unit	Contents	No. of Lectures Allotted
I	**Rectification:** The 3-phase Bridge rectifier or Graetz circuit, Inversion, Kinds of D.C links, Paralleled and Series connection of thyristors, Power flow in HVDC transmission system.	12
II	**Converter Station:** Major components of a converter station-converter unit, filters, reactive power source. Ground return and ground electrode.	12
III	**Basic principles of DC link control:** Converter control characteristics, firing angle control and extinction angle control. Parallel operation of D.C. link with A.C. transmission line. Introduction to Multiterminal HVDC Systems and HVDC Circuit Breakers, Comparison between AC and DC transmissions, break even distance for overhead transmission lines and underground cables. Application of HVDC transmission.	16

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Differentiate EHVAC and EHVDC systems Distinguish the operation of distribution schemes
CO2	Analyze the operation, characteristics and performance parameters of HVDC converters
CO3	Analyze the characteristics of converter and HVDC system controller
CO4	Illustrate the reactive power and harmonic control techniques for HVDC system.
CO5	Illustrate the operation of DC system model
CO6	Analyze the power flow in AC/DC Systems

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

<table>
<tr><td>Programme: PG
Class: M-Tech: Power Electronics & Drive</td><td>Year: II
Semester: III</td></tr>
<tr><td>Credits
Theory: 4
Practical: 0</td><td>Subject: Electric & Hybrid Vehicles</td></tr>
<tr><td>Course Code:</td><td>SEPED-233</td></tr>
<tr><td colspan="2">Course Objectives: The objectives of studying this course are,
1. To understand upcoming technology of hybrid system.
2. To understand different aspects of drives application.</td></tr>
<tr><td colspan="2">Nature of Paper: Departmental Elective-III</td></tr>
<tr><td colspan="2">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="2">L: 3
T: 1
P: 0(In Hours/Week) Theory – 1Hr=1 credit
Practical- 2 Hrs.=1Credit(4Hrs./Week</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, vehicle power source, characterization Transmission characteristics Mathematical models to describe vehicle performance	10
II	Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis, matching the electric machine and the internal combustion engine (ICE) the energy storage technology, Communications, supporting subsystems	10
III	Introduction to electric components used in hybrid and electric Vehicles, Configuration and control of DC Motor drives, Configuration and control of Introduction Motor drives configuration and control of Permanent Magnet Motor drives Configuration and control of Switch Reluctance, Motor drives, Drive system efficiency.	10
IV	Introduction to energy management and their strategies used in hybrid and electric vehicle, Classification of different energy management strategies, Comparison of different energy management strategies, Implementation issues of energy strategies.	10

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	30 20 -- 100
Total:	150
Prerequisites for the course:	

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Understand the architecture and vehicle dynamics of electric and hybrid vehicles.
CO2	Analyze and model the power management systems for electric and hybrid vehicles.
CO3	Devise power electronics based control strategies for electric and hybrid vehicles.
CO4	Analyze and design various components of electric and hybrid vehicles with environment concern.
CO5	Investigate and model the issues in mathematical domain related to grid interconnections of electric and hybrid vehicle.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject: Mechatronics Systems**
Course Code:	**SEPED-234**
Course Objectives: The objectives of studying this course are, 1. **Mechatronics**, which is also called **mechatronic** engineering, is a multidisciplinary branch of engineering that focuses on the engineering of both electrical and mechanical systems, and also includes a combination of robotics, electronics, computer, telecommunications, systems, control, and product engineering.	
Nature of Paper: Departmental Elective-IV	
Minimum Passing Marks/Credits: 40% Marks /4	
L: 3 T: 1 P: 0(In Hours/Week) Theory – 1Hr=1 credit Practical- 2 Hrs.=1Credit(4Hrs./Week	

Unit	Contents	No. of Lectures Allotted
I	**Electrical Systems** Mathematical modelling of Electro Mechanical Systems, RLC Circuits, active and passive electrical circuits, PMDC Motor, Stepper motor, three phase squirrel cage induction motor, three phase permanent magnet synchronous motor, servo motor.	08
II	**Mechanical Systems** Introduction to various systems of units, mathematical modeling of mechanical systems, Newton's laws, moment of inertia, forced response and natural response, rotational systems, spring mass system, free vibration, spring mass damper system, mechanical systems with dry friction, work energy and power, passive elements and active elements an energy method for deriving equations of motion, energy and power transformers.	08
III	**Fluid and Thermal systems** Mathematical modeling of liquid level system: Resistance and capacitance of liquid level systems with interaction. Mathematical modeling of pneumatic systems: Resistance and capacitance of pneumatic systems, mathematical modeling of a pneumatic systems, liberalization of non-linear systems. Mathematical modeling of hydraulic systems: Hydraulic circuits, hydraulic servo-meter and mathematical model of hydraulic servo motor dashpots. Mathematical modeling of thermal systems: Thermal resistance and 7 thermal capacitance mathematical modeling of thermal systems.	08
IV	**Design of Mechanical Elements** The phases of design, Design considerations, codes and standards,	08

	optimum design process, design variables, cost functions, design constraints, optimum design. Springs, rolling contact bearing, journal bearing, Spur and helical gear, bevel and worm gears, shafts, axes and spindles, Flexible Mechanical Elements, Belts, timing belts, chain and sprocket, flexible shafts, brakes, clutches, cams, four bar mechanism.	
V	**Design of Hydraulic System** Hydraulic circuit design, Actuator design, selection of pumps, selection of valves, design of control circuits	08

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report	
Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:
After undergoing this course, the students will be able to:

CO1	Identification of key elements of Mechatronics system and its representation in terms of block diagram.
CO2	Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O.
CO3	Interfacing of Sensors, Actuators using appropriate DAQ micro-controller.
CO4	Time and Frequency domain analysis of system model (for control application).
CO5	PID control implementation on real time systems.
CO6	Development of PLC ladder programming and implementation of real life system.

IIMT UNIVERSITY MEERUT (U.P.)
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UGC Approved Section 2f & 12B

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject: Power Quality**
Course Code:	**SEPED-235**

Course Objectives: The objectives of studying this course are,

1. The quality of electrical power is an important contributing factor to the development of any country and this can be achieved through continuous power quality monitoring which helps detect record and prevent power quality problems.

Nature of Paper: Departmental Elective-IV

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0(In Hours/Week) Theory – 1Hr=1 credit
Practical- 2 Hrs.=1Credit(4Hrs./Week

Unit	Contents	No. of Lectures Allotted
I	**Power Quality Problems and Monitoring :** Introduction, surges, voltage sag and swell, over voltage, under voltage, outage voltage and phase angle imbalances, electrical noise, harmonic, frequency deviation monitoring.	14
II	**Solution to power quality problems :** Design, measures to minimize the frequency and duration of outages in distribution systems, voltages regulators, harmonic filters, power conditioners, uninterruptible power supplies, emergency and standby power systems, application of power conditioners.	12
III	**Minimization of disturbances at Customer site :** Power quality standards, standard test waveforms, power distribution system design, measure to minimize voltage disturbances.	14

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar	30
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	--
5) ESE	100
Total:	150

Prerequisites for the course:

Course Learning Outcomes:

After undergoing this course, the students will be able to:

CO1	Analyze power quality problems and suggest solutions
CO2	Implement compensating techniques for a given power quality problem.
CO3	Suggest protection techniques under different fault conditions
CO4	Develop control techniques for compensating devices
CO5	Understand power quality monitoring and classification techniques
CO6	To Study the Effects of harmonics on various equipment's.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M-Tech: Power Electronics & Drive**	Year: 2 Semester: III
Credits Theory: 4 Practical: 0	**Subject: Optimization Techniques**
Course Code:	**SEPED-236**

Course Objectives: The objectives of studying this course are,
1. The subject objective is to make student expert enough so that they can find solution in an optimized way keeping control all the parameters and constraints.

Nature of Paper: Departmental Elective-IV

Minimum Passing Marks/Credits: 40% Marks /4

L: 3
T: 1
P: 0(In Hours/Week) Theory – 1Hr=1 credit
Practical- 2 Hrs.=1Credit(4Hrs./Week

Unit	Contents	No. of Lectures Allotted
I	Linear programming – formulation-Graphical and simplex methods-Big-M method Two phase method-Dual simplex method-Primal Dual problems.	08
II	Unconstrained one-dimensional optimization techniques - Necessary and sufficient conditions –Unrestricted search methods-Fibonacci and golden section method Quadratic Interpolation methods, cubic interpolation and direct root methods.	08
III	Unconstrained n dimensional optimization techniques – direct search methods – Random search –pattern search and Rosen brooch’s hill claiming method Descent methods- Steepest descent, conjugate gradient, quasi -Newton method.	08
IV	Constrained optimization Techniques- Necessary and sufficient conditions – Equality and inequality constraints-Kuhn-Tucker conditions-Gradient projection method-cutting plane method- penalty function method.	08
V	Dynamic programming principle of optimality- recursive equation approach-application to shortest route, cargo-loading, allocation and production schedule problems.	08

If the course is available as Generic Elective then the students of following departments may opt it.
Not applicable

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	30
2) Presentations /Seminar	
3) Assignments	20
4) Research Project Report Seminar On Research Project Report	--
5) ESE	100

BOS

Total:	150
Prerequisites for the course:	
Course Learning Outcomes: After undergoing this course, the students will be able to: **CO1** Recall the theoretical foundations of various issues related to linear programming modeling to formulate real-world problems as a L P mode **CO2** Explain the theoretical workings of the graphical, simplex and analytical methods for making effective decision on variables so as to optimize the objective function **CO3** Identify appropriate optimization method to solve complex problems involved in various industries. **CO4** Demonstrate the optimized material distribution schedule using transportation model to minimize total distribution cost. **CO5** Explain the theoretical workings of sequencing techniques for effective scheduling of jobs on machines **CO6** Apply the knowledge of game theory concepts to articulate real-world competitive situations to identify strategic decisions to counter the consequences.	

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-III

Programme: PG **Class: M. Tech: Power Electronics & Drive**	Year: II Semester: III
Credits Theory: 0 Practical: 4	**Subject: SEMINAR**
Course Code: SEPED-237	**Title : SEMINAR**
Course Objectives: To share information, research findings or expertise on a particular topic or subject matter with a targeted audience.	
Nature of Paper: Core	
Minimum Passing Marks/Credits: 50% Marks /2	
L: 0 T: 0 P: 12 (In Hours/Week) Theory - 0 Practical- 1 Hrs.=1 Credit (3Hrs./Week=3 Credits)	

Unit	Contents	No. of Lectures Allotted
	Seminar should be presented on a very recent topic on any technological domain. It should consist of following components: Topic name, introduction, literature reviews, methodology, discussion and conclusion.	

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Internal	50
Total:	50

Prerequisites for the course:

Course Learning Outcomes:
1. Able to share research findings, insights, and knowledge with faculty, and the academic community.
2. Able to demonstrating the seminar topic and showing the proficiency in the chosen area of study.
3. Improve the ability to effectively express the complex technical information to a diverse audience.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech: Power Electronics & Drive</td><td colspan="2">Year: II
Semester: III</td></tr>
<tr><td colspan="2">Credits
Theory: 0
Practical: 4</td><td colspan="2">Subject: Synopsis/Dissertation Proposal</td></tr>
<tr><td colspan="2">Course Code: SETEE-238</td><td colspan="2">Title : Synopsis/Dissertation Proposal</td></tr>
<tr><td colspan="4">Course Objectives:</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits:50% Marks /4</td></tr>
<tr><td colspan="4">L: 0
T: 0
P: 24 (In Hours/Week)
Theory - 0
Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td></td><td colspan="2">1. Selection of the topic:This is the initial step in the research process. It involves identifying a subject or area of interest to investigate.
2. Literature reviews:This involves examining existing research, studies, and scholarly works related to your topic.
3. Finding the research gaps:These gaps represent opportunities for your research. Formulate clear and specific research objectives or research questions based on these gaps.</td><td></td></tr>
<tr><td colspan="4">If the course is available as Generic Elective then the students of following departments may opt it .NA</td></tr>
<tr><td colspan="4" align="center">Evaluation/Assessment Methodology</td></tr>
<tr><td colspan="4" align="right">Max. Marks</td></tr>
<tr><td colspan="3">1) Internal
2) External</td><td>50
100</td></tr>
<tr><td colspan="3" align="right">Total:</td><td>150</td></tr>
<tr><td colspan="4">Prerequisites for the course:</td></tr>
<tr><td colspan="4">Course Learning Outcomes:
1. Able to well-defined research topic that aligns with the academic or professional interests and is suitable for investigation. This is the foundation upon which your research will be built.
2. Able to identify key theories, concepts, and methodologies relevant to the selected research.
3. Able to formulate the objectives to complete the research.</td></tr>
</table>

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech: Power Electronics & Drive</td><td colspan="2">Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: 0
Practical: 4</td><td colspan="2">Subject: Comprehensive Viva</td></tr>
<tr><td colspan="2">Course Code: SEPED-241</td><td colspan="2">Title : Comprehensive Viva</td></tr>
<tr><td colspan="4">Course Objectives: Evaluation of the project report to ensure that the studends have well understanding of their research field.</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits:50% Marks /4</td></tr>
<tr><td colspan="4">L: 0
T: 0
P: 8 (In Hours/Week)
Theory - 0
Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td></td><td colspan="2">1. Presentation and submission of the well completed research report.</td><td></td></tr>
<tr><td colspan="4">If the course is available as Generic Elective then the students of following departments may opt it.NA</td></tr>
<tr><td colspan="4">Evaluation/Assessment Methodology</td></tr>
<tr><td colspan="4">Max. Marks</td></tr>
<tr><td colspan="3">1) Internal
2) External</td><td>80
120</td></tr>
<tr><td colspan="3">Total:</td><td>200</td></tr>
<tr><td colspan="4">Prerequisites for the course:</td></tr>
<tr><td colspan="4">Course Learning Outcomes:
1. Able to demonstrate satisfactory level of knowledge, understanding, and the ability to effectively communicate their ideas and findings.
2. A successful viva is typically a prerequisite for the awarding of an M.Tech. degree.</td></tr>
</table>

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester-IV

Programme: PG **Class: M. Tech: Power Electronics & Drive**		Year: II Semester: IV
Credits Theory: 0 Practical: 8		**Subject: : Dissertation {Final}**
Course Code: SEPED-242		**Title : Dissertation {Final}**
Course Objectives: Completinon of the results, discussion and conclusion of the final project report.		
Nature of Paper: Core		
Minimum Passing Marks/Credits:50% Marks /8		
L: 0 T: 0 P: 16 (In Hours/Week) Theory - 0 Practical- 1 Hrs.=1 Credit (3Hrs./Week=3Credits)		
Unit	**Contents**	**No. of Lectures Allotted**
	1. Complation of the project 2. Submission of the dissertation report	
If the course is available as Generic Elective then the students of following departments may opt it.NA		
Evaluation/Assessment Methodology		
		Max. Marks
1) Internal 2) External		150 250
Total:		400
Prerequisites for the course:		
Course Learning Outcomes: 1. Project report serve as a well documented of the project which offering a reference for the future researchers.		

School of Engineering & Technology

ACADEMIC HAND BOOK

Master of Technology (M.Tech)
in
Computer Science and Engineering

Evaluation Scheme

Master of Technology (M.Tech) in Computer Science and Engineering

M.Tech (Computer Science & Engineering)
Semester I

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		External	Internal	Total
1	MTCS-111	Advanced Data Structure And Algorithms	3	1	-	4	70	30	100
2	MTCS-112	Advanced Operating System	3	1	-	4	70	30	100
3	MTCS-113	Software Testing & Quality Assurance	3	1	-	4	70	30	100
4	Elective- I	Departmental Elective Course-I	3	1	-	4	70	30	100
5	MTCS-111P	Advanced Data Structures And Algorithms Lab	0	0	3	2	30	20	50
6	*NECC-111	Industrial Visit/ Seminar/Presentation On The Report Of Visits	-	-	-	NC	-	25	-
7	*NECC-112	University Social Responsibility	-	-	-	NC	-	25	-
8	NECC-113	Spoken Tutorial Certification	-	-	2	1	-	25	25
9	NECC-114	Mooc/ Swayam	-	-	2	1	-	25	25
		Total	**12**	**4**	**7**	**20**	**310**	**190**	**500**

***Note**: NECC-111 & NECC-112 are Non-credit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.

M.Tech (Computer Science & Engineering)
Semester II

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		External	Internal	Total
1	MTCS-121	ADBMS	3	1	0	4	70	30	100
2	MTCS-122	Advanced Computer Architecture	3	1	0	4	70	30	100
3	MTCS-123	Mobile Ad Hoc Network	3	1	0	4	70	30	100
4	Elective- II	Departmental Elective Course-II	3	1	0	4	70	30	100
5	MTCS-121P	Adbms Laboratory	0	0	3	2	30	20	50
6	*NECC-121	Industrial Visit/ Seminar/Presentation On The Report Of Visits	-	-	-	NC	-	25	-
7	*NECC-122	University Social Responsibility	-	-	-	NC	-	25	-
8	NECC-123	Spoken Tutorial Certification	-	-	2	1	-	25	25
9	NECC-124	Mooc/ Swayam	-	-	2	1	-	25	25
		Total	**12**	**4**	**7**	**20**	**310**	**190**	**500**

***Note**: NECC-121 & NECC-122 are Non-credit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.

M.Tech (Computer Science & Engineering)
Semester III

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		External	Internal	Total
1	Elective- III	Departmental Elective Course-III	3	1	-	4	70	30	100
2	Elective- IV	Departmental Elective Course-IV	3	1	-	4	70	30	100
3	MTCS-231P	Seminar	-	-	8	4	--	100	100
4	MTCS-232P	Synopsis of Dissertation	-	-	12	6	90	60	150
5	*NECC-231	Industrial Visit/ Seminar/Presentation on the report of visits	-	-	-	NC	-	25	-
6	*NECC-232	University SocialResponsibility	-	-	-	NC	-	25	-
7	NECC-233	Spoken Tutorial Certification	-	-	2	1	-	25	25
8	NECC-234	MOOC/ SWAYAM	-	-	2	1	-	25	25
		Total	**6**	**2**	**24**	**20**	**230**	**270**	**500**

***Note**: NECC-231 & NECC-232 are Non-credit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.

M.Tech (Computer Science & Engineering)
Semester IV

S. No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		External	Internal	Total
1	MTCS-421	Final Dissertation	0	0	16	8	120	80	200
2	MTCS-422	Comprehensive Viva	0	0	8	4	60	40	100
		Total	**0**	**0**	**24**	**12**	**180**	**120**	**300**

**** Electives to be selected from the following list***

***** Seminar should be presented on a very recent topic on any technological domain.**

Departmental Elective-I, II

MECS-001 Cyber Security
MECS -002 Dataware housing & Data Mining
MECS -003 Mobile Computing
MECS-004 Software Project Management

Departmental Elective-III

MECS -005 Internet of Things
MECS -006 Cloud Computing
MECS -007 Compiler Design

Departmental Elective-IV

MECS -008 Software Testing and Audit
MECS -009 Neural Networks
MECS -010 Data Compression
MECS -011 Pattern Recognition
MECS -012 Semantic Webs and Web
MECS -013 High Performance Computing

Format-1

Format-1

CBCS: Statement of Credit distribution	
College/School: School of Engineering & Technology Programme: M.Tech Duration: 4 Semester Annual/Semester: Semester	Credit range: 72-80 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr) or	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	18	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)			DSE-I(4)		
II	20	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)		SEC-1(2)	DSE-II(4)		
Provision to change the core papers							
III	20			SEC-1(2)	DSE-III(4) DSE-IV(4)		Seminar-1 (04) Dissertation Phase-I(06)
IV	12						Comprehensive Viva(04) Dissertation Phase-II(08)
Total Credits	**70**	06(Th)*4(Cr) = 24 02 (Pr)*2(Cr) = 04 **Total = 28**		2*2= 04 **= 04**	4(Th)*4(Cr)= 16 **= 16**		04+06 = 10 04+08 = 12 **=2 2**

BOS

Format-2

Format-2

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES M.Tech CSE	FIRST YEAR	SEMESTER -I	i) C1 (Th.4 Cr.+P 2Cr)	4 2	4 3	40 24	Advanced Data Structure And Algorithms	5		
			ii) C2(Th.4 Cr.).	4	4	40	Advanced Operating System	5		
			iii)C3 (Th.4 Cr)	4	4	50	Software Testing & Quality Assurance	5		
			iv) DSE-1 (Th.4 Cr.)	4	4	45	Cyber Security Dataware housing & Data Mining Mobile Computing Software Project Management	5		
		SEMESTER - II	i) C4 (Th.4 Cr.+P2Cr.)	4 2	4 3	40 24	Advance Database Management System	5		
			ii) C5(Th.4 Cr.).	4	4	40	Advanced Computer Architecture	5		
			iii)C6 (Th.4 Cr.)	4 2	4 3	50 24	Mobile Ad Hoc Network	5		

			iv) DSE-2 (Th.4 Cr.) v) SEC-1	4 2	4 -	4 -	Cyber Security Dataware housing & Data Mining Mobile Computing Software Project Management Spoken Tutorial Certification	5		

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break** **Programme Outcome:** PO_1 PO_2 PO_3	**Programme Specific Outcome:** PSO_1 PSO_2 PSO_3

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES M.Tech CSE	**SECOND YEAR**	**SEMESTER -III**	i) DSE-3	4	4	40	**Internet of Things** **Cloud Computing** **Compiler Design**	5		
			ii) DSE-4	4	4	45	Software Testing and Audit Neural Network Data Compression Pattern Recognition Semantic webs and web High Performance Computing	5		
			iii) SEC-2	6	8	50	Synopsis of Dissertation			
			iv) SEC-3	4	4	60	**Seminar**			
			vii) SEC-4	1	4		**MOOCS/Swayam**			
		SEMESTER -IV	i) SEC-5	8	16	80	Final Dissertation			
			ii) SEC-6	4	8	40	**Comprehensive Viva**			

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break** **Programme Outcome:** PO_1 PO_2 PO_3	**Programme Specific Outcome:** PSO_1 PSO_2 PSO_3

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester I

Programme: PG **Class: M. Tech CSE**	Year: 1 Semester: I
Credits Theory:4 Practical:	**Subject: ADVANCED DATA STRUCTURES AND ALGORITHMS**
Course Code: **MTCS-111**	**Title: ADVANCED DATA STRUCTURES AND ALGORITHMS**
Course Objectives: **The Student will Learn:** The fundamental design, analysis, and implementation of basic data structures. Basic concepts in the specification and analysis of programs. Principles for good program design, especially the uses of data abstraction. Significance of algorithms in the computer field Various aspects of algorithm development Qualities of a good solution	
Nature of Paper: Core	
Minimum Passing Marks/Credits:40% Marks	
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation-Big Oh, Omega and Theta notations, Complexity Analysis Examples. Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.	**8**
II	Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-Array List, Linked List, Vector classes, Stacks and Queues in java.util, Iterators in java.util.	**8**
III	Searching–Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods- Open Addressing, Chaining, Hashing in java.util-HashMap, Hash Set, Hash table. Sorting –Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.	**8**
IV	Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, Threaded binary trees. Graphs-	**8**

	Graphs terminology, Graph ADT, representations, graph traversals/search methods-DFS and BFS, Java code for graph traversals, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.	
V	Search trees- Binary search tree-Binary search tree ADT, insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees – Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util- Tree Set, Tree Map Classes, Tries(examples only),Comparison of Search trees.Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.	**8**

Reference / Text Books:

1. Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
2. Data structures and Algorithms in Java, Adam Drozdek, 3rd edition, CengageLearning.
3. Data structures and Algorithm Analysis in Java, M.A.Weiss, 2nd edition, Addison-Wesley (Pearson Education).

REFERENCE BOOKS:

1. Java for Programmers, Deitel and Deitel, Pearson education.
2. Data structures and Algorithms in Java, R.Lafore, Pearson education.
3. Java: The Complete Reference, 8th editon, Herbert Schildt, TMH.
4. Data structures and Algorithms in Java, M.T.Goodrich, R.Tomassia, 3rd edition,
5. Data structures and the Java Collection Frame work,W.J.Collins, Mc Graw Hill.
6. Classic Data structures in Java, T.Budd, Addison-Wesley (Pearson Education).
7. Data structures with Java, Ford and Topp, Pearson Education.
8. Data structures using Java, D.S.Malik and P.S.Nair, Cengage learning.
9. Data structures with Java, J.R.Hubbard and A.Huray, PHI Pvt. Ltd.
10. Data structures and Software Development in an Object-Oriented Domain,
11. J.P.Tremblay and G.A.Cheston, Java edition, Pearson Education.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3)Assignments	
4) Research Project Report	
Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course: Computer Organization and Architecture

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.Understand the basic principles and operations of data structures.
CO2.Apply Hashing, Disjoint sets and String-Matching techniques for solving problems effectively
CO3.Apply the concepts of advanced Trees and Graphs for solving problems effectively. L3
CO4.Analyze the given scenario and choose appropriate Data Structure for solving problems.
CO5.Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc
CO6.Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester I

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech CSE</td><td colspan="2">Year: 1
Semester: I</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:0</td><td colspan="2">Subject: ADVANCED OPERATING SYSTEMS</td></tr>
<tr><td colspan="2">Course Code:
MTCS-112</td><td colspan="2">Title: ADVANCED OPERATING SYSTEMS</td></tr>
<tr><td colspan="4">Course Objectives:
The Student will Learn:
To understand main components of Real time Operating system and their working To study the operations performed by OS as a resource manager. To understand the scheduling policies of DOS To implement the working principles of OS. To study different OS and compare their features.</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits:40% Marks</td></tr>
<tr><td colspan="4">L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td colspan="2">Introduction: Overview, Functions of an Operating System, Design Approaches, Types of Advanced Operating System - Synchronization Mechanisms, Concept of a Process, Concurrent Processes, The Critical Section Problem, Other Synchronization Problems, Language Mechanisms for Synchronization, Axiomatic Verification of Parallel Programs - Process Deadlocks - Preliminaries, Models of Deadlocks, Resources, System State, Necessary and Sufficient conditions for a Deadlock, Systems with Single-Unit Requests, Consumable Resources,Reusable Resources.</td><td>8</td></tr>
<tr><td>II</td><td colspan="2">Distributed Operating Systems: Introduction, Issues, Communication Primitives, Inherent Limitations Lamport’s Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Distributed Mutual Exclusion, Non-Token Based Algorithms, Lamport’s Algorithm - Token-Based Algorithms, Suzuki-Kasami’s Broadcast Algorithm, Distributed Deadlock Detection, Issues, Centralized Deadlock-Detection Algorithms - Distributed Deadlock-Detection Algorithms. Agreement Protocols, Classification - Solutions, Applications.</td><td>8</td></tr>
<tr><td>III</td><td colspan="2">Distributed Resource Management: Distributed File systems, Architecture, Mechanisms, Design Issues, Distributed Shared Memory, Architecture, Algorithm, Protocols - Design Issues. Distributed Scheduling, Issues, Components, Algorithms.</td><td>8</td></tr>
<tr><td>IV</td><td colspan="2">Failure Recovery and Fault Tolerance: Basic Concepts-Classification of Failures, Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault</td><td>8</td></tr>
</table>

	Tolerance; Issues - Two-phase and Non blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols	
V	Multiprocessor and Database Operating Systems: Structures, Design Issues, Threads, Process Synchronization, Processor Scheduling, Memory Management, Reliability / Fault Tolerance; Database Operating Systems, Introduction, Concurrency Control, Distributed Database Systems, Concurrency Control Algorithms.	**8**

Reference / Text Books:

1. A. Silberschatz - Applied Operating System Concepts, Wiley, 2000.
2. Lubemir F Bic and Alan C. Shaw - Operating System Principles, Pearson Education, 2003

REFERENCE BOOKS:

- MukeshSinghal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", 2 .McGraw-Hill, 2000
- Abraham Silberschatz, Peter B. Galvin, G. Gagne, "Operating 3.System Concepts", Sixth Addison n Wesley Publishing Co., 2003.
- Andrew S. 4.Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	
Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course: Computer Organization and Architecture

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Understanding of Operating System Concepts: Students should gain a deep understanding of fundamental operating system concepts.

CO2.Understand the concept of Advanced Process Management: Students should be able to analyze and design algorithms and techniques for process scheduling.

CO3.Students should be able to understand and implement various memory management techniques, such as virtual memory, paging, segmentation, and demand paging.

CO4.Students should have knowledge of different file system architectures and their features. They should be able to analyze and design file system structures and algorithms.

CO5.Students should gain knowledge of distributed operating systems and parallel processing.

CO6.Students should be able to evaluate the performance of an operating system and identify potential bottlenecks.

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester I

Programme: PG **Class: M. Tech CSE**	Year: 1 Semester: I
Credits Theory:4 Practical: 0	**Subject: Software Testing and Quality Assurance**
Course Code: **MTCS-113**	**Title: Software Testing and Quality Assurance**
Course Objectives: **The Student will Learn:** After successful completion of this course, student will be able to learn and develop project documentations and soft skills for effective project presentation develop practical skills related to software quality assurance apply software testing techniques for information systems development.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:40% Marks	
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Software Quality, Role of testing, verification and validation, White-Box and Black-Box Testing, Test Planning and Design, Monitoring and Measuring Test Execution, Test Tools and Automation, Test Team Organization andManagement .	**8**
II	**Unit Testing and Control Flow Testing:** Concept of Unit Testing, Static Unit Testing, Defect Prevention, Mutation Testing, Debugging, Unit Testing in extreme Programming Control Flow Graph, Paths in a Control Flow Graph, All-Path Coverage Criterion, Statement Coverage Criterion, Branch Coverage Criterion, Examples of Test Data Selection.	**8**
III	**Data Flow Testing and System Integration Testing**: Data Flow Anomaly, Data Flow Graph, Data Flow Testing Criteria, Feasible Paths and Test Selection Criteria, Comparison of Testing Techniques. Types of Interfaces and Interface Errors, System Integration Techniques, Software and Hardware Integration, Off-the-Shelf Component Testing, Built-in Testing, **System Test Categories**: Basic Tests, Functionality Tests, Robustness Tests, Interoperability Tests, Performance Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Documentation Tests.	**8**
IV	**Functional Testing:** Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing, Error Guessing, Category Partition. System Test Design: Test Design Factors, Requirement Identification, Characteristics of Testable Requirements, Test Design Preparedness Metrics, Test Case Design Effectiveness System Test Planning and Automation: Structure of a	**8**

	System Test Plan, System Test Automation System Test Execution: Metrics for Tracking System Test, Beta Testing, System Test Report, Product Sustaining, Measuring Test Effectiveness.	
V	**Acceptance Testing Software Quality**: Types of Acceptance Testing, Selection of Acceptance Criteria, Acceptance Test Execution, Acceptance Testing in eXtreme Programming. Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard ISO 9000:2000 Fundamentals, ISO 9001:2000 Requirements.	**8**

Reference / Text Books:

1. SagarNaik University of Waterloo, PiyuTripathy, Software Testing and Quality Assurance: Theory and Practice, Wiley.
2. William Perry, Effective Methods for Software Testing, Wiley.
3. Paul C. Jorgensen,Software Testing - A Craftsman's Approach, CRC Press.
4. Srinivasan Desikan and Gopala swamy Ramesh ,Software Testing, Pearson Education

REFERENCE BOOKS:

1. Louis Tamres,Introducing to Software Testing, Addison Wesley Publications.
2 Ron Patton, SAMS Techmedia Indian Edition,Software Testing, Pearson Education.
3. Glenford J. Myers,The Art of Software Testing, John Wiley & Sons.
4. Robert V. Binder, Testing Object-Oriented Systems: Models Patterns and Tools, Addison Wesley.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Understand and explain the key concepts and principles of software testing.

CO2.Understand and explain the key concepts techniques and the principles of Unit testing.

CO3.Understand and explain the key concepts techniques and the principles of Data flow testing and System Testing.

CO4.Understand and explain the key concepts, techniques and the principles of Functional testing.

CO5.Understand and explain the key concepts techniques and the principles of Acceptance testing.

CO6.Apply software testing techniques: Students should be able to apply various testing techniques such as black box testing, white box testing, gray box testing, functional testing, non-functional testing, regression testing, and others to ensure the quality and reliability of software.

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester I/II

Programme: PG **Class: M. Tech CSE**	Year: I Semester: I
Credits Theory:4 Practical:0	**Subject:** CYBER SECURITY
Course Code: MECS-001	**Title:** CYBER SECURITY

Course Objectives:
The Student will Learn:

1. To understand the basic concepts and the applications of information systems.
2. To have knowledge about Cyber Security Vulnerabilities.
3. To understand the Intrusion Detection and Prevention.
4. To understand the Cryptography and Network Security.
5. To implement the Cyberspace and the Law.

Nature of Paper: Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction to information systems: Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.	**8**
II	Cyber Security Vulnerabilities and Cyber Security Safeguards: Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.	**8**
III	Intrusion Detection and Prevention: Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.	8
IV	Cryptography and Network Security: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User	8

	Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer-SSL and TLS, Security at Network Layer-IPSec.	
V	Cyberspace and the Law: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.	8

Reference / Text Books:

1. Dr. Surya PrakashTripathi, RitendraGoyal, Praveen kumarShukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
2. Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill.
3. CHANDER, HARISH," Cyber Laws And It Protection " , PHI Learning Private Limited, Delhi, India

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course: Nil

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Understand and explain the basic concept of information systems and security Risk Analysis.
CO2.Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
CO3.Understand Intrusion detection and Prevention Techniques
CO4.UnderstandCryptography and Network Security.
CO5.Understand Firewalls and Security Protocols at the Application Layer.
CO6.Understand Cyberspace and the National Cyber Security Policy 2013.

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester I/II

Programme: PG **Class: M. Tech CSE**	Year: I Semester: I
Credits Theory:4 Practical:0	**Subject:** Dataware housing & Data Mining
Course Code: MECS-002	**Title:** Dataware housing & Data Mining

Course Objectives:

- Be familiar with mathematical foundations of data mining tools.
- Understand and implement classical models and algorithms in data warehouses and data mining.
- Characterize the kinds of patterns that can be discovered by association rule mining, classification

Nature of Paper: Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Data Warehousing:** Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept	**8**
II	**Data Warehouse Process and Technology:** Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design,	**8**
III	Coding a **Data Mining:** Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	8
IV	**Classification**: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-	8

	DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	
V	**Data Visualization and Overall Perspective:** Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining	8

Reference / Text Books:

1. Alex Berson, Stephen J. Smith "Data Warehousing, Data-Mining & OLAP", TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, " Data Warehousing: Architecture and Implementation", Pearson
3. I.Singh, Data Mining and Warehousing, Khanna Publishing House
4. Margaret H. Dunham, S. Sridhar,"Data Mining:Introductory and Advanced Topics" Pearson Education
5. Arun K. Pujari, "Data Mining Techniques" Universities Press
6. Pieter Adriaans, Dolf Zantinge, "Data-Mining", Pearson Education

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course: Nil

Course Learning Outcomes:
After completing the course, students should be able to:

CO1.Understand the functionality of the various data mining and data warehousing component
CO2.Appreciate the strengths and limitations of various data mining and data warehousing models
CO3.Explain the analyzing techniques of various data
CO4.Describe different methodologies used in data mining and data ware housing.
CO5.Explain Data Visualization and Overall Perspective of data ware housing and data mining with various technologies.

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester I/II

Programme: PG **Class: M. Tech CSE**	Year: I Semester: I
Credits Theory:4 Practical:0	**Subject:** Mobile Computing
Course Code: MECS-003	**Title:** Mobile Computing
Course Objectives: • Understand the concept / fundamentals of mobile computing and their types. • Understand the practical applications of various protocols in the area of mobile computing. • Understand the importance of transaction processing systems. • Understand the importance of routing protocols	
Nature of Paper: Elective	
Minimum Passing Marks/Credits:40% Marks	
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Introduction to mobile computing, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.	**8**
II	Wireless Networking, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, WAP: Architecture, protocol stack, application environment, applications.	**8**
III	Data management issues, adaptive clustering for mobile wireless networks, data replication for mobile computers, File system, Disconnected operations.	8
IV	Mobile Agents computing, transaction processing in mobile computing environment, security and fault tolerance.	8
V	Ad-hoc networks, localization, MAC issues, QoS in Ad Hoc Networks, applications, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA).	8

Reference / Text Books:

1. Thampi - Mobile Communications and Computing ,Wiley
2. J. Schiller, Mobile Communications, Addison Wesley.
3. Charles Perkins, Mobile IP, Addison Wesley.
4. Charles Perkins, Ad hoc Networks, Addison Wesley.
5. Upadhyaya, “Mobile Computing”, Springer
6. Stojmenovic, Handbook of Wireless Networks and Mobile Computing, Wiley India.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course: Nil	

Course Learning Outcomes:

After completing the course, students should be able to:

CO-1Understand the basic concept of mobile computing and wireless computing & cellular concept. Learn about the cellular concept and channel allocation in cellular system.

CO-2 Understand the wireless networking and its Protocol. Understand the practical application of various protocols in the area of mobile computing.

CO-3 Understand the file system and data management issues in mobile computing

CO-4 Understand the Transaction processing system in mobile computing environment.

CO-5 Understand the mobile Ad-hoc Network (MANET) and Importance of different Routing Protocol in Mobile Computing.

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester I/II

Programme: PG **Class: M. Tech CSE**	Year: I Semester: I
Credits Theory:4 Practical:0	**Subject:** Software Project Management
Course Code: MECS-004	**Title:** Software Project Management

Course Objectives:

- In this course the students will learn the basic concepts and frameworks of Software Project Management (SPM)
- Students will understand the role that SPM has to play in effective business administration.
- It will provide an insight as to how to use the available resources as a tool to formulate and implement strategies in the field of software development.

Nature of Paper: Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction and Software Project Planning: Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, SPM Objectives, SPM Framework, Project Management Cycle, Management Spectrum, Project Plan, Structure of a Software Project Management Plan, Types of project plan, Software Project Planning, Planning Objectives, Software project estimation, Estimation models, Estimation methods, Decision process.	**8**
II	Project Organization and Scheduling: Project Elements, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.	**8**
III	Project Monitoring and Control: Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Cost Variance (CV), Schedule Variance (SV), Budgeted Cost for Work Scheduled (BCWS), Cost Performance Index (CPI), Schedule Performance Index (SPI), Error Tracking, Interpretation of Earned Value Indicators, Software Reviews, Types of Review: Walkthroughs, Inspections, Code Reviews, Deskchecks, Pair Programming.	**8**

IV	Software Quality Assurance and Testing Testing Objectives, Testing Principles, Test Strategies, Types of Testing, Levels of Testing, Test Plans, Test Cases, Program Verification & validation, Program Correctness, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process, The SEI Capability Maturity Model CMM).	8
V	Project Management and Project Management Tools Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis.	8

Reference / Text Books:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education.
3. Kieron Conway, Software Project Management, Dreamtech Press.
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment “A Systems Approach to Planning, Scheduling, and Controlling” Wiley
6. Mohapatra, Software Project Management, Cengage Learning.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course: Nil

Course Learning Outcomes:

After completing the course, students should be able to:

CO1.Evaluate project management techniques for IT projects to initiate, plan, execute and evaluate a project and work in teams to create a project plan for a project scenario.

CO2.Implement communication, modeling, construction & deployment practices in software development.

CO3.Implement different types of metrics (Cost Variance, Schedule Variance) used in software development.

CO4.Explain the concepts of various software testing methods & be able to apply appropriate testing approaches for development of software.

CO5.Present strategies for gaining confidence in managing projects through simple project planning.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-I

Programme: PG **Class: M. Tech CSE**	Year: I Semester: I
Credits Theory: 0 Practical: 2	**Subject:** Advanced Data Structures AndAlgorithms Lab
Course Code:MTCS-111P	**Title:** Advanced Data Structures AndAlgorithms Lab
Course Objectives: The objectives of studying this course are, The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:20% Marks	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Practical-1	Implementation of Array ADT and String ADT
Practical-2	Programs for Stack, Queues and Circular Queues using Arrays
Practical-3	Program to convert an Infix Expression into Postfix and Postfix Evaluation
Practical-4	Program to implement a Singly Linked List
Practical-5	Programs to implement Stack & Queues using Linked Representation
Practical-6	Programs implement Double Linked List and Circular Linked List
Practical-7	Program for Polynomial Arithmetic using Linked List
Practical-8	Program to implement Hashing
Practical-9	Programs to implement Insertion Sort, Selection Sort, Heap Sort, and Shell Sort
Practical-10	Program to implement Quick Sort and Merge Sort

Reference / Text Books:

1. Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
2. Data structures and Algorithms in Java, Adam Drozdek, 3rd edition,CengageLearning.
3. Data structures and Algorithms in Java, R.Lafore, Pearson education.
4. Java: The Complete Reference, 8th editon, Herbert Schildt, TMH.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	
Course Learning Outcomes: After the completion of the course the student will be able to CO1. Implement List ADTs and their operations CO2. Develop programs for sorting. CO3. Develop programs for implementing trees and their traversal operations. CO4. Implement graph traversal algorithms. CO5. Apply algorithm design techniques. CO6. Implement Stack & Queues using Linked Representation	

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester II

Programme: PG **Class: M. Tech CSE**	Year: 1 Semester:II
Credits Theory:4 Practical:	**Subject: ADVANCED DATABASE MANAGEMENT SYSTEM**
Course Code: **MTCS-121**	**Title: ADVANCED DATABASE MANAGEMENT SYSTEM**
Course Objectives: **The Student will Learn:** By the end of the course, you will know: History and Structure of databases How to design a database, How to convert the design into the appropriate tables Handling keys appropriately Enforcing Integrity Constraints to keep the database consistent Normalizing the tables to eliminate redundancies Querying relational data Optimizing and processing the queries Storage Strategies for easy retrieval of data through index Triggers, Procedures and Cursors ,Transaction Management Distributed databases management system concepts and Implementation	
Nature of Paper:Core	
Minimum Passing Marks/Credits:40% Marks	
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL,DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, ER diagrams,. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views –Altering Tables and Views, Relational Algebra, Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL, Triggers	**8**
II	Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND, THIRD Normal forms – BCNF –Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form.	**8**
III	Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking –	**8**

	Transaction Supportin SQL. Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking. Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery	
IV	Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks. TreeStructured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete. Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendable vs. Linear Hashing.	**8**
V	Distributed databases: Introduction to distributed databases, Distributed DBMS architectures, Storing data in a distributed DBMS, Distributed catalog management, Distributed query processing Updating distributed data, Distributed transactions, Distributed concurrency control, Distributed recovery	**8**

Reference / Text Books:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.

REFERENCE BOOKS:

1. Introduction to Database Systems, C.J.Date,Pearson Education.
2. Database Management System Oracle SQL and PL/SQL, P.K.Das Gupta, PHI.
3. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
4. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg, Pearson education.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
After completing the course, students should be able to:
CO1.Understand the fundamentals of relational database systems including: data models, database architectures and ER feature
CO2.Analyze and apply the different normalization techniques
CO3.Assess the basic issues of transaction processing and concurrency control.
CO4.Understand the roles that databases play in organizations and familiarize with basic database storage, file organization, database accessing techniques.
CO5.Understand the basics of query processing, object-oriented, distributed databases
CO6.Analyze non-relational database systems and structures and XML

Format-3

IIMTU-NEP IMPLEMENTATION
Year I /Semester II

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech CSE</td><td>Year: 1
Semester:II</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:0</td><td>Subject: ADVANCED COMPUTER ARCHITECTURE</td></tr>
<tr><td colspan="2">Course Code:
MTCS-122</td><td>Title: ADVANCED COMPUTER ARCHITECTURE</td></tr>
<tr><td colspan="3">Course Objectives:
The Student will Learn:
• Understand the micro-architectural design of processors.
• Learn about the various techniques used to obtain performance improvement.
• Learn about the various techniques used to obtain power savings in current processor.</td></tr>
<tr><td colspan="3">Nature of Paper:Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits:40% Marks</td></tr>
<tr><td colspan="3">L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Parallel computer models: The state of computing, Classification of parallel computers, Multiprocessors and Multicomputers, Multivector and SIMD computers.</td><td>8</td></tr>
<tr><td>II</td><td>Program and network properties and Principles of Scalable Performance: Conditions of parallelism, Program partitioning and scheduling, Program flow mechanisms, System Interconnect Architectures. Performance Metrics and Measures, Parallel processing applications, speedup performance laws, scalability analysis and approaches.</td><td>8</td></tr>
<tr><td>III</td><td>Processors and Memory Hierarchy: Advanced processor technology, Superscalar and Vector Processors, Vector processing principles, Memory hierarchy technology, virtual memory technology.</td><td>8</td></tr>
<tr><td>IV</td><td>Pipelining & Superscalar Techniques: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Arithmetic Pipeline Design, Superscalar and Superpipeline design.</td><td>8</td></tr>
<tr><td>V</td><td>Parallel & Scalable architectures: Multiprocessor system Interconnects, Cache coherence and synchronization mechanisms, message passing mechanisms, latency hiding techniques, principles of multithreading, scalable and multithreaded architecture</td><td>8</td></tr>
<tr><td colspan="3">Reference / Text Books:
1. Kai Hwang, “Advanced computer architecture”; TMH. 2000
2. J.P.Hayes, “Computer Architecture and organization”; MGH. 1998
3. V.Rajaranam & C.S.R.Murthy, “Parallel computer”; PHI. 2002
4. Stalling W, “Computer Organisation & Architecture”, PHI. 2000</td></tr>
</table>

5. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design"; Narosa Publishing. 1998 5. Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH.	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: **After completing the course, students should be able to:** CO1.Compare and contrast among different parallel computer models. CO2.Explain and calculate the Program and network properties CO3.Apply the different Principles of Scalable Performance of parallel computers CO4.Describe different Processors technologies and Memory Hierarchy. CO5.Explain Pipelining & Superscalar Techniques. CO6.Explain Parallel & Scalable architectures and their communication.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year:I / Semester: II

Programme: PG **Class: M. Tech CSE**	Year: I Semester:II
Credits Theory:4 Practical:	**Subject:** MOBILE Ad Hoc NETWORKS
Course Code:MTCS-123	**Title:** MOBILE Ad Hoc NETWORKS

Course Objectives: 1. To teach the design issues and different routing protocols for unicast and multicast routing protocols. 2. To give an idea about different transport layer and security solutions. 3. To make them understand the different energy management schemes and wireless sensor network architecture. 4. To analyze the different parameters using the network simulator.
Nature of Paper: Core
Minimum Passing Marks/Credits:40% Marks
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures allotted
I	INTRODUCTION Introduction - Fundamentals of wireless communication technology - The Electromagnetic spectrum - Radio propagation mechanisms - Characteristics of the wireless channel - IEEE 802.11a,b standard - Origin of Ad hoc: Packet radio networks - Technical challenges - Architecture of PRNETs - Components of packet radios - Adhoc wireless networks - Heterogeneity in mobile devices - Wireless sensor networks - Traffic profiles - Types of Ad hoc mobile communications - Types of mobile host movements - Challenges facing Ad hoc mobile networks - Ad hoc wireless internet	8
II	AD HOC ROUTING PROTOCOLS: Introduction - Issues in designing a routing protocol for Ad hoc wireless networks - Classifications of routing protocols - Table-Driven routing protocols - Destination Sequenced Distance Vector (DSDV) - Wireless Routing Protocol (WRP) - Cluster Switch Gateway Routing (CSGR) - Source-Initiated On-Demand approaches - Ad hoc On-Demand Distance Vector Routing (AODV) Dynamic Source Routing (DSR) - Temporally Ordered Routing Algorithm (TORA) - Signal Stability Routing (SSR) -Location-Aided Routing (LAR) - Power-Aware Routing (PAR) - Zone Routing Protocol (ZRP).	**8**
III	MULTICAST ROUTING IN AD HOC NETWORKS Introduction - Issues in designing a multicast routing protocol - Operation of	**8**

	multicast routing protocols - An architecture reference model for multicast routing protocols -Classifications of multicast routing protocols – TreeBased multicast routing protocols - Mesh-based multicast routing protocols - Summary of tree and mesh based protocols - Energy-efficient multicasting - Multicasting with quality of service guarantees – Applicationdependent multicast routing - Comparisons of multicast routing protocols.	
IV	TRANSPORT LAYER, SECURITY PROTOCOLS Introduction - Issues in designing a transport layer protocol for Ad hoc wireless networks - Design goals of a transport layer protocol for Ad hoc wireless networks -Classification of transport layer solutions - TCP over Ad hoc wireless networks - Other transport layer protocols for Ad Hoc wireless networks - Security in Ad hoc wireless networks - Network security requirements - Issues and challenges in security provisioning - Network security attacks - Key management - Secure routing in Ad hoc wireless networks.	**8**
V	QoS AND ENERGY MANAGEMENT Introduction - Issues and challenges in providing QoS in Ad hoc wireless networks - Classifications of QoS solutions - MAC layer solutions - Network layer solutions - QoS frameworks for Ad hoc wireless networks energy management in Ad hoc wireless networks -Introduction - Need for energy management in Ad hoc wireless networks - Classification of energy management schemes - Battery management schemes - Transmission power management schemes - System power management schemes.	**8**

Reference / Text Books:
Text books:
1. C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson Prentice-Hall, 2004.
2. C.K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols and Systems", Prentice-Hall of India, 2001.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
CO1: Define the fundamentals of Mobile ad-hoc Networks.
CO2. Understand and be able to use mobile computing more effectively.
CO3. Apply different routing technologies for designing a routing protocol.
CO4. Understand the MANETs and WSNs for industry and research point of views.
CO5. Identify and describe various types of applications for MANETs and WANS.
CO6. Demonstrate the ability to solve security related problems using a routing Protocol.

Format-3

IIMTU-NEP IMPLEMENTATION
Year – I /Semester-II

Programme: PG **Class: M. Tech CSE**	Year: I Semester: II
Credits Theory: 0 Practical: 2	**Subject:** Advanced Database Management System Lab
Course Code:MTCS-121P	**Title:** Advanced Database Management System Lab
Course Objectives: The objectives of studying this course are: The objective of this lab course is to understand the practical applicability of database management system concepts. Working on existing database systems, designing of database, creating relational database, analysis of table design. The lab course also provide practical knowledge to understand advanced database concepts such as Data mining and Big Data Analysis.	
Nature of Paper: Core	
Minimum Passing Marks/Credits:20% Marks	
L: 0 T: 0 P: 2 (n Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Practical	Contents
Practical-1	Basic SQL
Practical-2	Intermediate SQL
Practical-3	Advanced SQL
Practical-4	ER Modeling
Practical-5	Database Design and Normalization
Practical-6	Accessing Databases from Programs using JDBC
Practical-7	Building Web Applications using PHP & MySQL
Practical-8	Indexing and Query Processing
Practical-9	Query Evaluation Plans
Practical-10	Concurrency and Transactions

Reference / Text Books:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw hill, VI edition, 2006.
3. Introduction to Database Systems, C.J.Date,Pearson Education.
4. Database Management System Oracle SQL and PL/SQL, P.K.Das Gupta, PHI.
5. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
6. Database Systems, A Practical approach to Design Implementation and

<table>
<tr><th colspan="2">Evaluation/Assessment Methodology</th></tr>
<tr><td colspan="2" align="right">Max. Marks</td></tr>
<tr><td>1) Class tasks/ Sessional Examination
2) Presentations /Seminar
3) Assignments
4) Research Project Report Seminar On Research Project Report
5) ESE</td><td>20

30</td></tr>
<tr><td align="right">Total:</td><td>50</td></tr>
<tr><td colspan="2">Prerequisites for the course:</td></tr>
<tr><td colspan="2">Course Learning Outcomes: After the completion of the course the student will be able to:
CO1.Students get practical knowledge on designing and creating relational database systems.
CO2.Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, trigger, views and embedded SQL.
CO3.Use of various software to design and build ER Diagrams, UML, Flow chart for related database systems.
CO4.Students will be able to design and implement database applications on their ow
CO5.Students will be able to design and implement Concurrency and Transactions.</td></tr>
</table>

Format-3

IIMTU-NEP IMPLEMENTATION
Year:II /Semester:III

Programme: PG **Class: M. Tech CSE**	Year: II Semester:III
Credits Theory:4 Practical:	**Subject: Internet of Things**
Course Code: **MECS-005**	**Title: Internet of Things**

Course Objectives:

- Students will understand the concepts of Internet of Things and can able to build IoT applications.
- Design IoT applications in different domain and be able to analyze their performance

Nature of Paper: Department Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures allotted
I	Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network	8
II	Network & Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.	**8**
III	Challenges in IoT Design challenges, Development challenges, Security challenges, Other challenges	**8**
IV	Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications.	**8**
V	Developing IoTs Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python	**8**

Reference / Text Books:

Text books:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi“The Internet of Things key applications and protocols”, willey
2. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
3. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:**Computer Network**	
Course Learning Outcomes: CO1.Demonstrate basic concepts, principles and challenges in IoT. CO2.Illustrate functioning of hardware devices and sensors used for IoT. CO3.Analyze network communication aspects and protocols used in IoT. CO4.Apply IoT for developing real life applications using Ardunio programming. CO5.To develop IoT infrastructure for popular applications	

Format-3

IIMTU-NEP IMPLEMENTATION
Year:II/Semester:III

Programme: PG **Class: M. Tech CSE**	Year: II Semester:III
Credits Theory:4 Practical:	**Subject: Cloud Computing**
Course Code: **MECS-006**	**Title: Cloud Computing**

Course Objectives:
- To understand the concept and latest paradigm in the field of cloud computing.
- To get to know about the various security issues and challenges in cloud computing.

Nature of Paper: Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures allotted
I	**Introduction:** Introduction and Evolution of Computing Paradigms: History and Evolution, Introduction to Cloud Computing, Definition of Cloud, Existing usage of cloud computing, New paradigm in the cloud, Applications. Cloud Computing Architectural Framework: Cloud: Benefits, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Elasticity in Cloud – On-demand Provisioning.	8
II	**Enabling Technologies:** Service Oriented Architecture – REST and Systems of Systems, Web Services, Publish- Subscribe Model, Vendor Lock-in and Efforts at Standardization: Need of migration; Preventing vendor lock-in, Virtualization: Basics of virtualization, Server virtualization, VM migration techniques, Role of virtualization in cloud computing, pros and cons of virtualization, Virtualization Structures – Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.	**8**
III	**Cloud Architecture, Services and Storage:** Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds: Their benefits and challenges, Private vs Public cloud, laaS, PaaS, SaaS, Cloud Economics and Capacity Management: Restricted choices; Capacity planning; Queuing and response time, Architectural Design Challenges, Cloud Storage, Storage as a Service, Advantages of Cloud Storage – Cloud Storage Providers – S3, Data loss or leakage, Account or service hijacking	**8**
IV	**Resource Management and Security in Cloud:** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods, Overview of cloud Security: Explain the security concerns in Traditional	**8**

	IT, Challenges of cloud computing in terms of application security, server security, and network security, Cloud Reliability, Fault Tolerance and Response Time, Software as a Service Security, Security as a Service by cloud providers, Security Governance, Virtual Machine Security, IAM Security Standards.	
V	**Cloud Technologies and Advancements:** Classification of Cloud implementations: Amazon's cloud services (AWS), The Elastic Compute Cloud (EC2). The Simple Storage Service (S3), The Simple Queuing Services (SQS), Google AppEngine - PaaS, Windows Azure, Hadoop, MapReduce, Virtual Box, Open Stack, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Cloud software for private banking, Selection criteria for cloud deployment, Issues risk in cloud computing, Future technology trends in cloud computing.	**8**

Reference / Text Books:

Text books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:**Computer Network**

Course Learning Outcomes:

CO1.Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

CO2.Explain the core concept of Architecture and virtualization of cloud computing.

CO3.Apply fundamental concepts in cloud infrastructures to understand the service and storage in cloud.

CO4.Understand the fundamental concepts of cloud resource management

CO5.Understand the key security and compliance challenges of cloud computing

CO6.Analyze various cloud programming models and AWS.

Format-3

IIMTU-NEP IMPLEMENTATION
Year:II/Semester:III

Programme: PG **Class: M. Tech CSE**	Year: II Semester: III
Credits Theory:4 Practical:	**Subject: Compiler Design**
Course Code: MECS-007	**Title: Compiler Design**

Course Objectives:

- To understand the concept / fundamentals of parsing and the implement different parsing techniques.
- To get to know the various code optimization procedures

Nature of Paper: Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures allotted
I	**Introduction to Compiler:** Introduction to compiling: Compilers, Analysis of the source program, Phases and passes, Pass Structure, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Lexical Analysis: Lexical Analyzer, Role, Design Approach, Implementation, LEX Capabilities, Regular Expressions: Transition Diagrams, Finite state Machines. Syntactic Specifications of Programming Languages: CFG, Derivation, Parse tree, Ambiguity, Capabilities, LEX compiler, Syntax Analysis: Need for syntax analysis and its scope, BNF notation, YACC.	8
II	**Basic Parsing Techniques:** Parsers, Shift reduce parsing, operator precedence parsing, top Top-Down parsing with backtracking, backtracking and their automatic generation,, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing, panic mode error recovery and error recovery in YACC tool	**8**
III	**Syntax-directed Translation:** Need for various static semantic analysis in declaration processing, Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, Syntax Directed translation mechanism, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top	**8**

	down parser. Array References in arithmetic expressions, procedures call, declarations and case statements, Type checking, Language features influencing run time memory management.	
IV	**Symbol Tables:** Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Symbol Table management, Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	**8**
V	**Code Optimization and Code Generation:** Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**8**

Reference / Text Books:

Text books:

1. Alfred, V.A., Ullman, J.D., Principles of Compiler Design, Narosa Publishing House.
2. Aho, A.V., Sethi, R. and Ullman, J.D, Compiler: Principle, Techniques and Tools, Addison-Wesley.
3. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill,2003.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

CO1.To explains the different phases and passes of compiler and eventually recognize patterns, tokens and regular expressions.
CO2.To implement the concept of parsers and construct the parsing tables
CO3.To illustrate and create the intermediate code
CO4.To analyze and implement compiler by Syntax-directed Translation schemes.
CO5.To summarize the knowledge of various parsers and parsing techniques.
CO6.To integrate the concept of code generation and code optimization.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II /Semester: III

Programme: PG **Class: M. Tech CSE**	Year: II Semester: III
Credits Theory:4 Practical:	**Subject: Software Testing and Audit**
Course Code:MECS-008	**Title: Software Testing and Audit**

Course Objectives:
1. To study fundamental concepts in software testing
2. To discuss various software testing issues and solutions in software unit test, integration and system testing.
3. To expose the advanced software testing topics, such as object-oriented software testing methods.

Nature of Paper: Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures allotted
I	**Review of Software Engineering**: Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths. **Verification:** Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.	8
II	**Functional Testing:** Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. **Structural Testing**: Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing.	**8**
III	**Regression Testing:**: What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique. **Reducing the number of test cases:** Prioritization guidelines, Priority category, Scheme, Risk Analysis.	**8**
IV	**Software Testing Activities:** Levels of Testing, Debugging, Testing	**8**

	techniques and their Applicability, Exploratory Testing **Automated Test Data Generation:** Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.	
V	**Object oriented Testing:** Definition, Issues, Class Testing, Object Oriented Integration and System Testing. **Testing Web Applications:** What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.	**8**

Reference / Text Books:

1. Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012
2. K..K. Aggarwal&Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi,2001.
4. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, "Software System Testing and Quality Assurance", Van NostrandReinhold, New York, 1984.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:**Computer Network**

Course Learning Outcomes:

CO1.Understand and describe the basic concepts of Review of Software Engineering and verification methods

CO2.Understand and describe the basic concepts of Functional Testing and structural testing

CO3.Identify a number of test styles and techniques and assess their usefulness in your context.

CO4.Understand the basic application of techniques used to identify useful ideas for tests.

CO5.Help determine the mission and communicate the status of your testing with the rest of your project team.

CO6.Characterize a good bug report, peer-review the reports of your colleagues, and improve your own report writing.

CO7.Understand the concept of Object oriented Testing and Testing Web Applications.

IIMTU-NEP IMPLEMENTATION
Year: II /Semester: III

Programme: PG **Class: M. Tech CSE**	Year: II Semester:III
Credits Theory:4 Practical:	**Subject: Neural Network**
Course Code:MECS-009	**Title: Neural Network**
Course Objectives: Neural network, a computer program that operates in a manner inspired by the natural neural network in the brain. The objective of such artificial neural networks is to perform such cognitive functions as problem solving and machine learning.	
Nature of Paper: Elective	
Minimum Passing Marks/Credits:40% Marks	
L:3 T:1 P:0(In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures allotted
I	**Neuro Computing and Neuroscience** Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.	8
II	**Data processing** Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.	**8**
III	Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.	**8**
IV	Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.	**8**
V	Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.	**8**

Reference / Text Books:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD,Cengage Learning

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

CO1.Understand and explore Neural Network applications.
CO2.Describe the differences between a computer and a Neural Network.
CO3.Understand the basic operation of the neurons in the brain.
CO4.Describe the basic elements of an artificial neuron.
CO5.Understand the basic operation Neuro Computing and Neuroscience
CO6.Understand the basic concept of Data processing

Format-3

IIMTU-NEP IMPLEMENTATION
Year:II/Semester:III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech CSE</td><td colspan="2">Year: II
Semester:III</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:</td><td colspan="2">Subject: Data Compression</td></tr>
<tr><td colspan="2">Course Code:MECS-010</td><td colspan="2">Title: Data Compression</td></tr>
<tr><td colspan="4">Course Objectives:
Data compression is a reduction in the number of bits needed to represent data. Compressing data can save storage capacity, speed up file transfer and decrease costs for storage hardware and network bandwidth.</td></tr>
<tr><td colspan="4">Nature of Paper: Elective</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits:40% Marks</td></tr>
<tr><td colspan="4">L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td colspan="2">Contents</td><td>No. of Lectures allotted</td></tr>
<tr><td>I</td><td colspan="2">Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.</td><td>8</td></tr>
<tr><td>II</td><td colspan="2">The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.</td><td>8</td></tr>
<tr><td>III</td><td colspan="2">Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.</td><td>8</td></tr>
<tr><td>IV</td><td colspan="2">Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.</td><td>8</td></tr>
</table>

V	Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.	**8**

Reference / Text Books:
1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition,KhalidSayood,The Morgan aufmannSeries
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
CO1.To gain a fundamental understanding of data compression methods for text, images, and video, and related issues in the storage, access, and use of large data sets
CO2.To gain a fundamental understanding of data compression methods for text, images, and video, and related issues in the storage, access, and use of large data sets
CO3.To illustrate the concept of various algorithms for compressing text, audio, image and video information.
CO4.To understand various Distortion criterias
CO5.To illustrate the Advantages of Vector Quantization over Scalar Quantization.

Format-3

IIMTU-NEP IMPLEMENTATION
Year:II/Semester:III

Programme: PG **Class: M. Tech CSE**	Year: II Semester:III
Credits Theory:4 Practical:	**Subject: Pattern Recognition**
Course Code:MECS-011	**Title: Pattern Recognition**

Course Objectives:
This course covers the techniques and gain proficiency of pattern recognition that are fundamental to a wide variety of application areas such as medical research, biometrics, computer vision, etc.

Nature of Paper: Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures allotted
I	**Introduction:** Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.	8
II	**Statistical Patten Recognition:** Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,	**8**
III	**Parameter estimation methods:** Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.	**8**
IV	**Nonparametric Techniques:** Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.	**8**
V	**Unsupervised Learning & Clustering: 8** Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.	**8**

Reference / Text Books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:**Computer Network**	
Course Learning Outcomes: CO1.Study of basics of Pattern recognition. Understand the designing principles and Mathematical foundation used in pattern recognition. CO2.Analysis the Statistical Patten Recognition. CO3.Understanding the different Parameter estimation methods CO4.Understanding the different Nonparametric Techniques. CO5.Understand and Make use of unsupervised learning and Clustering in Pattern recognition.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year:II/Semester:III

Programme: PG **Class: M. Tech CSE**	Year: II Semester:III
Credits Theory:4 Practical:	**Subject: Semantic Webs and Web**
Course Code:MECS-012	**Title: Semantic Webs and Web**

Course Objectives:
The Semantic Web aims to enrich the Web with a layer of machine-interpretable metadata so that computer programs can predictably derive new information.

Nature of Paper: Elective

Minimum Passing Marks/Credits:40% Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures allotted
I	Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.	8
II	Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, quering in RQL, URI	**8**
III	Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.	**8**
IV	Semantics: Kinds of semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers	**8**
V	Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules	**8**

Reference / Text Books:

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
Seminar On Research Project Report	70
5) ESE	
Total:	100
Prerequisites for the course:**Computer Network**	

Course Learning Outcomes:

CO1.Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web.

CO2.Understand the concepts of Web Science, semantics of knowledge and resource, ontology.

CO3.Understand the concepts XML with Document Type Definitions and Schema

CO4.Understand the concepts Role of Ontology in intelligent information retrieval on web

CO5.Use ontology engineering approaches in semantic applications

CO6.Learn Web graph processing for various applications such as search engine, community detection

CO7.Program web applications and graph processing techniques using Python.

Format-3

IIMTU-NEP IMPLEMENTATION
Year:II/Semester:III

Programme: PG **Class: M. Tech CSE**	Year: II Semester:III
Credits Theory:4 Practical:	**Subject: High Performance Computing**
Course Code:MECS-013	**Title: High Performance Computing**

Course Objectives:
1. To Study various computing technology architecture.
2. To know Emerging trends in computing technology.
3. To highlight the advantage of deploying computing technology.

Nature of Paper: Elective

Minimum Passing Marks/Credits:40 % Marks

L:3 T:1 P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures allotted
I	Overview of Grid Computing Technology, History of Grid Computing, High Performance Computing, Cluster Computing. Peer-to-Peer Computing, Internet Computing, Grid Computing Model and Protocols, Types of Grids: Desktop Grids, Cluster Grids, Data Grids, High- Performance Grids, Applications and Architectures of High Performance Grids, High Performance Application Development Environment.	8
II	Open Grid Services Architecture, Introduction, Requirements, Capabilities, Security Considerations, GLOBUS Toolkit.	**8**
III	Overview of Cluster Computing, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware and SSI, Resource Management and Scheduling, Programming, Environments and Tools, Cluster Applications, Cluster Systems,	**8**
IV	Beowulf Cluster: The Beowulf Model, Application Domains, Beowulf System Architecture, Software Practices, Parallel Programming with MPL, Parallel Virtual Machine (PVM).	**8**
V	Overview of Cloud Computing, Types of Cloud, Cyber infrastructure, Service Oriented Architecture Cloud Computing Components: Infrastructure, Storage, Platform, Application, Services, Clients, Cloud Computing Architecture.	**8**

Reference / Text Books:

1. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley
2. Ahmar Abbas, "Grid Computing: Practical Guide to Technology & Applications", Firewall Media, 2004.
3. Joshy Joseph and Craig Fellenstein , "Grid Computing" Pearson Education, 2004.
4. lan Foster, et al.,"The Open Grid Services Architecture", Version 1.5 (GFD.80). Open Grid Forum, 2006.
5. Ian Foster. Globus Tool kit Version 4: Software for Service-Oriented Systems. IFIP International Conference on Network and Parallel Computing, Springer- Verlag LNCS 3779, pp 2-13,2006
6. Rajkumar Buyya. High Performance Cluster Computing: Architectures and Systems. Prentice-Hall India, 1999.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course: **Computer Network**

Course Learning Outcomes:

CO1.Student will be able to understand architecture of computing technology.

CO2.Student will be able to know cloud computing service models.

CO3.Know about emerging trends in computing technology.

CO4.Student will be able to know Cyber infrastructure, Service Oriented Architecture Cloud Computing Components

School of Engineering & Technology

ACADEMIC HAND BOOK

POSTGRADUATE DEGREE COURSE IN
CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Evaluation Scheme

POSTGRADUATE DEGREE COURSE IN

CONSTRUCTION TECHNOLOGY AND MANAGEMENT

M. Tech. in CTM

First Year, First Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTCT-111	Construction Management and Equipment	4	0	0	4	20	10	70	--	--	100
2	MTCT-112	Concrete Construction Technology	4	0	0	4	20	10	70	--	--	100
3	MTCT-113	Construction Laws and Regulations	4	0	0	4	20	10	70	--	--	100
4	DECT-111	Environmental Impact Assessment	4	0	0	4	20	10	70	--	--	100
	DECT-112	Recent Advances in Construction Materials										
5	MTCT-114 P	Computational Laboratory for Construction Management Lab	--	--	4	2	--	--	--	20	30	50
6	*NECC-111	Industrial Visits/Seminar on the reports of visit	--	--	--	--	--	--	--	25	--	--
7	*NECC-112	University Social Responsibility	--	--	--	--	--	--	--	25	--	--
8	NECC-114	MOOCS/Swayam	--	--	--	2	--	--	--	50	--	50
Total						20	80	40	280	70	30	500

*Note: NECC-111 &NECC-112 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Students need to qualify it but the marks will not be added in total marks.

M. Tech. in Construction Technology & Management
First Year, Second Semester

S. No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTCT-121	Construction Planning Scheduling and Control	4	0	0	4	20	10	70	--	--	100
2	MTCT-122	Quality Management and Safety Management Systems in Construction	4	0	0	4	20	10	70	--	--	100
3	MTCT-123	Form Work for Construction Structures	4	0	0	4	20	10	70	--	--	100
4	DECT-123	Resource Management and Control In Construction	4	0	0	4	20	10	70	--	--	100
	DECT-124	Disaster Reduction and Management										
5	MTCT-124 P	Quality Control in Construction Lab	--	--	4	2	--	--	--	20	30	50
6	*NECC-121	Industrial Visits/Seminar on the reports of visit	--	--	--	--	--	--	--	25	--	--
7	*NECC-122	University Social Responsibility	--	--	--	--	--	--	--	25	--	--
8	NECC-124	MOOCS/Swayam	--	--	--	2	--	--	--	50	--	50
		Total				20	80	40	280	70	30	500

*Note: NECC-121 &NECC-122 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student needs to qualify it but the marks will not be added in total marks.

M. Tech. in Construction Technology & Management
Second Year, Third Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	DECT-235	Construction Economics & Finance	4	0	0	4	20	10	70	--	--	100
	DECT-236	Infrastructure Valuation										
2	DECT-237	MANAGEMENT INFORMATION SYSTEMS	4	0	0	4	20	10	70	--	--	100
	DECT-238	STRATEGIC MANAGEMENT OF CONSTRUCTION										
3	MTCT-231	Seminar	--	--	8	4	--	--	--		200	200
4	MTCT-232	Dissertation(Phase-I)/Synopsis	--	--	12	6	--	--	--	80	120	200
5	*NECC-231	Industrial Visits/Seminar on the reports of visit	--	--	--	--	--	--	--	25	--	--
6	*NECC-232	University Social Responsibility	--	--	--	--	--	--	--	25	--	--
7	NECC-234	MOOCS/Swayam	--	--	--	2	--	--	--	50	--	50
		Total				20	40	20	140	150	320	650

*Note: NECC-231 &NECC-232 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Students need to qualify it but the marks will not be added in total marks.

M. Tech. in Construction Technology & Management
Second Year, Fourth Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTCT-241	Dissertation(Phase-II)	--	--	16	8	--	--	--	80	120	200
2	MTCT-242	Comprehensive Viva			8	4	--	--	--	40	60	100
		Total			24	12				120	180	300

Format-1

Format-1

CBCS: Statement of Credit distribution	
College/School: School of Engineering & Technology Programme: M.Tech Duration: 4 Semester Annual/Semester: Semester	Credit range: 72-80 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr) or	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	18	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)			DSE-I(4)		
II	20	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)		SEC-1(2)	DSE-II(4)		
Provision to change the core papers							
III	20			SEC-1(2)	DSE-III(4) DSE-IV(4)		Seminar-1 (04) Dissertation Phase-I(06)
IV	12						Comprehensive Viva(04) Dissertation Phase-II(08)
Total Credits	**70**	06(Th)*4(Cr) = 24 02 (Pr)*2(Cr) = 04 **Total = 28**		2*2= 04 **= 04**	4(Th)*4(Cr)= 16 **= 16**		04+06 = 10 04+08 = 12 **=22**

Format-2

(M.TECH IN CTM) **Format-2**

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES M.Tech. in CTM	**FIRST YEAR**	**SEMESTER -I**	i) C1 (Th.4 Cr. + P. 2 Cr.)	4 2	4 4	40 16	Construction Management and Equipment Computational Laboratory for Construction Management Lab	5		
			ii) C2(Th.4 Cr.).	4	4	40	Concrete Construction Technology	5		
			iii)C3 (Th.4 Cr.)	4	4	40	Construction Laws and Regulations	5		
			iv) DSE 1 (Th.4 Cr.)	4	4	40	Environmental Impact Assessment Or Recent Advances in Construction Materials	5		
			v) SEC I	2	-	-	MOOCS/ Swayam			
		SEMESTER - II	i) C4 (Th.4 Cr.+ P2 Cr.)	4 2	4 4	40 32	Construction Planning Scheduling and Control Quality Control in Construction Lab	5 5		
			ii) C5 (Th.4Cr.)	4	4	40	Quality Management and Safety Management Systems in Construction	5		
			iii) C6 (Th.4Cr.)	4	4	40	Form Work for Construction Structures	5		
			iv) DSE 2 (Th.4Cr.)	4	4	40	Disaster Reduction and Management Or Resource Management and Control in Construction	5		
			v) SEC I	2	-	-	MOOCS/ Swayam			

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semester break**

Programme Outcome:

Annexure I

Programme Specific Outcome:

Annexure II

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR	SEMESTER -III	i) DSE 3 (Th. 4 Cr.)	4	4	40	Construction Economics & Finance or Infrastructure Valuation	5		
			ii) DSE 4 (Th. 4 Cr.)	4	4	40	Strategic Management of Construction Or Management Information Systems.	5		
			iii) Seminar (P. Cr 4)	4	8	40	Seminar	-		
			iv) Dissertation (Phase I)/Synopsis (P. Cr.6)	6	12	40	Dissertation (Phase-I)/Synopsis	-		
		SEMESTER -IV	i) Dissertation (Phase-II) (P. Cr. 8)	8	16	40	Dissertation (Phase-II)	-		
			ii) Comprehensive Viva (P.Cr.4)	4	8	30	Comprehensive Viva	-		
			-	-	-	-	-	-	-	-

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semesters break**

Annexure I

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and

Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Annexure II

PSO1: Developing systems, components, or processes in multiple areas of building technology and management.

PSO2: Investigate and solve complex construction management problems. Use and develop innovative tools and methods suitable for the field of building technology and management.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: I

Programme: PG **Class: M. Tech in CTM**	Year: **I** Semester: I
Credits Theory: 4 Practical:0	**Subject: Construction Management and Equipment**
Course Code: MTCT-111	**Title: Construction Management and Equipment**

Course Objectives:
1. Main objective of this course to discuss the principles of management and their functions in construction organizations.
2. Knowledge of organization's working procedures and organizational developments and group decision making.
3. Identify quality of team leader and qualities of project leader.
4. Find out the main objective of construction equipment's.
5. We can easily deals with all management work in construction.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Factors affecting selection of equipment - technical and economic	8
II	construction engineering fundamentals, Analysis of production outputs and costs,	8
III	Characteristics and performances of equipment for Earth moving,	8
IV	Erection, Material transport, Pile driving, Dewatering,	8
V	Concrete construction (including batching, mixing, transport, and placement) and Tunneling.	8

Reference / Text Books:
Text Books-

1. Robert wade Brown, Practical foundation engineering hand book, McGraw Hill Publications, 1995
2. Patrick Powers .J, Construction Dewatering: New Methods and Applications John Wiley & Sons, 1992
3. Jerry Irvine, Advanced Construction Techniques CA Rockers, 1984
4. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder.C, Construction Planning Equipment and Methods, McGraw Hill. Singapore 1995
5. Sharma S.C. Construction Equipment and Management, Khanna Publishers, Delhi, 1988

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Section 2f & 12B

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

1. To understand management fundamentals to leverage management capabilities in construction.
2. To build planning strategies and guidelines.
3. To Review an organization and conduct group work within the organization.
4. To explain the beneficial use of construction equipment's.
5. To explain all management of construction.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: I

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: I
Credits Theory: 4 Practical:0	**Subject: Concrete Construction Technology**
Course Code: MTCT-112	**Title: Concrete Construction Technology**

Course Objectives:
1. Understand the theoretical concept of Concrete material which includes Cement, Admixtures and Aggregates.
2. Learn different types of aggregates, admixtures & know the mechanism of hydration of cement.
3. Design different types of structures and to detail the structures.
4. Understand the concept of mix design of concrete& its importance in estimation of composition of materials.
5. Knowledge about various types of special concretes & its application.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction of Concrete materials, Admixtures, Fly Ash, Polymers, Early Age Properties, Strength, Permeability & Durability. Principles of Concrete mix design, Concrete Mix Design procedure by: IS/ACI/British Standards. Concreting Operations-Practices and Equipment, Batching; Mixing; Transporting; Placing and Compacting; curing. Properties and technique of construction for concrete, Fiber reinforced concrete, light weight concrete, heavy weight concrete, Foam concrete, High performance Concrete.	8
II	Special concrete operations, shot Crete, grouting, Grunting, under water concreting, hot and cold weather concrete, pump bale concrete.	8
III	Construction techniques for reinforced concrete elements-materials, Principles and procedures for beams, slabs, columns, Foundations, walls and tanks, design and fabrication of form work for R.C.C elements.	8
IV	Prestressed concrete construction-Principle, methods, materials, Tools and equipment for the construction of a prestressed bridge	8
V	Inspection and Quality Control of Concrete Construction-Stages, Principles, Checklist, Statistical Controls, procedures.	8

BOS

Reference / Text Books: **Text Books-** 1. Concrete Technology by M. S. Shetty, S Chand, New Delhi-110055. 2. Concrete Technology by M. L. Gambhir, Tata McGraw-Hill. **Concrete Technology Reference Books:** 1. Properties of concrete by A. M. Neville, Longman Publishers. 2. Concrete Technology by R.S. Varshney, Oxford, and IBH. 3. Concrete technology by A. M. Neville, J.J. Brooks, Pearson. 4. Ferro cement Construction Manual by Dr. D. B. Divekar-1030, Shivaji Nagar, Model Colony, Pune.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:
Course Learning Outcomes: 1. To understand the properties of the components of concrete. 2. To describe the physical & mechanical attributes of aggregates. 3. To analyze the behavior of concrete in fresh and cured conditions, describing and conducting tests related to the use of concrete on construction sites. 4. To explain the factors that affects the strength of concrete. 5. To review the factors that influence concrete mixes and understand the BIS method of mix design.

IIMTU-NEP IMPLEMENTATION
Year: I / Semester I

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in CTM</td><td>Year : I
Semester: I</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical:0</td><td>Subject: Construction Laws and Regulations</td></tr>
<tr><td colspan="2">Course Code: MTCT-113</td><td>Title: Construction Laws and Regulations</td></tr>
<tr><td colspan="3">Course Objectives:
The objective of this course is to take an advanced look at the legal principles of construction law and how it applies to engineering and project management and to explore best practices of dispute resolution as it relates to project management.
1. General principles of construction law including completion, defects, retention, certification, licensing and contract provisions.
2. Practical focus upon legal concepts applicable to the construction industry.
3. Relevant provisions of standard form building contracts.
4. Contractual relationships in the engineering and construction industry and the actions that result in disputes. Major emphasis is on the principal contractual relationships (owner-contractor, owner-architect/engineer, contractor subcontractor, and architect/engineer-consultant)
5. Legal issues and business issues that impact project management.</td></tr>
<tr><td colspan="3">Nature of Paper: CORE</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks/4</td></tr>
<tr><td colspan="3">L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>CONSTRUCTION CONTRACTS
Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability –Design of Contract Documents – International Contract Document – Standard Contract Document– Law of Torts.</td><td>8</td></tr>
<tr><td>II</td><td>TENDERS
Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Andhra Pradesh Transparency in Tenders Act.</td><td>8</td></tr>
<tr><td>III</td><td>ARBITRATION
Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence –Enforcement of Award – Costs.</td><td>8</td></tr>
</table>

IV	LEGAL REQUIREMENTS Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land –Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and theirInfluence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law– Local Government Laws for Approval – Statutory Regulations.	8
V	LABOUR REGULATIONS Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Andhra Pradesh Factory Act – Child Labour Act - Other Labour Laws.	8

Reference / Text Books:

Text Books-

1. Gajaria G.T., Laws Relating to Building and Engineering Contracts in India,
2. Jimmie Hinze, Construction Contracts, McGraw Hill, 2001.
3. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. To understand knowledge about legal Terms commonly used in the Construction Industry.
2. To explain General Structure of the U.S. Legal and Regulatory System.
3. To analyze well knowledge about construction contract, roles and responsibilities of the parties.
4. To build regulatory environment and licenses.
5. To build an environment which is avoids disputes in administrative procedures.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester 1

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: I
Credits Theory: 4 Practical:0	**Subject: Environmental Impact Assessment**
Course Code: DECT-111	**Title: Environmental Impact Assessment**

Course Objectives:

1. Appreciate the purpose and role of EIA in the decision-making process.
2. We provide the knowledge and professional skills necessary to conduct environmental impact assessments.
3. A series of environmental impact assessment studies.
4. Interpret options for evaluating environmental and social impacts.
5. Know formats of EIA Report (Environmental Impact Statement, or Environmental Statement).
6. Provides students with an understanding of the historical development of impact assessment in selected regions of the world

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Role of EIA as a tool for Sustainable Development. Concept of Carrying Capacity and Limits to growth in terms of population, Food, Resources, Capital, Energy, Land Services etc.	8
II	Impact Assessment: Environmental, Social and Economic issues, Issues in collection of baseline data, preliminary concept of Natural Resource Accounting,	8
III	Concept of Screening, Initial environmental examination (IEE), Environmental Impact Assessment (EIA	8
IV	), Environmental Impact Statement (EIS), and Strategic Environmental Assessment., Rapid and Comprehensive EIA. Methodologies: Including Checklists, Matrices and Networks, EIA: Case studies and Issues.	8
V	Procedures for Environmental Clearance by the Government of India, Mitigation Strategies, Environmental Management, Appropriate Setting of Industries and Projects for minimizing impacts. Concept of Zoning Atlas.	8

Reference / Text Books:

Text Books-

1. Environmental Impact Assessment - Larry, W. Canter McGraw-Hill.

BOS

2. Introduction to Environmental Impact Assessment - John Glasson, R. Theriveland A. Chandwic, Routledge, Taylor & Francis.
3. Methods of Environmental Impact Assessment - Peter Morris, Riki Therivel, Routledge, Taylor & Francis.
4. A Practical Guide to Environmental Impact Assessment - Paul, A Erickson, CBS Publishers & Distributors Pvt Ltd.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
1. To explain critically consider the assumptions inherent in impact assessments.
2. To develop skills to identify and solve problems.
3. To select the purpose of developing follow-up procedures, and options for designing these procedures.
4. To examine strengths & limitations of environmental management.
5. To understand screening & scoping processes.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I /Semester 1

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: I
Credits Theory: 4 Practical: 0	**Subject: Recent Advances in Construction Materials**
Course Code: DECT-112	**Title: Recent Advances in Construction Materials**

Course Objectives:

- It focuses on the principles of sustainable construction and demolition waste management and resource efficiency.
- Study of the impact of building materials on the environment; Development and development of waste management plans before and on site.
- Raise awareness of construction methods for substructures of heavy structures in a variety of environments.
- Knowledge about advance equipment and techniques.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Foams and lightweight materials, fibre reinforced concrete. Types of fibres, workability, mechanical and physical properties of fibre reinforced concrete.	8
II	Industrial waste materials in concrete, their influence on physical and mechanical properties and durability of concrete, Concrete at high temperature. High strength concrete. Changes in concrete with time, Corrosion of concrete in various environments.	8
III	Corrosion of reinforcing steel. Electro-chemical process, measures of protection. Ferro-cement, material and properties.	8
IV	Polymers in Civil Engineering Polymers, fibres and composites, Fibre reinforced plastic in sandwich panels, modeling. Architectural use and aesthetics of composites. Adhesives and sealants.	8
V	Structural elastomeric bearings and resilient seating. Moisture barriers, Polymer foams and polymers in Building Physics. Polymer concrete composites.	8

Reference / Text Books:

Text Books-

1. Metha P.K and Monteiro. P.J.M, “CONCRETE", Microstructure, Properties and Materials, Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi, 2006

2. Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006
3. Neville. A.M. , " Properties of Concrete", 4th Edition Longman,1995
4. Mindass and Young, “Concrete", Prentice Hall.1998

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. To identify different building materials and choose the right building material type for your situation.
2. To explain about various traditional building materials and new materials in civil engineering.
3. To evaluate the right color for the right type of flooring, arch geometry, plaster, and building redecoration.
4. Assessment of suitability and sustainability of materials for construction projects
5. To select the advantage of the latest advances in building technology.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I /Semester I

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: I
Credits Theory: 0 Practical:3	**Subject: Computational Laboratory for Construction Management Lab**
Course Code: MTCT-114P	**Title: Computational Laboratory for Construction Management Lab**

Course Objectives:
- The objective of this course is to make students to learn principles and design of structures.
- Main object of this lab to save a time of many calculation of construction work.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 2 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical-1	Planning and Scheduling of Multi storied building	3
Practical-2	Planning and scheduling of Road Project	3
Practical-3	Prepare the resource sheet, assign and level the resource	3
Practical-4	Preparing different reports available in Primavera	3
Practical-5	Plot the variance graphs for the given Project	3

Reference / Text Books:
Text Books- NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50

Prerequisites for the course:

Course Learning Outcomes:
- To explain all the details of furniture and stairs in the form of drawings.
- To evaluate detailed building plans with height and section height.
- To use computer software to transfer blueprints for buildings.

IIMTU-NEP IMPLEMENTATION
Year: I /Semester: II

Programme: PG **Class: M. Tech in CTM**	Year: **I** Semester: **II**
Credits Theory: 4 Practical:2	**Subject: Construction Planning Scheduling and Control**
Course Code: MTCT- 121	**Title: Construction Planning Scheduling and Control**

Course Objectives:
1. Students shall be able to Plan Bar Chart, CPM chart, PERT chart material requirement schedule, Manpower schedule, Machinery Schedule.
2. Student shall be able to carry out manpower resources leveling and smoothing.
3. Overview of Construction Management and Present Status of Construction Industry.
4. The course also focuses on creating a viable schedule while applying the industry standard software, Primavera P6, for project planning and scheduling.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks / 4

L: 4
T: 0
P: 2 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	UNDERSTANDING PROJECT MANAGEMENT: Project manager, organization structures, organizing and staffing the project office and team	8
II	MANAGEMENT FUNCTIONS: Directing, controlling, project authority, interpersonal influences, barriers, team building, communication, time management, conflicts	8
III	CONSTRUCTION PLANNING:Project planning, milestone schedules, WBS , Network techniques, CPM, PERT and Prima Vera, Resources leveling and smoothing.	8
IV	COST CONTROL: Understanding control, operating cycles, cost account codes, Job cost report, Projected Cost Estimates, status reporting, variance and earned value.	8
V	PROJECT MANAGEMENT INFORMATION SYSTEM : MIS reporting, Daily, Weekly and monthly reporting, Actual vs. Planned cost reports, Planning & Cost control document. Quality and safety	8

Reference / Text Books:
Text Books-

1. Harold Kerzner Project Management CBS Publisers& Distributors 2nd Edition.
2. Frank Harris & Ronald McCaffer Modern Construction Management Blackwell science 4th

Edition.

3. Roy Pilcher Principles of Construction Management McGraw Hill London.13Calin M. Popescu, Chotchai.
4. Charoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	30
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. To create a schedule for the project, create a baseline for the schedule, consolidate scheduling resources, and Plan your baseline.
2. To understand the theory and principles of planning, scheduling and control.
3. To Uses industry-standard planning software, Primavera, P6
4. To describe the knowledge about project outcomes with project planning, scheduling, and control.
5. To explain what risk is and improve project outcomes with project risk management.

IIMTU-NEP IMPLEMENTATION
Year: I /Semester: II

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: **II**
Credits Theory: 4 Practical:0	**Subject: Quality Management and Safety Management Systems in Construction**
Course Code: MTCT- 122	**Title: Quality Management and Safety Management Systems in Construction**
Course Objectives: 1. Understand the elements of quality planning and the implication. 2. Become aware of objectives and advantage of quality assurance. 3. Study the relationship between quality and safety management. 4. Safety is very important on construction site, which is learning from this course. 5. Main objective to find out the best quality for construction.	
Nature of Paper: CORE	
Minimum Passing Marks/Credits: 40% Marks/4	
L: 4 T: 0 P: 0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**QUALITY MANAGEMENT: Introduction** – Definitions and objectives – Factors influencing construction quality –Responsibilities and authority – Quality plan – Quality Management Guidelines – Quality circles.	8
II	**QUALITY SYSTEMS: Introduction** - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification. 14	8
III	**QUALITY PLANNING :** Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures -Processes and products – Total QA / QC programme and cost implication.	8
IV	**QUALITY ASSURANCE AND QULAITY IMPROVEMENT TECHNIQUES :** Objectives – Regularity agent, owner, design, contract and construction oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, Factors influencing construction quality – Critical, major failure aspects and	8

	failure mode analysis, –Stability methods and tools, optimum design – Reliability testing, Reliability coefficient and reliability prediction - Life cycle costing – Value engineering and value analysis. Quality Improvement Tools and Techniques.	
V	**SAFETY MANAGEMENT SYSTEMS :** Fundamental of safety management, construction safety, safety in scaffolding and working platform, welding and handling, excavation work, concreting and cementing work. Building construction, TAC and NBC rules, High rise building. Evolution of modern safety concept- Safety policy - Safety Organization. Safety survey, safety inspection, safety sampling, Safety Audit. Concept of an accident, Reportable and non reportable accidents, unsafe act and condition principles of accident prevention, Overall accident investigation process. Risk management	8

Reference / Text Books:

Text Books-

1. Hutchins.G, ISO 9000 : A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification, Viva Books Pvt. Ltd., 1994.
2. James, J.O' Brian, Construction Inspection Handbook – Total Quality Management, Van Nostrand, 1997
3. John L. Ashford, The Management of Quality in Construction, E &F.N.Spon, 1989.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. To create a management team for quality control.
2. To find out the best quality for construction work.
3. To design high quality construction projects from start to finish within budget, schedule and safety requirements.
4. To Analysis, evaluation, and selection of computer applications for efficient and effective project management.
5. To find out the course duration with best quality construction materials.

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: **II**
Credits Theory: 4 Practical:0	**Subject: Form Work for Construction Structures**
Course Code: MTCT- 123	**Title: Form Work for Construction Structures**

Course Objectives:
1. Students will be familiar with the technology of major construction as outlined in the listed topic headings.
2. Students will be able to describe, analyze, compare and evaluate the technology of high-rise construction and be aware of some of the problems that can be associated with poor management of construction projects.
3. Well knowledge about the quantity of materials.
4. Find out the volume of all materials.
5. To provide stable work place for construction.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**PLANNING, SITE EQUIPMENT & PLANT FOR FORM WORK** Introduction - Forms for foundations, columns, beams walls etc., General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction -Planning examples. Overall Planning - Detailed planning - Standard units - Corner units - Pass units - Calculation of labour constants - Formwork hours - Labour Requirement - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan -Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork - Formwork accessories.	8
II	**MATERIALS ACCESSORIES PROPRIETARY PRODUCTS & PRESSURES** Lumber - Types - Finish - Sheathing boards working stresses - Repetitive member stress -Plywood - Types and grades - Jointing Boarding - Textured surfaces and strength - Reconstituted wood - Steel - Aluminum - Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Vertical loads for design of slab	8

	forms -Uplift on shores - Laterals loads on slabs and walls.	
III	**DESIGN OF FORMS AND SHORES :** Basic simplification - Beam formulae - Allowable stresses - Deflection, Bending - Lateral stability - Shear, Bearing - Design of Wall forms - Slab forms - Beam forms - Column forms - Examples in each. Simple wood stresses - Slenderness ratio - Allowable load vs length behaviour of wood shores - Form lining Design Tables for Wall 16 formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.	8
IV	**BUILDING AND ERECTING THE FORM WORK** : Carpentry Shop and job mill - Forms for Footings - Wall footings - Column footings - Sloped footing forms - Strap footing - Stepped footing - Slab form systems - Sky deck and Multiflex - Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.	8
V	**FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SCAFFOLDS :** Hemispherical, Parabolic, Translational shells - Typical barrel vaults Folded plate roof details -Forms for Thin Shell roof slabs design considerations - Building the forms - Placing concrete -Form removed -Strength requirements -Tunnel forming components - Curb forms invert forms -Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method -Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts. Slip Forms - Principles -Types - advantages - Functions of various components - Planning -Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold -Single pole scaffolds - Truss suspended - Gantry and system scaffolds.	8

Reference / Text Books:

Text Books-

1. Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996.
2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996
3. Michael P. Hurst, Construction Press, London and New York, 2003.
4. Robert L. Peurifoy and Garold D. Oberlender, Formwork For Concrete Structures,McGraw -Hill, 1996.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

1. To identify the functional role of formwork in different structures.
2. To evaluate the different materials needed for the formwork.
3. To analyze formwork loads.
4. To explain special shape applications and their safety.
5. To understand the knowledge about importance of scaffolding.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: **II**
Credits Theory: 4 Practical:0	**Subject: Disaster Reduction and Management**
Course Code: DECT- 124	**Title: Disaster Reduction and Management**

Course Objectives:
1. The graduates are expected to adopt various numerical method and mathematical tools for analysis of research data.
2. Learning about the natural disaster.
3. Learning the risk reduction methods of disasters.
4. To provide basic conceptual understanding of disasters and its relationships with development.
5. To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks/4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Disaster Reduction** Earthquake resistant design of structures, Response spectra and design earthquake parameters, 19 Principles and philosophies,Codal provisions, Factors affecting damage to structures, Enforcement of codal provisions, Strong motion instrumentation and data processing, Effective rescue operation,	8
II	General planning and design aspects, Conventional earthquake resistant design, Seismic base isolation method, retrofitting, Training and lecturing at various levels, Preparedness to meet earthquake disaster,Programmes for public awareness, demonstrations and exhibitions, Information management (Safety, emergencies, management and planning, design, response, user experience problems and case studies), Proper land use practices, long term disaster preparedness measures.	8
III	Precautions after a major earthquake, Preparedness for medical supply Emergency care (First aid, Home remedies), Disposal of dead bodies (Human and Cattle) , Care for old and orphans. **Indirect Damages** Damage due to ground failures, Landslides, rockslides, liquefaction, fire, floods, tsunamis, release of hazardous material like poisonous gas, nuclear	8

	radiation.	
IV	**Disaster Management** Management cell, Central crisis management core group, damage reconnaissance, Management of relief and rehabilitation (Infrasture rehabilitation, Housing rehabilitation, Social rehabilitation), Role of volunteers, Emergency operation centers, Information system, Danger zone restrictions, Cooperation with local authority, Coordination for international relief, Role of government, NGO's, Business and donors, Role of remote sensing in relief operations, Information management and related technologies in engineering and disaster management.	8
V	The design and management of Disaster Information Resource Network, Asian Disaster Preparedness Centre, Regional data base, Contacts and Sources, CD - ROM Library for Natural Disaster Management, Regional Disaster Documentation Centre, Non-Governmental Organizations.	8

Reference / Text Books:

Text Books-

1. Disaster Mitigation Experiences & Reflectios by Pardeep Sahni, Alka Dhameja, and Uma Medury.
2. Disaster Management Report by Department of Agriculture and Cooperation, Govt. of India.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. To understand ability to integrate knowledge and analyze, assess and manage various public health aspects of disaster events at local and global levels, even when limited information is available.
2. To select the ability to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects that affect vulnerability and capacity to respond to disasters.
3. To apply the ability to manage the public health aspects of disasters.
4. To design and conduct research on different aspects of emergencies and disasters while demonstrating insight into the potential and limits of science, its role in society, and human responsibility for its use.
5. To Apply knowledge of existing global frameworks and existing agreements and the role of the community in Successful disaster risk reduction.

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: **II**
Credits Theory: 4 Practical:0	**Subject: Resource Management and Control in Construction**
Course Code: DECT- 123	**Title: Resource Management and Control in Construction**

Course Objectives:

- Students will be acquainted with the major construction technology as described in the subject titles listed.
- Students will be able to describe, analyze, compare and evaluate high-rise building technology and be aware of some of the problems that can be associated with poor construction project management.
- Understanding time management, resource allocation and leveling.
- Understanding about the Materials and Equipment.
- Manage all construction material.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Resource Planning** Resource Planning, Procurement, Identification, Personnel, Planning for material, Labour, time schedule and cost control, Types of resources, manpower, Equipment, Material, Money, Time.	8
II	**Labour Management** Systems approach, Characteristics of resources, Utilization, measurement of actual resources required, Tools for measurement of resources, Labour, Classes of Labour, Cost of Labour, Labour schedule, optimum use Labour.	8
III	**Materials and Equipment** Material: Time of purchase, quantity of material, sources, Transportation, Delivery and Distribution. Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.	8
IV	**Time Management, Resource Allocation and Leveling** Personnel time, Management and planning, managing time on the project, forecasting the future, Critical path measuring the changes	8

	and their effects – Cash flow and cost control.	
V	Time-cost trade off, Computer application – Resource leveling, resource list, resource allocation, Resource loading, Cumulative cost – Value Management.	8

Reference / Text Books:

Text Books-

1. James. A., Adrain, Quantitative Methods in Construction Management, American Elsevier Publishing Co., Inc., 1973.
2. Oxley Rand Poslcit, Management Techniques applied to the Construction Industry, Granda Publishing Ltd., 1980

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. To explain construction project plans from start to finish while maintaining budgets, schedules, materials and equipment.
2. To Analyze, evaluate, and select computer applications to efficiently and effectively manage time and resource allocation and more.
3. To understand the environmental impact of engineering solutions and the need for sustainable development.
4. To Use the methods, techniques, advanced modern engineering tools, test equipment and software packages you need to practice engineering.
5. To practice the construction profession, students acquire competent technical knowledge and develop ideas that combine existing and current knowledge.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in CTM**	Year : I Semester: **II**
Credits Theory: 0 Practical:2	**Subject: Quality Control in Construction Lab**
Course Code: MTCT- 124P	**Title: Quality Control in Construction Lab**

Course Objectives:
1. The objective of this course is to make students to learn principles and design of experiments.
2. To investigate the performance of various Concrete.
3. Control the quality of work.
4. Know about the good quality of work.
5. To check easily quality and control the wastage on construction site.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
Practical - 1	Mix Design of Concrete	3
Practical – 2	Tests on fresh concrete	3
Practical – 3	Tests on hardened concrete	3
Practical – 4	In-situ Strength determination by Rebound Hammer.	3
Practical – 5	Measurement of Moisture content in aggregates, soil and hardened concrete surface using NDT techniques.	3
Practical – 6	Pull-Out Tests on concrete	3
Practical – 7	Effect of Chemical admixtures on fresh and harden properties of concrete	3
Practical – 8	Effect of mineral admixtures on fresh and harden properties of concrete	3
Practical – 9	Tests on Bitumen materials	3
Practical – 10	Tests on Course aggregates for road construction	3

Reference / Text Books:
Text Books-

- Metha P.K and Monteiro. P. J. M. “CONCRETE", Microstructure, Properties and Materials, Third Edition,Tata McGraw- Hill Publishing company Limited, New Delhi, 2006
- Shetty .M.S., “Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd.,New Delhi,2006
- Neville. A.M. , " Properties of Concrete", 4th Edition Longman,1995

• Mindass and Young, “Concrete", Prentice Hall.1998	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

1. To describe the physical characteristics of aggregates, sources and manufacturing processes for gravels, engineering properties of aggregates, and how aggregates are classified.
2. To understand Name the constituents of Portland cement concrete and proportion concrete mix designs.
3. To explain the fieldwork and inspections necessary for successful results in concrete construction.
4. To define conduct and document laboratory investigations.
5. To create a work in small teams with individuals of diverse cultural backgrounds.

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M. Tech in CTM**	Year: **II** Semester: **III**
Credits Theory: 4 Practical:0	**Subject: Construction Economics & Finance**
Course Code: **DECT-235**	**Title: Construction Economics & Finance**

Course Objectives:
1. Covers the construction industry, methods of financing and accounting, and their use in managing construction projects.
2. Learn the elements of the construction industry.
3. Study the need for financial management and the means to achieve it.
4. A study of accounting methods used in construction.
5. Understand concept of financial management.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Construction accounting, Income statement. Depreciation and amortization. Engineering economics,	8
II	Time value of money, discounted cash flow, NPV, ROR, PI, Bases of comparison, Incremental rate of return Benefit-cost analysis,	8
III	Replacement analysis, Break even analysis. Risks and uncertainties and management decision in capital budgeting. Taxation and inflation.	8
IV	Work pricing, cost elements of contract, bidding and award, revision due to unforeseen causes, escalation. Turnkey activities, Project appraisal and project yield. Working capital management, financial plan and multiple source of finance.	8
V	International finance, Budgeting and budgetary control, Performance budgeting. appraisal through financial statements, Practical problems and case studies.	8

Reference / Text Books:
Text Books-

1. Simon A. Burtonshaw-Gunn, “Risk and Financial Management in Construction”, Gower Publishing, Ltd.,2009
2. Warneer Z, Hirsch, Urban Economics, Macmillan, New York, 1993

3. Eugene F. Brigham, Michael C. Ehrhardt, ”Financial Management Theory and Practice”, Cengage hLearning, 2010	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

1. To apply valuation principles to calculate the upcoming value of a lump sum payment.
2. To distinguish between discrete compounding and continuous compounding.
3. To evaluate FV and PV for flat rates with various compounding frequencies, including continuous compounding.
4. To describe present value lump sum of deferred annuity.
5. To describe interest rates for both lump sum and annuity situations.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M. Tech in CTM**	Year: **II** Semester: **III**
Credits Theory: 4 Practical:0	**Subject: STRATEGIC MANAGEMENT OF CONSTRUCTION PROJECTS**
Course Code: DECT-238	**Title: STRATEGIC MANAGEMENT OF CONSTRUCTION PROJECTS**

Course Objectives:
1. Enable students to understand the principles of strategic management in construction.
2. This course is designed to guide students through the principles of strategic management in construction.
3. This includes strategic management processes, tools and techniques, marketing and strategic alliances.
4. Understand the environmental, social and economic frameworks within which environmental management decisions are made.
5. Understand life cycle perspectives, systems approaches and environmental technologies to transform industrial environmental issues related to processes, products and services into performance improvement opportunities.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks /4

L: 40
T:
P: (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction to Strategic Management Concepts-necessity and significance of strategic Management.	8
II	Different approaches of Strategy Formation and Implementation-procedures- problem encountered.	8
III	External and Internal Environment Analysis	8
IV	Financial Strategies-budget allocation for different tasks -Decision and Analytical Tools.	8
V	Corporate Strategic Events, Leadership and Decision-making, Corporate Social Responsibility.	8

Reference / Text Books:

Text Books-

1. David Langford, Steven Male, Strategic Management in Construction, 2nd Edition, John Wiley and Sons, 2008
2. Richard Fellows, Construction Management in Practice, 2nd Edition, Blackwell Science

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

1. To understand the well knowledge about the nature of alliances in construction companies.
2. To design the business process of strategic management.
3. Acquisition and application of basic knowledge in strategic management.
4. To analyze the well knowledge about the completion of the work.
5. To be able arrangement of all materials at the time of construction.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M. Tech in CTM**	Year: **II** Semester: **III**
Credits Theory: 4 Practical:0	**Subject: INFRASTRUCTURE VALUATION**
Course Code: DECT-236	**Title: INFRASTRUCTURE VALUATION**

Course Objectives:

1. Preparing for construction site capital budgeting.
2. Creation of company performance statements.
3. Describe the main components of infrastructure, which is very important for construction.
4. Infrastructure construction has traditionally been the domain of the state/public sector. Globally, the sector is now being offered to the private sector, his sector, for the creation, investment, and management of rapid infrastructure facilities.

Nature of Paper: CORE

Minimum Passing Marks/Credits: 40% Marks/4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Function analysis; FAST diagramming; brain storming; criteria scoring matrices.	8
II	Value Engineering-Definition and concepts of the creative and structured phases of value Engineering.	8
III	The workshop approach to achieve value- procedures-merits and demerits-detailed analysis	8
IV	Teambuilding theory; target setting; time management.	8
V	An introduction to value theory; an introduction to value management.	8

Reference / Text Books:

Text Books-

1. Lawrence D. Miles, Techniques of Value Analysis and Engineering, McGraw-Hill Book Company, 2009.
2. M.R.S. Murthy, Cost Analysis for Management Decisions, Tata McGraw-Hill Publishing Company Ltd., 1988.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
Seminar On Research Project Report	
5) ESE	70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

1. To design of political processes for infrastructure development.
2. To understand the best tools for effective project evaluation, management, and control.
3. To compute risks and learn to manage them.
4. To implement the Best Project Financing Options.
5. To learn from experience from international/domestic project management best practices.

IIMTU-NEP IMPLEMENTATION
Year: II /Semester: III

<table>
<tr><td>Programme: PG
Class: M. Tech in CTM</td><td>Year: II
Semester: III</td></tr>
<tr><td>Credits
Theory: 4
Practical: 0</td><td>Subject: MANAGEMENT INFORMATION SYSTEMS</td></tr>
<tr><td>Course Code: DECT- 237</td><td>Title: MANAGEMENT INFORMATION SYSTEMS</td></tr>
<tr><td colspan="2">Course Objectives:
1. Apply logical, critical, and creative thinking to analyze, synthesize, and apply theoretical knowledge and technical skills to formulate evidence-based solutions to industry problems or problems.
2. Demonstrate intellectual independence and autonomy to collaborate effectively with others to solve problems and address industry-specific issues and needs.
3. Describe the role of information technology and decision support systems in business, and grasp current corporate issues to solve business problems.
4. It introduces the basic principles of computational analysis and design of information systems, and deepens the understanding of the principles and techniques used.</td></tr>
<tr><td colspan="2">Nature of Paper: CORE</td></tr>
<tr><td colspan="2">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="2">L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	Importance of Management Information Systems (MIS), Manger's View of Information systems, Functions of Management, managerial role in the Construction Organization.	8
II	Decision Making in Construction Industry, role of Management Information Systems in decision Making.	8
III	Strategic Uses of Information Technology, Inter Organizational Systems, Strategic Information Systems related to Construction Industry, Process of Reengineering Work.	8
IV	Information Technology, Classification of Information Systems, Role of Information Technology in Construction Industry, Impact of Information Technology on the Individuals and Organization.	8
V	File Structures and Processing methods in Construction Organizations, Data base Concepts, An Data Base management systems, Knowledge Based management systems.	8

Reference / Text Books:

Text Books-

1. Management Information Systems - The Manager's View. Robert Schultheis, Mary Sumner. (1999).Tate McGraw Hill Edition, New Delhi.
2. Construction Project Administration, Kwakye, A.A.(1997), Adisson Wesley Longman,
3. Management Information Systems by Sumner, Tata McGraw Hill Publication

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. To understand knowledge about the utility of management information systems.
2. To produce basic knowledge of organizational systems.
3. To instruct all the site activity during construction.
4. To describes basic concepts and techniques used in the field of management information systems.
5. To differentiate the process of developing and implementing information systems.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in CTM</td><td>Year: II
Semester: III</td></tr>
<tr><td colspan="2">Credits
Theory: NA
Practical: 6</td><td>Subject: DISSERTATION (PHASE – I)</td></tr>
<tr><td colspan="2">Course Code: MTTE-232</td><td>Title: DISSERTATION (PHASE – I)</td></tr>
<tr><td colspan="3">Course Objectives:
1. Research Skills: Develop advanced research abilities, including problem identification, data collection, analysis, and drawing meaningful conclusions.
2. Innovation: Encourage innovative solutions to engineering challenges, contributing to the field's knowledge and advancement.
3. Technical Communication: Enhance written and oral communication skills for effectively sharing complex technical information.
4. Project Management: Develop project management skills to effectively plan, execute, and complete a research project.
5. Contributions to Engineering: Aim to make a significant, practical, and ethical contribution to the chosen field of engineering through the dissertation research.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (12Hrs./Week=6Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Select a Research Topic: Choose a topic that aligns with the program's guidelines.</td><td>NA</td></tr>
<tr><td>II</td><td>Review the Literature and Gap Identification: Conduct an extensive review of existing literature to understand the current state of knowledge in your chosen area.</td><td>NA</td></tr>
<tr><td>III</td><td>Formulate Research Questions or Objectives: Clearly define the research questions or objectives that your dissertation will address.</td><td>NA</td></tr>
<tr><td>IV</td><td>Research Methodology: Define the methods to achieve the research objective.</td><td>NA</td></tr>
<tr><td>V</td><td>Collect and Analyze Data: Implement your research methodology to collect data or conduct experiments. Analyze the data using appropriate statistical or analytical techniques.</td><td>NA</td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.</td></tr>
</table>

BOS

NA	
Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	80 120
Total:	200
Prerequisites for the course:	

Course Learning Outcomes:

- **Research Skills:** Develop the ability to design, execute, and report on a research project, including problem identification and methodology.
- **Innovation and Critical Thinking**: Demonstrate creativity and critical thinking in addressing engineering challenges with innovative solutions.
- **Communication Proficiency:** Exhibit clear technical writing skills and the ability to communicate research findings effectively.
- **Project Management**: Manage research projects, including resource allocation and time management, to meet objectives and deadlines.
- **Contribution to the Field:** Produce a dissertation that makes an original and meaningful contribution to the field of engineering.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- IV

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in CTM</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: NA
Practical: 8</td><td>Subject: DISSERTATION (PHASE – II)</td></tr>
<tr><td colspan="2">Course Code: MTTE-241</td><td>Title: DISSERTATION (PHASE – II)</td></tr>
<tr><td colspan="3">Course Objectives:
1. Research Skills: Develop advanced research abilities, including problem identification, data collection, analysis, and drawing meaningful conclusions.
2. Innovation: Encourage innovative solutions to engineering challenges, contributing to the field's knowledge and advancement.
3. Technical Communication: Enhance written and oral communication skills for effectively sharing complex technical information.
4. Project Management: Develop project management skills to effectively plan, execute, and complete a research project.
5. Contributions to Engineering: Aim to make a significant, practical, and ethical contribution to the chosen field of engineering through the dissertation research.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.= 1 Credit (16Hrs./Week=8 Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>NA</td><td>Collect and Analyze Data: Implement your research methodology to collect data or conduct experiments. Analyze the data using appropriate statistical or analytical techniques.</td><td>NA</td></tr>
<tr><td>NA</td><td>Draft the Dissertation</td><td>NA</td></tr>
<tr><td>NA</td><td>Finalize and Submit: Make any final revisions as required by sectunity committee. Prepare the final, formatted version of dissertation.</td><td></td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	80 120
Total:	200
Prerequisites for the course:	

Course Learning Outcomes:

- **Research Skills:** Develop the ability to design, execute, and report on a research project, including problem identification and methodology.
- **Innovation and Critical Thinking**: Demonstrate creativity and critical thinking in addressing engineering challenges with innovative solutions.
- **Communication Proficiency:** Exhibit clear technical writing skills and the ability to communicate research findings effectively.
- **Project Management**: Manage research projects, including resource allocation and time management, to meet objectives and deadlines.
- **Contribution to the Field:** Produce a dissertation that makes an original and meaningful contribution to the field of engineering.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- IV

<table>
<tr><td>Programme: PG
Class: M. Tech in CTM</td><td colspan="2">Year: II
Semester: IV</td></tr>
<tr><td>Credits
Theory: NA
Practical: 4</td><td colspan="2">Subject: COMPREHENSIVE VIVA</td></tr>
<tr><td>Course Code: MTTE-242</td><td colspan="2">Title: COMPREHENSIVE VIVA</td></tr>
<tr><td colspan="3">Course Objectives:
1. Demonstrate Research Knowledge: Assess the student's in-depth understanding of the research, including background, methods, and results.
2. Critical Thinking and Problem-Solving: Evaluate the ability to think critically and apply problem-solving skills to the research.
3. Effective Communication: Assess the student's capacity to present complex technical information clearly and engage in scholarly discussions.
4. Ethical Considerations: Ensure that research adheres to ethical standards and that the student can discuss ethical implications.
5. Overall Competency: Determine if the student has met educational objectives, displayed mastery of the field, and demonstrated readiness for the award of the M.Tech degree.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /4</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.= 1 Credit (8Hrs./Week= 4 Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>NA</td><td>Prepare Visuals: Create clear and informative figures, tables, and charts to illustrate your data and findings.</td><td>NA</td></tr>
<tr><td>NA</td><td>Presentation and Defense: Prepare for your dissertation defense, which may involve presenting your research findings and answering questions from your committee. Address any concerns or revisions raised during the defense.</td><td>NA</td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1) Internal 2) External	40 60
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- **In-Depth Understanding of Research:** The student demonstrates a deep understanding of the research topic, showcasing comprehensive knowledge of the background, literature review, research methods, and results.
- **Critical Thinking and Problem-Solving Skills:** The student exhibits strong critical thinking abilities and effectively applies problem-solving skills in addressing questions and challenges related to the research.
- **Effective Communication:** The student effectively communicates complex technical information, presenting research findings in a clear, organized, and engaging manner during the viva.
- **Ethical Awareness and Implications:** The student acknowledges and discusses the ethical considerations related to their research, demonstrating an understanding of ethical principles and implications.
- **Comprehensive Competency and Scholarly Engagement:** The student's performance in the comprehensive viva demonstrates a high level of overall competency in the field of engineering, including interdisciplinary thinking (if applicable), and readiness for the award of the M.Tech degree.

School of Engineering & Technology

ACADEMIC HAND BOOK

POSTGRADUATE DEGREE COURSE
IN
ENVIRONMENTAL ENGINEERING

EVALUATION SCHEME

POSTGRADUATE DEGREE COURSE IN ENVIRONMENTAL ENGINEERING

M. Tech. in Environmental Engineering
First Year, First Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTEE-111	Air & Noise Pollution	4	0	0	4	20	10	70	--	--	100
2	MTEE-112	Water & Waste Water Treatment System	4	0	0	4	20	10	70	--	--	100
3	MTEE-113	Environmental Chemistry	4	0	0	4	20	10	70	--	--	100
4	DEEE-111	Solid Waste Management	4	0	0	4	20	10	70	--	--	100
	DEEE-112	Environmental Auditing and Management System										
5	MTEE-114 P	Water & Waste Water Treatment System Lab	--	--	3	2	--	--	--	20	30	50
6	*NECC-111	Industrial Visits/Seminar on the reports of visit	--	--	--	--	--	--	--	25*	--	25*
7	*NECC-112	University Social Responsibility	--	--	--	--	--	--	--	25*	--	25*
8	NECC-114	MOOCS/Swayam	--	--	4	2	--	--	--	50	--	50
		Total	16	0	7	20	80	40	280	70	30	500

*Note: NECC-111 &NECC-112 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student need to qualify it but the marks will not be added in total marks.

M. Tech. in Environmental Engineering
First Year, Second Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTEE-121	Environmental Statistical Methods	4	0	0	4	20	10	70	--	--	100
2	MTEE-122	Application of Remote Sensing & GIS for Environmental Engineering	4	0	0	4	20	10	70	--	--	100
3	MTEE-123	Environmental Impact Assessment	4	0	0	4	20	10	70	--	--	100
4	DEEE-123	Global Environmental Issues and Sustainable Development	4	0	0	4	20	10	70	--	--	100
	DEEE-124	Environmental Legislation										
5	MTEE-124 P	Water Transmission Lab	--	--	3	2	--	--	--	20	30	50
6	*NECC-121	Industrial Visits/Seminar on the reports of visit	--	--	--	--	--	--	--	25*	--	25*
7	*NECC-122	University Social Responsibility	--	--	--	--	--	--	--	25*	--	25*
8	NECC-124	MOOCS/Swayam	--	--	4	2	--	--	--	50	--	50
		Total	16	0	7	20	80	40	280	70	30	500

*Note: NECC-121 &NECC-122 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student need to qualify it but the marks will not be added in total marks.

M. Tech. in Environmental Engineering
Second Year, Third Semester

<table>
<tr><th rowspan="3">S.No.</th><th rowspan="3">Subject Code</th><th rowspan="3">Subject</th><th colspan="3" rowspan="2">Periods</th><th rowspan="2">Credit</th><th colspan="5">Evaluation Scheme</th><th rowspan="3">Subject Total</th></tr>
<tr><th colspan="3">Theory</th><th colspan="2">Practical</th></tr>
<tr><th>L</th><th>T</th><th>P</th><th></th><th>CT</th><th>TA</th><th>ESE</th><th>TA</th><th>ESE</th></tr>
<tr><td rowspan="2">1</td><td>DEEE-235</td><td>Industrial Pollution Control</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">20</td><td rowspan="2">10</td><td rowspan="2">70</td><td rowspan="2">--</td><td rowspan="2">--</td><td rowspan="2">100</td></tr>
<tr><td>DEEE-236</td><td>INSTRUMENTAL METHOD OF ANALYSIS</td></tr>
<tr><td rowspan="2">2</td><td>DEEE-237</td><td>EARTH AND ENVIRONMENT</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">20</td><td rowspan="2">10</td><td rowspan="2">70</td><td rowspan="2">--</td><td rowspan="2">--</td><td rowspan="2">100</td></tr>
<tr><td>DEEE-238</td><td>CLIMATOLOGY</td></tr>
<tr><td>3</td><td>MTEE-231</td><td>Seminar</td><td></td><td></td><td>8</td><td>4</td><td>--</td><td>--</td><td>--</td><td>--</td><td>200</td><td>200</td></tr>
<tr><td>4</td><td>MTEE-232</td><td>Dissertation (Phase-I)/SYNOPSIS</td><td></td><td></td><td>12</td><td>6</td><td>--</td><td>--</td><td>--</td><td>80</td><td>120</td><td>200</td></tr>
<tr><td>5</td><td>*NECC-231</td><td>Industrial Visits/Seminar on the reports of visit</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>25*</td><td>--</td><td>25*</td></tr>
<tr><td>6</td><td>*NECC-232</td><td>University Social Responsibility</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>25*</td><td>--</td><td>25*</td></tr>
<tr><td>8</td><td>NECC-234</td><td>MOOCS/Swayam</td><td>--</td><td>--</td><td>--</td><td>2</td><td>--</td><td>--</td><td>--</td><td>50</td><td>--</td><td>50</td></tr>
<tr><td colspan="6">Total</td><td>20</td><td>40</td><td>20</td><td>140</td><td>130</td><td>320</td><td>650</td></tr>
<tr><td colspan="13">*Note: NECC-231 &NECC-232 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Students need to qualify it but the marks will not be added in total marks.</td></tr>
</table>

M. Tech. in Environmental Engineering
Second Year, Fourth Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTEE-241	Dissertation(Phase-II)	0	0	16	8	--	--	--	80	120	200
2	MTEE-242	Comprehensive Viva	0	0	8	4	--	--	--	40	60	100
		Total			24	12				120	180	300

Format-1

Format-1

CBCS: Statement of Credit distribution	
College/School: School of Engineering & Technology Programme: M.Tech Duration: 4 Semester Annual/Semester: Semester	Credit range: 72-80 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr) or	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	18	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)			DSE-I(4)		
II	20	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)		SEC-1(2)	DSE-II(4)		
Provision to change the core papers							
III	20			SEC-1(2)	DSE-III(4) DSE-IV(4)		Seminar-1 (04) Dissertation Phase-I(06)
IV	12						Comprehensive Viva(04) Dissertation Phase-II(08)
Total Credits	**70**	06(Th)*4(Cr) = 24 02 (Pr)*2(Cr) = 04 **Total = 28**		2*2= 04 **= 04**	4(Th)*4(Cr)= 16 **= 16**		04+06 = 10 04+08 = 12 **=22**

Format-2

IIMTU-NEP Implementation:(M.Tech in Environmental Engineering) **Format-2**

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES B.Tech EE	FIRST YEAR	SEMESTER -I	i) C1 (Th.4 Cr.)	4	4	40	Air & Noise Pollution	5		
			ii) C2(Th.4 Cr.+ P 2 Cr).	4 2	4 4	40 16	Water & Waste Water Treatment System Water & Waste Water Treatment System Lab	5		
			iii)C3 (Th.4 Cr.)	4	4	40	Environmental Chemistry	5		
			iv) DSE-1 (Th.4 Cr.)	4	4	40	Solid Waste Management Environmental Auditing and Management System	5		
			v) SEC I	2	-	-	MOOCS/ Swayam	-		
		SEMESTER - II	i) C4 (Th.4 Cr.)	4	4	40	Environmental Statistical Methods	5		
			ii) C5 (P 2)	2	4	20	Water Transmission Lab	-		
			iii) C6(Th.4Cr.)	4	4	40	Application of Remote Sensing & GIS for Environmental Engineering	5		
			iv) C7(Th.4Cr.)	4	4	40	Environmental Impact Assessment	5		
			v) DSE-2 (Th.4Cr.)	4	4	40	Global Environmental Issues and Sustainable Development Environmental Legislation	5		
			vi) SEC II	2	-	-	MOOCS/ Swayam			

Programme Outcome:
Annexure I

Programme Specific Outcome:
Annexure II

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR	SEMESTER -III	i) DSE-3 (Th. 4 Cr.)	4	4	40	Industrial Pollution Control Instrumental Method of Analysis	5		
			ii) DSE-4 (Th. 4 Cr.)	4	4	40	Earth and Environment Climatology	5		
			iii) Seminar (P 4Cr.) iv) Dissertation (Phase-I)/ (P 6Cr.)	4 6	8 12	40 40	Seminar Dissertation (Phase-I)/SYNOPSIS	5		
		SEMESTER -IV	i) Dissertation (Phase-II) (P 8Cr.) ii) Comprehensive Viva (P 4Cr.)	8 4	16 8	40 30	Dissertation (Phase-II) Comprehensive Viva	5		

Programme Outcome:
Annexure I

Programme Specific Outcome:
Annexure II

Annexure I

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and

Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Annexure II

Programme Specific Outcome:

PSO1: Post-graduate students can utilize cutting-edge resources, and methods to evaluate environmental deterioration.

PSO2: Evaluate the hazards and effects on the environment due to rapid urbanization and create environmental management plans.

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: I

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Environmental Engineering</td><td>Year: I
Semester: I</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: Air and Noise Pollution</td></tr>
<tr><td colspan="2">Course Code: MTEE-111</td><td>Title: : Air and Noise Pollution</td></tr>
<tr><td colspan="3">Course Objectives:
1. Acquire knowledge about the types, causes, and impacts of contaminants.
2. To introduce students to a wide range of research fields about air contaminants and various models for their investigation.
3. Research on the meteorological variables used to gauge air pollution.
4. Be aware of the significance of vehicular air pollution and its effects.
5. To give students the necessary engineering abilities, such as how to work out engineering issues with noise control procedures.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40 Marks %/4</td></tr>
<tr><td colspan="3">L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>Unit-I</td><td>Source of air pollution; classification of aerosols, Gases vapors, natural pollutants; properties of air pollutants.</td><td>8</td></tr>
<tr><td>Unit-II</td><td>Metrological factors influencing dispersion of air pollutants; Gaussian plume model for dispersion of air pollutants and its applications.</td><td>8</td></tr>
<tr><td>Unit-III</td><td>Effects on man material, vegetation, art treasure; Air pollution disasters; Economic Effects of air pollution; Global Effects of Air pollution.</td><td>8</td></tr>
<tr><td>Unit-IV</td><td>Air pollution due to automobiles and emission control; General concept of transport planning for prevention of air pollution.</td><td>8</td></tr>
<tr><td>Unit-V</td><td>Control technology for particulate and gaseous pollutants. Basics of noise pollution; Measurement of noise; permissible noise levels in different zones; Effects of noise.</td><td>8</td></tr>
<tr><td colspan="3">Reference / Text Books:
1. Air pollution control theory by Martin Crawford - McGraw-Hill, 1976.
2. Air pollution control by A.C. Stern.
3. Air pollution control by H.C. Perkins – Mc Graw-Hill, 1974.
4. Air pollution control by Joe O. Ledbetter- Dekker, 1972.
5. Atmospheric Chemistry and Physics: From Air Pollution to Climate Change, 2nd Edition byJohnH.Seinfeld, Spyros N. Pandis.</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

1. Gain a basic understanding of air pollution and its effects on the ecosystem.
2. Utilize dispersion models to calculate the pollution level in ambient air.
3. Ability to analyze the reasons for vehicular emissions and the need for technical improvement for control.
4. Identify and develop various particle and gaseous pollution control systems.
5. Ability to conduct investigations for monitoring and controlling noise pollution.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: I

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: I Semester: I
Credits Theory: 4 Practical: 0	**Subject:** Water & Waste Water Treatment System
Course Code: MTEE-112	**Title: :** Water & Waste Water Treatment System

Course Objectives:
1. To comprehend the fundamental properties of wastewater.
2. Understanding of Kinetics of biological systems.
3. Recognize the layout and operation of various treatment modalities.
4. Know the extent and impact of the hazardous content.
5. To help the students comprehend the modelling and design components of the many biological approaches.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 4 T: 0 P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit-I	Gas transfer: Aeration systems, Energy requirement, Design of aeration systems. Membrane. Filtration, Terminology, Process classification, Membrane configurations, Membrane operation for micro filtration, Ultra filtration and Reverse osmosis, Area requirement, Membrane fouling and its control, Application of membranes. Electro dialysis: Theory, Area and power requirement, Disposal of concentrate waste streams.	**8**
Unit-II	Grit removal: Types of grit chambers, Characteristics, quantities, processes and disposal of grit, Design of grit chambers, Flotation: Objective, Types of flotation systems, Design considerations. Chemical precipitation for removal of phosphorous, heavy metals and dissolved inorganic substances.	**8**
Unit-III	Microbial growth kinetics, Modeling suspended and attached growth treatment processes. Suspended growth processes for biological nitrification and de- nitrification, Biological nitrogen and phosphorous removal.	**8**
Unit-IV	Anaerobic sludge blanket processes, Design considerations for up flow Anaerobic Sludge Blanket process. Theory and design of Sludge treatment, sludge thickening, sludge drying, incineration, aerobic and anaerobic digestion of sludge.	**8**
Unit-V	Wetland and aquatic treatment systems; Types, application, Treatment kinetics and effluent variability in constructed wetlands and aquatic systems, Free water surface and subsurface constructed wetlands, Floating plants (water hyacinths and duckweed), Combination systems, Design procedures for constructed wetlands, Management of constructed wetlands and aquatic systems.	**8**

Reference / Text Books:
1. Wastewater Engineering treatment and reuse– Metcalf Eddy.
2. Theory and Practice of water and Wastewater treatment – Ronald Droste.
3. Physico-chemical processes of water purification – Weber
4. Wastewater Treatment for Pollution Control – Soli Arceivala

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Assignments	10
3) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
1. Gain a basic understanding of fundamental ideas behind the primary and secondary wastewater treatment processes.
2. Describe the physical and biological processes involved in the treatment of water and wastewater.
3. Determine design flow, and create flow diagrams for wastewater treatment.
4. Be proactive in finding solutions to common issues with wastewater treatment plant management.
5. Create a system for treating and disposing of sludge.

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: I

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Environmental Engineering</td><td>Year: I
Semester: I</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: Environmental Chemistry</td></tr>
<tr><td>Course Code: MTEE-113</td><td colspan="2">Title: : Environmental Chemistry</td></tr>
<tr><td colspan="3">Course Objectives:
1. Learn the importance and function of microorganisms in the environment.
2. Examine microscopic bacteria, algae, and fungi, and gain knowledge of them.
3. Knowledge regarding the measurement and control of microorganisms.
4. Learn about concentration measurement and technologies used for environmental preservation
5. To use their understanding of chemistry to enhance the sustainability and well-being of society.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="3">L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
Unit-I	Principles of Physical Chemistry: Reversible reactions, equilibrium constant, Le-Chatelier principle. Reaction rate Order and molecularity, kinetic equations of different orders, reversible and consecutive reactions.	**8**
Unit-II	Catalysis-type, characteristics, activation energy, mechanism of catalyst action, acid base catalysts. Photo catalysis. Adsorption classification, adsorption of gases on solids, adsorption from solutions, ion exchange adsorption, applications, Longmuir theory	**8**
Unit-III	Environmental Chemicals: Chemical speciation –speciation of lead, mercury, arsenic and chromium. Structure and property- activity relationship, fate of organics in the environment – transformation reactions-hydrolysis, elimination, oxidation, reduction and photochemical transformation. Risk evaluation of environmental chemicals, Toxic chemicals in the environment, impact on enzymes. Biochemical effects of arsenic, lead, mercury and pesticides	**8**
Unit-IV	**Fundamentals of analytical Principles** Analysis of water and water quality parameters -concept of pH, measurement of acidity, alkalinity, hardness, residual chlorine, chlorides, DO, BOD, COD, fluoride and nitrogen.	**8**
Unit-V	Introduction to spectral analysis, colorimetry, fluorimety, nephlometry, turbidimetry, absorption and emission spectral methods.	**8**

Reference / Text Books:

1. C. N. Sawyer, P.L McCarty and G.F Parkin, Chemistry for Environmental Engineering and Science, 5th ed. Tata McGraw-Hill, 2003
2. B. S. Bhal, GD Tuli and Arun Bhal, Essentials of Physical Chemistry, S. Chand & Co. Ltd. New Delhi, 2003
3. Arun Kumar De, Environmental Chemistry, 5th ed, New Age International (P) Ltd, New Delhi

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Assignments	10
3) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. Understand the core underlying mechanism of water and wastewater management with basic chemistry topics.
2. Apply the principles of environmental chemistry and microbiology, which are crucial to the practice of environmental engineering.
3. Quantify the amount and impacts of pollutants in wastewater using technical and analytical skills.
4. Gain a basic understanding of water quality parameters.
5. Understand the principles of various environmental research instruments.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: I

Programme: PG **Class: M. Tech in Environmental Engineering**		Year: I Semester: I
Credits Theory: 4 Practical: 0		**Subject:** Solid Waste Management
Course Code: DEEE-111		**Title: :** Solid Waste Management
Course Objectives: 1. A thorough understanding of the hierarchy of solid waste management. 2. Acquire knowledge of solid waste collection, transfer, and transportation. 3. Be familiar with the construction and management of a municipal solid waste dump. 4. Be acquainted with a resource recovery design. 5. To impart expertise on the design components of solid waste management.		
Nature of Paper: Departmental Elective		
Minimum Passing Marks/Credits: 40% Marks /4		
L: 4 T: 0 P: 0 (In Hours/Week) Theory - 4 Practical- 0		
Unit	**Contents**	**No. of Lectures Allotted**
Unit-I	**Solid waste management:** Objectives, Functional elements, Environmental impact of mis-management. Solid waste: Sources, Types, Composition, Quantities, Physical, Chemical and Biological properties. Solid waste generation rate: Definition, Typical values for Indian cities, Factors affecting. Storage and collection: General considerations for waste storage at source, Types of collection systems. Transfer station: Meaning, Necessity, Location, Economic analysis. Transportation of solid waste: Means and methods, Routing of vehicles.	**8**
Unit-II	**Sorting and material recovery:** Objectives, Stages of sorting, sorting operations, Guidelines for sorting for material recovery, typical material recovery facility for a commingled solid waste. Composting of solid waste: Principles, Methods, Factors affecting, Properties of compost, Vermicomposting. Energy recovery from solid waste: Parameters affecting, Biomethanation, Fundamentals of thermal processing, Pyrolysis, Incineration, Advantages and disadvantages of various technological options.	**8**
Unit-III	**Landfills:** Definition, Essential components, Site selection, Land filling methods, Leachate and landfill.	**8**
Unit-IV	**Biomedical Waste:** Generation, identification, storage, collection, transport, treatment, common treatment and disposal, occupational hazards and safety measures. Biomedical waste legislation in India.	**8**

Unit-V	**Indian scenario:** Present scenario and measures to improve system for different functional elements of solid waste management system. Elements of financial management plan for solid waste system.	**8**

Reference / Text Books:

1. Manual on municipal solid waste management – Government of India publication.
2. Integrated solid waste management – George Tchobanoglous.
3. Solid waste management – A. D. Bhide.
4. Solid waste management handbook– Pavoni.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Assignments	10
3) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. Gain knowledge about the sources of solid waste, their classification, different collection, and transport mechanisms, and the hierarchy of integrated solid waste management.
2. Design and operate energy recovery facilities.
3. Understanding the concepts and principles of Bio-Medical wastes.
4. Competent in landfill design and operation.
5. Suggest an improvement plan for managing solid waste in the context of the Indian scenario.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: I

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: I Semester: I
Credits Theory: 4 Practical: 0	**Subject:** Environmental Auditing and Management Systems
Course Code: DEEE-112	**Title: :** Environmental Auditing and Management Systems

Course Objectives:
1. To comprehend the idea behind an environmental audit.
2. Acquire the knowledge and abilities required for the auditing of environmental management systems.
3. To learn about environmental management systems.
4. To use managerial abilities when they start their own business.
5. Learning the techniques for identifying and evaluating environmental aspects of an organization's activities, products, and services.

Nature of Paper: Departmental Elective

Minimum Passing Marks/Credits: 40% Marks /4

L: 4 T: 0 P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit-I	Concepts of environmental audit, objectives of audit. Types of audits; features of effective auditing; programme planning; organisation of auditing programme, pre-visit data collection.	**8**
Unit-II	Audit protocol; onsite audit; data sampling - inspections - evaluation and presentation; exit interview; audit report - action plan - management of audits; waste management contractor audits. Life cycle approach.	**8**
Unit-III	Introduction; principles & elements of successful environmental management; ISO principles; EMS; creating an environmental management system in line with ISO: 14000; benefits of an environmental management system.	**8**
Unit-IV	Principles & elements of successful environmental management: leadership, environmental management planning, implementing an environmental management system, measurement & evaluations required for an environmental management system, environmental management reviews & improvements.	**8**
Unit-V	Legal and regulatory concerns; Integrating ISO 9000 & ISO 14000.	**8**

Reference / Text Books:

1. Renewable Energy Environment and Development- Maheswar Dayal, Konark Publishers
2. Planning and Implementation of ISO14001, Environmental Management System- Girdhar Gyani, Raj Publishiong House, Jaipur

3. ISO: 14000 Handbook- Joseph Caseio (Ed), McGraw-Hill Professional
4. INSIDE ISO: 14000 – The Competitive Advantage of Environmental Management- Don Sayre, St Lucie Pree.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Assignments	10
3) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. Understand the principles of environmental audits and put them into practice.
2. Recognize the necessity of environmental management standards.
3. Understand the key environmental issues faced by managers in different geographic and cultural contexts.
4. Get a better understanding of the moral and ethical considerations involved in achieving the efficient and sustainable use of resources.
5. Acquainted with practical skills that are pertinent, especially in the areas of impact assessment, auditing, and law.

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: I

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: I Semester: I
Credits Theory: 0 Practical: 2	**Subject:** Water & Waste Water Treatment System Lab
Course Code: MTEE-114P	**Title: :** Water & Waste Water Treatment System Lab

Course Objectives:
1. To instruct the students on the operation and layout of various physical and chemical systems for the treatment of water and wastewater.
2. To familiarize students with the procedures used in typical environmental investigations into the quality of water and wastewater.
3. To learn which tests are suited for specific environmental issues.
4. Write technical reports and statistically interpret laboratory results.
5. Use the results of the laboratory studies to identify problems, quantify them, and develop technical and basic environmental designs.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 0
Practical- 3

Unit	Contents	No. of Lectures Allotted
Practical No. 1	Testing the samples for BOD.	**2**
Practical No. 2	Testing the samples for COD.	**2**
Practical No. 3	Testing the samples for TDS.	**2**
Practical No. 4	Testing the samples for TS.	**2**
Practical No. 5	Testing the samples for Turbidity.	**2**
Practical No. 6	Testing the samples for Hardness.	**2**
Practical No. 7	Testing the samples for Alkalinity.	**2**
Practical No. 8	Testing the samples for DO.	**2**
Practical No. 9	Testing the samples for Conductivity.	**2**

Reference / Text Books:

1. Renewable Energy Environment and Development- Maheswar Dayal, Konark Publishers
2. Planning and Implementation of ISO14001, Environmental Management System- Girdhar Gyani, Raj Publishiong House, Jaipur
3. ISO: 14000 Handbook- Joseph Caseio (Ed), McGraw-Hill Professional
4. INSIDE ISO: 14000 – The Competitive Advantage of Environmental Management- Don Sayre, St Lucie Pree.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	
2) Assignments	20
3) ESE	30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

1. Understand the principles of environmental audits and put them into practice.
2. Recognize the necessity of environmental management standards.
3. Understand the key environmental issues faced by managers in different geographic and cultural contexts.
4. Get a better understanding of the moral and ethical considerations involved in achieving the efficient and sustainable use of resources.
5. Acquainted with practical skills that are pertinent, especially in the areas of impact assessment, auditing, and law.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:** Environmental Statistical Methods
Course Code: MTEE-121	**Title:** Environmental Statistical Methods

Course Objectives:

1. This course's goal is to help students comprehend statistical concepts, such as measurements of location and dispersion.
2. Analyze the quality standards, apply the right techniques, and reduce errors.
3. To comprehend the foundations of statistical techniques.
4. To become proficient in creating statistical models
5. Translating problem descriptions into models that can be solved quantitatively.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit-I	**Distributions:** Binomial, Poisson and Normal distributions - Definitions, Simple problems only (Derivations not included).	**8**
Unit-II	**Curve Fitting:** Principle of Least Squares, Fitting of straight line and parabola - Correlation - Karl Pearson's coefficient of correlation and Spearman's rank correlation - Linear regression.	**8**
Unit-III	**Sampling Distributions:** Sampling Distributions - Tests based on Normal, t, Chi-Square and F-Distributions.	**8**
Unit-IV	**Applications Of Variances:** One way and Two way classification of ANOVA - Completely Randomized Design - Randomized Block Design - Latin square Design.	**8**
Unit-V	**Queuing Models:** Single and multiple server Markovian queuing models - M/M/1 and M/M/c queuing models and Applications (Derivations not included).	**8**

Reference / Text Books:

1. Gupta, S.C., and Kapoor, V.K., “Fundamentals of mathematical statistics”, Sultan Chand and sons, Reprint 2003.
2. Gupta, S.C., and Kapoor, V.K., “Fundamentals of Applied statistics”, Sultan Chand and sons, 2003.
3. Veerarajan T. “Probability Statistics and Random processes”, TMH, First reprint, 2004.

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: 1. Capable of statistically analyzing a set of data to determine the relationship and variability. 2. Understanding systems analysis ideas and techniques. 3. Capable of comprehending why frequency distribution is important in environmental sample data. 4. Computation and applications of variances. 5. Effectively communicate modeling results and system procedures.	

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Environmental Engineering</td><td colspan="2">Year: I
Semester: II</td></tr>
<tr><td>Credits
Theory: 4
Practical: 0</td><td colspan="3">Subject: Application of Remote Sensing & GIS for Environmental Engineering</td></tr>
<tr><td>Course Code:
MTEE-122</td><td colspan="3">Title: Application of Remote Sensing & GIS for Environmental Engineering</td></tr>
<tr><td colspan="4">Course Objectives:
1. Learn the principles of remote sensing.
2. Examine and analyze GPS data.
3. To perform remote sensing data analysis to address spatial issues.
4. Understand the concepts and uses of remote sensing, GIS, in the field of environmental engineering.
5. To comprehend the processing of data and the use of GIS software.</td></tr>
<tr><td colspan="4">Nature of Paper: Core</td></tr>
<tr><td colspan="4">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="4">L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
Unit- I	**Introduction to Remote Sensing:** Principles of Remote sensing, Types of Remote Sensing, Advantages of Remote Sensing, Physical basis of Remote Sensing, Applications of Remote Sensing; History of Remote Sensing.	**8**
Unit-II	**The Electromagnetic spectrum:** the nature and generation of Electromagnetic radiation (EMR) Spectral Reflectance Curves. Interaction of EMR with the atmosphere and earth's surface features. Spectral signatures and characteristics, spectral reflectance curves for rocks, soil, vegetation and water features within near and near Infrared. Spectral signatures, Resolution. Remote Sensing observations and platforms: Ground, airborne and satellite based platforms; some important Remote Sensing Satellites. Aerial Stereo coverage and Remote Sensing Satellites. Sensors: Passive and Active Sensors; Major Remote Sensing Sensors; single and multi-band scanners Satellite band designations and principal applications; Colour / False Colour; Aerial Photography/ Aerial Photo Interpretation.	**8**
Unit-III	**Digital Image Processing:** Pixels and Digital Number; Digital Image Structure; Format of Remote Sensing Data; Image Processing functions: Image Restoration, Image Enhancement, Image Transformation, Image Classification and Analysis; Image interpretation strategies. Visual Photo-Interpretation Techniques based on 'Photo elements' and 'Terrain elements'.	**8**

Unit-IV	**Geographic Information System:** Introduction, Definition, Preparation of thematic map from remote sensing data, Map Projection and Coordinate system, GIS components: Hardware, software and infrastructures, GIS data types, Data acquisition, Data Input and Data Processing, and management including topology DEM/ DTM generation.	**8**
Unit-V	**Remote Sensing:** Integration of Remote Sensing and GIS techniques and its applications in Environmental Impact Assessment and Management including some case studies.	**8**

Reference / Text Books:

1. Remote Sensing and GIS - Anji Reddy M., the Book Syndicate, Hyderabad, 2000.
2. Principles of Geographical Information Systems - P A Burrough and R. A. McDonnell, OUP, Oxford, 1998.
3. Remote Sensing for Earth Resource- Rao, L.P., AEG Publication, Hyderabad, 1987.
4. Geographic Information System- Kang Tsung Chang, Tata Mc Graw Hill, Publication Edition, 2002.
5. Remote Sensing And Image Interpretation Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman, Wiley,2003
6. Journal by Insurance company surveyors and loss assessors – Mumbai – published by Insurance companies.

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Assignments	10
3) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. Learn about the principles of remote sensing, sensors, and their properties.
2. Become familiar with various image processing and enhancement methods.
3. Examine the GIS's fundamental elements.
4. Develop the ability to interpret and analyze images when creating thematic maps.
5. Gain an in-depth understanding of present and upcoming satellite missions that are utilized for modeling and environmental evaluation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:** Environmental Impact Assessment
Course Code: MTEE-123	**Title:** Environmental Impact Assessment

Course Objectives:
1. To understand the significance of environmental impact assessment in different engineering projects
2. To summarize the different environmental impact assessment approaches.
3. To determine the forecasting tools for evaluating the environmental impacts
4. To explain the environmental management system ideas
5. Create plans for environmental management.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit-I	Role of EIA as a tool for Sustainable Development. Concept of Carrying Capacity and Limits to growth in terms of population, Food, Resources, Capital, Energy, Land Services etc.	**8**
Unit-II	Impact Assessment: Environmental, Social and Economic issues, Issues in collection of baseline data, preliminary concept of Natural Resource Accounting, Concept of Screening.	**8**
Unit-III	Initial environmental examination (IEE), Environmental Impact Assessment (EIA). Environmental Impact Statement (EIS), and Strategic Environmental Assessment. Rapid and Comprehensive EIA. Methodologies: Including Checklists, Matrices and Networks, EIA: Case studies and Issues.	**8**
Unit-IV	Procedures for Environmental Clearance by the Government of India, Mitigation Strategies, Environmental Management.	**8**
Unit-V	Appropriate Setting of Industries and Projects for minimizing impacts. Concept of Zoning Atlas.	**8**

Reference / Text Books:

1. Environmental Impact Assessment - Larry, W. Canter McGraw-Hill.
2. Introduction to Environmental Impact Assessment - John Glasson, R. Theriveland A. Chandwic, Routledge, Taylor & Francis.
3. Methods of Environmental Impact Assessment - Peter Morris, Riki Therivel, Routledge, Taylor & Francis.
4. A Practical Guide to Environmental Impact Assessment - Paul, A Erickson, CBS Publishers &

Distributors Pvt Ltd.	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:
1. Determine appropriate steps to sustainable growth.
2. Recognize the environmental impact assessment procedure.
3. Inculcate the decision-making power to propose measures based on the effects on the environment.
4. Determine the forecasting techniques for the evaluation of various environmental impacts.
5. Gain knowledge about the significance of environmental impact assessment in different engineering projects.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject:** Global Environmental Issues and Sustainable Development
Course Code: DEEE-123	**Title:** Global Environmental Issues and Sustainable Development

Course Objectives:

1. Awareness of possible resource options.
2. To help students recognize and thoroughly debate the main empirical problems with sustainable development, such as the transition to renewable energy sources.
3. To assist students in comprehending the core ideas behind sustainable development.
4. To introduce students to a wide range of study fields so they can use and, as a result, appropriately apply their theoretical knowledge of public policy and international relations to the topic of sustainable development.
5. Encourage students to participate in social initiatives that will advance sustainable development and help them live more sustainably.

Nature of Paper: Departmental Elective

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit-I	Earth capital – natural resources, renewable and non-renewable ecosystem services, biogeochemical cycles, redundancy & biodiversity, environmental degradation and its impacts on various cycles.	**8**
Unit-II	Society and use of fossil fuels, carbon dioxide & global warming, the likely impacts, the importance of mitigation on methane, connections with meat eating and livestock, sectoral contributions, international interventions and the role of united world action.	**8**
Unit-III	Biodiversity & introduced species, ecosystem components, species interactions, loss of habitats and adaptation, bio-concentration and bioaccumulation, loss of food webs.	**8**
Unit-IV	Genetically modified foods and their fallouts, green revolution, and the consequences of food grown on chemical fertilizers and pesticides, urbanization and its consequences, fallouts of expanding transportation, housing, and lifestyle sectors. Spread of modern diseases, case studies of significant environmental problems and disasters and the lessons learnt, historical role of technology, and the consequences of modern technology.	**8**
Unit-V	Role of environmental ethics, Anthropo-Centric versus eco-centric world views, ecological traditions, Religio-philosophical approaches, Semitic	**8**

	versus non-Semitic perceptions of environment and their fallouts, role of science and technology in environmental degradation and conservation, the concept of deep ecology and Gaia hypothesis.	

Reference / Text Books:

1. Global Environmental Issues- Frances Harris, J. Wiley, cop.
2. An introduction to global environmental issues- instructor's manual- Kevin T. Pickering, Routledge.
3. Global environmental issues: A climatological approach - David D. Kemp, Routledge.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Assignments	10
3) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

1. Keen knowledge of biogeochemical cycles and earth resources.
2. Capable of conducting and developing a plan for assessing risk and vulnerability related to climate impacts on important systems.
3. Gain knowledge of biodiversity's significance, threats, and protection measures.
4. Critically assess how unplanned growth and a population that is always growing affect the environment.
5. Evaluate several ecological mechanisms for restoring a deteriorated ecosystem.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: I Semester: II
Credits Theory: 4 Practical: 0	**Subject: Environmental Legislation**
Course Code: DEEE-124	**Title:** Environmental Legislation

Course Objectives:
1. Know the Importance of Sector specific safety and risks.
2. Observe and understand biological and physical health hazards.
3. To impart knowledge of women's safety, and child labor.
4. Observe and understand the Asbestosis, NIHL PFT.
5. Know the importance of legislation in India, ESI Act.

Nature of Paper: Departmental Elective

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit-I	Environmental acts - their need, historical background, national and international acts and agreements, genesis of environmental acts - general procedure followed in changing a bill into an act; implementation of an act, role of executive, legislature, and judiciary. Legislative powers and their limitations.	**8**
Unit-II	Major National Acts – The Water (prevention and control of pollution) Act, The Air Act, The Environment (protection) Act, Hazardous waste Rules, Biomedical Waste (Management and Handling) Rules, Municipal Solid Waste Rules, Batteries (Management and Handling) Rules, e-waste (management and handling) Rules, Prevention of Cruelty to Animals (Slaughter House) Rules, Slaughter Act.	**8**
Unit-III	Role and Functions of the Central and State Pollution Boards and the powers vested in them. Municipal Acts, Acts related to Land Ownership and use, Factory Act, Acts related to Environmental and Occupational health, Industrial hygiene, Significant International and Interstate Conventions and Treaties on issues such as Climate Change, Ozone depletion, Riparian Rights and sharing of Waters etc.	**8**
Unit-IV	ISO: 14000 - its need, procedure and significance, ISO: 14000 Certification, National Certifications, Role of BIS, Role of Public Hearing, Non - Governmental Organizations and their role, Role of Civil Society, and Judiciary.	**8**

Unit-V	Water Policy, Rehabilitation Policy, and other related major policies of the government of India. Amendments to various Acts from time to time.	**8**

Reference / Text Books:
1. Environmental Legislation in India- K.R. Gupta, Jain Book Depot (JBD)
2. Environmental Law- DS Sengar, Prentice Hall of India
3. ISO 14001 and beyond- environmental management systems in the real world -Christopher Sheldon, Green Publishing

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Assignments	10
3) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
1. Recognize the characteristics of legislation pertaining to environmental protection.
2. Understand national and international environmental laws and regulations.
3. Examine the environmental laws that apply to the industry and have important environmental implications.
4. Obtain a fundamental understanding of ISO 14001-based management systems and auditing that are directly relevant to the environment.
5. Determine and assess how an organization's activities affect the environment.

IIMTU-NEP IMPLEMENTATION
Year: I / Semester: II

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: I Semester: II
Credits Theory: 0 Practical: 2	**Subject:** Water Transmission Lab
Course Code: MTEE-124P	**Title:** Water Transmission Lab

Course Objectives:
1. To educate the students in detailed design concepts related to water transmission mains, water distribution systems, and sewer networks with an emphasis on computer application.
2. Examine various modeling techniques in environmental systems with the goal of learning and utilizing computational fluid dynamics in environmental and economic modeling.
3. Students will gain knowledge from this course on which tests are appropriate for particular environmental concerns.
4. Compose technical reports and analyze lab data statistically.
5. Make use of the findings from the laboratory research to pinpoint issues, give them a numerical value, and create technical and fundamental environmental designs.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /2

L: 0
T: 0
P: 3 (In Hours/Week)
Theory - 0
Practical- 3

Unit	Contents	No. of Lectures Allotted
Practical No. 1	Use of computer software in water transmission.	**2**
Practical No. 2	Use of computer software in water distribution.	**2**
Practical No. 3	Use of computer software in sewer design - LOOP version 4.0.	**2**
Practical No. 4	Use of computer software in sewer design – SEWER.	**2**
Practical No. 5	Use of computer software in sewer design – BRANCH.	**2**

Reference / Text Books:
1. Renewable Energy Environment and Development- Maheswar Dayal, Konark Publishers
2. Planning and Implementation of ISO14001, Environmental Management System- Girdhar Gyani, Raj Publishiong House, Jaipur
3. ISO: 14000 Handbook- Joseph Caseio (Ed), McGraw-Hill Professional
4. INSIDE ISO: 14000 – The Competitive Advantage of Environmental Management- Don Sayre, St Lucie Pree.

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	
2) Assignments	20
3) ESE	30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

1. Use environmental and water-related software
2. Utilize software to solve problems
3. Build models with software
4. Conduct typical environmental investigations.
5. Choose the best methods for particular applications and be familiar with some practical design factors.

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UGC Approved Section 2f & 12B

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Environmental Engineering</td><td>Year: II
Semester: III</td></tr>
<tr><td colspan="2">Credits
Theory: 4
Practical: 0</td><td>Subject: Industrial Pollution Control</td></tr>
<tr><td colspan="2">Course Code: DEEE-235</td><td>Title: Industrial Pollution Control</td></tr>
<tr><td colspan="3">Course Objectives:
1. Understanding the Industrial effluent characteristics and their effects on the environment.
2. Understand the treatment and disposal alternatives of industrial wastewater.
3. To give insight into the methods and procedures employed to treat waters contaminated due to anthropogenic activities.
4. To comprehend different terminologies used in industrial wastewater treatment.
5. Acquainted with air pollution control technologies.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 40% Marks /4</td></tr>
<tr><td colspan="3">L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0</td></tr>
<tr><th>Unit</th><th>Contents</th><th>No. of Lectures Allotted</th></tr>
<tr><td>Unit-I</td><td>Water pollution laws and standards.</td><td>8</td></tr>
<tr><td>Unit-II</td><td>Industrial wastewater treatment, processes and equipment.</td><td>8</td></tr>
<tr><td>Unit-III</td><td>Water pollution control in different Chemical industries.</td><td>8</td></tr>
<tr><td>Unit-IV</td><td>Air Pollution Laws, Air pollutants monitoring equipment and method of analysis, Air pollution control methods in industries.</td><td>8</td></tr>
<tr><td>Unit-V</td><td>Sludge treatment and disposal.</td><td>8</td></tr>
<tr><td colspan="3">Reference / Text Books:
1. Nelson & Nemerow, Industrial Water Pollution-Origin, Characteristics and Treatment, Addison, Wesley Publishing Co.
2. Sincero A.P. & Sincero G.A., Environmental Engineering, A Design Approach, Prentice Hall Of India
3. Babbitt H.E, Sewage & Sewage Treatment, John Wiley
4. Abbasi S. A., & Ramasami E, Biotechnical Methods of Pollution Control, Universities Press (India) Ltd.</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

1. To identify different environmental issues brought on by inappropriate handling of industrial wastewater.
2. Suggest suitable methods of cleaning up pollutants from industrial wastewater.
3. Recommending specific industry-specific pollution control measures.
4. Suggest plans for minimizing air pollution from industries.
5. Overview of waste reduction in the product design of industries.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject:** Instrumental Method of Analysis
Course Code: EEE-236	**Title:** Instrumental Method of Analysis

Course Objectives:
1. To analyze the quality standards.
2. To use the appropriate instruments and minimize errors.
3. Understanding of several environmental research instruments.
4. To familiarize the student with the methods and equipment used for environmental monitoring.
5. Give thorough education on the fundamental principles of instruments.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit- I	Introduction, Concepts of Quantitative Chemistry, Electron Paramagnetic Resonance.	**8**
Unit-II	X-Ray Fluorescence, Infrared Spectroscopy, Emission Spectroscopy, Flame Photometry, and UV-Visible spectroscopy, Atomic Absorption Spectroscopy.	**8**
Unit-III	Nephelometry and Turbidimetry, Gas Chromatography, Gas-Solid Chromatography, Gas-Liquid Chromatography, High Pressure Liquid Chromatography.	**8**
Unit-IV	Polarography, Voltametry and Chronopotentiometry, Colorimetry, Fluorimetry.	**8**
Unit-V	Laser Techniques, Electron Microscopy, Ion Chromatography, Nuclear Magnetic Resonance, TOC analyser.	**8**

Reference / Text Books:

1. An introduction to climate by G.T. Trewartha
2. Climatology by B. Haurwitz and J.M. Austin - McGraw-Hill Inc., US

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: 1. Recognize the fundamentals of environmental engineering and the purposes of instruments. 2. Knowledge of methods and equipment related to the environment. 3. Understanding how to use chromatographic procedures. 4. Analyse environmental materials using spectroscopic methods. 5. Ability to choose an appropriate instrument for water chemical analysis.	

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject:** Earth and Environment
Course Code: DEEE-237	**Title:** Earth and Environment

Course Objectives:
1. To understand the basic concept of earth science.
2. To comprehend today's environmental problems and potential solutions, this course places a strong emphasis on the physical and chemical interactions between the Earth and environmental systems.
3. The goal of this course is to make students aware of the value of both natural and anthropogenic environments and life.
4. Developing skills for identifying appropriate action for significant environmental challenges.
5. A deeper understanding of today's environmental problems and potential solutions.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit-I	Introduction, Biosphere and Environment, Importance of Clean Environment.	**8**
Unit-II	Assimilation Capacity of Environment, Conservation of Environment, Impact of Development on Environment.	**8**
Unit-III	Thermal Pollution, Radioactive and Non-Radioactive Pollution, Soil and Land Pollution.	**8**
Unit-IV	Impact of Mining and Deforestation, Green House Effect and Global Warming, Depletion of Ozone.	**8**
Unit-V	Biodiversity, Sustainable Development, e-Waste, Plastic Waste.	**8**

Reference / Text Books:

1. Nelson & Nemerow, Industrial Water Pollution-Origin, Characteristics and Treatment, Addison, Wesley Publishing Co.
2. Sincero A.P. & Sincero G.A., Environmental Engineering, A Design Approach, Prentice Hall Of India

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

1. Capable of using earth science knowledge to understand environmental processes.
2. Recognize the principles behind programs for clean development.
3. Investigation of soil and land contamination and potential hazards.
4. Capable of speculating on the implications of climate change.
5. Equipped to create long-term climate change mitigation plans.

Format-3

IIMTU-NEP IMPLEMENTATION
Year: II / Semester: III

Programme: PG **Class: M. Tech in Environmental Engineering**	Year: II Semester: III
Credits Theory: 4 Practical: 0	**Subject:** Climatology
Course Code: DEEE-238	**Title:** Climatology

Course Objectives:
1. The course introduces both ecology and transport modelling of aquatic systems for students.
2. Understand the effect of temperature variations on land and sea.
3. To impart basic awareness and knowledge of atmospheric sciences.
4. To comprehend the idea of global warming and the Earth's climate system.
5. To comprehend how civilization will be affected by climate change and how to mitigate it.

Nature of Paper: Departmental Elective

Minimum Passing Marks/Credits: 40% Marks /4

L: 4
T: 0
P: 0 (In Hours/Week)
Theory - 4
Practical- 0

Unit	Contents	No. of Lectures Allotted
Unit-I	Unit I: Temperature: Temperature at the Earth's surface as a function of latitude, effect of land and sea on the temp distribution, Annual Variation of temp, diurnal variation of temp, temp distribution at higher altitudes.	**8**
Unit-II	Wind and Pressure: wind and pressure distribution at the earth's surface, effect of land and sea on wind and pressure distribution, Monsoon circulation; wind and pressure distribution at higher levels	**8**
Unit-III	Precipitation: Annual Precipitation over the Earth as a function of latitude, effect of continents and oceans on the distribution of precipitation, precipitation and altitude, annual variation of precipitation, diurnal variation of precipitation.	**8**
Unit-IV	Weather and Climate, factors on which climate of a place depend; classification of climates, Koeppen's climate classification, Thornthwaite's Climate classifications, Climatic regions of the world. SOI, El Nino, ENSO, IOD; Basic concepts of Global warming and climate change	**8**
Unit-V	Indian Climatology: Four Meteorological seasons in India – Climatology. Mean M.S.L. pressure, Temperature, Rainfall and upper wind patterns. General Circulation of the Atmosphere.	**8**

Reference / Text Books:

1. An introduction to climate by G.T. Trewartha
2. Climatology by B. Haurwitz and J.M. Austin - McGraw-Hill Inc., US

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Assignments 3) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: 1. Analyze the concept of temperature on the earth's surface. 2. Recognize the links between human activity and global warming. 3. Determine the impact of climate change on ecosystems and biodiversity in various biomes and aquatic systems. 4. Create possible future climate change scenarios. 5. Identify potential solutions for tackling climate change.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Environmental Engineering</td><td>Year: II
Semester: III</td></tr>
<tr><td colspan="2">Credits
Theory: NA
Practical: 6</td><td>Subject: DISSERTATION (PHASE – I)</td></tr>
<tr><td colspan="2">Course Code: MTTE-232</td><td>Title: DISSERTATION (PHASE – I)</td></tr>
<tr><td colspan="3">Course Objectives:
1. Research Skills: Develop advanced research abilities, including problem identification, data collection, analysis, and drawing meaningful conclusions.
2. Innovation: Encourage innovative solutions to engineering challenges, contributing to the field's knowledge and advancement.
3. Technical Communication: Enhance written and oral communication skills for effectively sharing complex technical information.
4. Project Management: Develop project management skills to effectively plan, execute, and complete a research project.
5. Contributions to Engineering: Aim to make a significant, practical, and ethical contribution to the chosen field of engineering through the dissertation research.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /6</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (12Hrs./Week=6Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Select a Research Topic: Choose a topic that aligns with the program's guidelines.</td><td>NA</td></tr>
<tr><td>II</td><td>Review the Literature and Gap Identification: Conduct an extensive review of existing literature to understand the current state of knowledge in your chosen area.</td><td>NA</td></tr>
<tr><td>III</td><td>Formulate Research Questions or Objectives: Clearly define the research questions or objectives that your dissertation will address.</td><td>NA</td></tr>
<tr><td>IV</td><td>Research Methodology: Define the methods to achieve the research objective.</td><td>NA</td></tr>
<tr><td>V</td><td>Collect and Analyze Data: Implement your research methodology to collect data or conduct experiments. Analyze the data using appropriate statistical or analytical techniques.</td><td>NA</td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

BOS

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	80 120
Total:	200
Prerequisites for the course:	

Course Learning Outcomes:

- **Research Skills:** Develop the ability to design, execute, and report on a research project, including problem identification and methodology.
- **Innovation and Critical Thinking**: Demonstrate creativity and critical thinking in addressing engineering challenges with innovative solutions.
- **Communication Proficiency:** Exhibit clear technical writing skills and the ability to communicate research findings effectively.
- **Project Management**: Manage research projects, including resource allocation and time management, to meet objectives and deadlines.
- **Contribution to the Field:** Produce a dissertation that makes an original and meaningful contribution to the field of engineering.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- IV

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Environmental Engineering</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: NA
Practical: 8</td><td>Subject: DISSERTATION (PHASE – II)</td></tr>
<tr><td colspan="2">Course Code: MTTE-241</td><td>Title: DISSERTATION (PHASE – II)</td></tr>
<tr><td colspan="3">Course Objectives:
1. Research Skills: Develop advanced research abilities, including problem identification, data collection, analysis, and drawing meaningful conclusions.
2. Innovation: Encourage innovative solutions to engineering challenges, contributing to the field's knowledge and advancement.
3. Technical Communication: Enhance written and oral communication skills for effectively sharing complex technical information.
4. Project Management: Develop project management skills to effectively plan, execute, and complete a research project.
5. Contributions to Engineering: Aim to make a significant, practical, and ethical contribution to the chosen field of engineering through the dissertation research.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /8</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.= 1 Credit (16Hrs./Week=8 Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>NA</td><td>Collect and Analyze Data: Implement your research methodology to collect data or conduct experiments. Analyze the data using appropriate statistical or analytical techniques.</td><td>NA</td></tr>
<tr><td>NA</td><td>Draft the Dissertation</td><td>NA</td></tr>
<tr><td>NA</td><td>Finalize and Submit: Make any final revisions as required by sectunity committee. Prepare the final, formatted version of dissertation.</td><td></td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	80 120
Total:	200
Prerequisites for the course:	

Course Learning Outcomes:

- **Research Skills:** Develop the ability to design, execute, and report on a research project, including problem identification and methodology.
- **Innovation and Critical Thinking**: Demonstrate creativity and critical thinking in addressing engineering challenges with innovative solutions.
- **Communication Proficiency:** Exhibit clear technical writing skills and the ability to communicate research findings effectively.
- **Project Management**: Manage research projects, including resource allocation and time management, to meet objectives and deadlines.
- **Contribution to the Field:** Produce a dissertation that makes an original and meaningful contribution to the field of engineering.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- IV

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech In Environmental Engineering</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: NA
Practical: 4</td><td>Subject: COMPREHENSIVE VIVA</td></tr>
<tr><td colspan="2">Course Code: MTTE-242</td><td>Title: COMPREHENSIVE VIVA</td></tr>
<tr><td colspan="3">Course Objectives:
1. Demonstrate Research Knowledge: Assess the student's in-depth understanding of the research, including background, methods, and results.
2. Critical Thinking and Problem-Solving: Evaluate the ability to think critically and apply problem-solving skills to the research.
3. Effective Communication: Assess the student's capacity to present complex technical information clearly and engage in scholarly discussions.
4. Ethical Considerations: Ensure that research adheres to ethical standards and that the student can discuss ethical implications.
5. Overall Competency: Determine if the student has met educational objectives, displayed mastery of the field, and demonstrated readiness for the award of the M.Tech degree.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /4</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.= 1 Credit (8Hrs./Week= 4 Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>NA</td><td>Prepare Visuals: Create clear and informative figures, tables, and charts to illustrate your data and findings.</td><td>NA</td></tr>
<tr><td>NA</td><td>Presentation and Defense: Prepare for your dissertation defense, which may involve presenting your research findings and answering questions from your committee. Address any concerns or revisions raised during the defense.</td><td>NA</td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	40 60
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- **In-Depth Understanding of Research:** The student demonstrates a deep understanding of the research topic, showcasing comprehensive knowledge of the background, literature review, research methods, and results.
- **Critical Thinking and Problem-Solving Skills:** The student exhibits strong critical thinking abilities and effectively applies problem-solving skills in addressing questions and challenges related to the research.
- **Effective Communication:** The student effectively communicates complex technical information, presenting research findings in a clear, organized, and engaging manner during the viva.
- **Ethical Awareness and Implications:** The student acknowledges and discusses the ethical considerations related to their research, demonstrating an understanding of ethical principles and implications.
- **Comprehensive Competency and Scholarly Engagement:** The student's performance in the comprehensive viva demonstrates a high level of overall competency in the field of engineering, including interdisciplinary thinking (if applicable), and readiness for the award of the M.Tech degree.

School of Engineering & Technology

ACADEMIC HAND BOOK

POSTGRADUATE DEGREE COURSE
IN
STRUCTURAL ENGINEERING

CBCS Committee

EVALUATION SCHEME

POSTGRADUATE DEGREE COURSE IN STRUCTURAL ENGINEERING

M. Tech. in Structural Engineering
First year, First Semester

S. No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTSE-111	Advanced Analysis of Structures	4	0	0	4	20	10	70	--	--	100
2	MTSE-112	Advanced Concrete Design	4	0	0	4	20	10	70	--	--	100
3	MTSE-113	Theory of Elasticity	4	0	0	4	20	10	70	--	--	100
4	DESE-111	Analysis & Design Of Bridge Superstructures	4	0	0	4	20	10	70	--	--	100
	DESE-112	Computer Oriented Numerical Methods										
5	MTSE-114P	Advanced Concrete Design Lab	--	--	3	2	--	--	--	20	30	50
6	*NECC-111	Industrial Visits Assessments	--	--	--	--	--	--	--	25*	--	25*
7	*NECC-112	University Social Responsibility	--	--	--	--	--	--	--	25*	--	25*
8	NECC-114	MOOCS	--	--	4	2	--	--	--	50	--	50
		Total	16	0	7	20	80	40	280	70	30	500

*Note: NECC-111 &NECC-112 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Students need to qualify it but the marks will not be added in total marks.

M. Tech. in Structural Engineering
First year, Second Semester

S. No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTSE-121	Finite ElementMethods	4	0	0	4	20	10	70	--	--	100
2	MTSE-122	Pre-Stressed Concrete	4	0	0	4	20	10	70	--	--	100
3	MTSE-123	StructuralDynamics	4	0	0	4	20	10	70	--	--	100
4	DESE-123 DESE-124	Design of TallBuildings Advanced Foundation Design	4	0	0	4	20	10	70	--	--	100
5	MTSE-124(P)	Finite Element Methods Lab	--	--	2	2	--	--	--	20	30	50
6	*NECC-121	Industrial VisitsAssessments	--	--	--	--	--	--	--	25	--	--
7	*NECC-122	University Social Responsibility	--	--	--	--	--	--	--	25*	--	25*
8	NECC-124	MOOCS/Swayam	--	--	4	2	--	--	--	50	--	50
		Total	16	0	6	20	80	40	280	70	30	500

*Note: NECC-122 &NECC-123 are Noncredit courses (Audit Courses) and will be evaluated on the basis of reportpresented by the student of his/her industrial visits and social visits respectively during the semester. Students need to qualify it but the marks will not be added in total marks.

M. Tech. in Structural Engineering
First year, Third Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	DESE-235	Experimental Stress Analysis	4	0	0	4	20	10	70	--	--	100
	DESE-236	Stability of Structures										
2	DESE-237	Advanced SteelDesign	4	0	0	4	20	10	70	--	--	100
	DESE-238	Theory of Platesand Shells										
3	MTSE-231	Seminar	--	--	8	4	--	--	--	--	200	200
4	MTSE-232	Dissertation(Phase-I)/SYNOPSIS	--	--	12	6	--	--	--	80	120	200
5	*NECC-231	Industrial Visits/Seminar on thereports of visit	--	--	--	--	--	--	--	25*	--	25*
6	*NECC-232	University Social Responsibility	--	--	--	--	--	--	--	25*	--	25*
7	NECC-234	MOOCS/Swayam	--	--	--	2	--	--	--	50	--	50
		Total	8	0	20	20	40	20	140	130	320	650

*Note: NECC-231 & *NECC-232 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Students need toqualify it but the marks will not be added in total marks.

M. Tech. in Structural Engineering
Second Year, Fourth Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTCT-241	Dissertation(Phas e-II)	--	--	16	8	--	--	--	80	120	200
2	MTCT-242	Comprehensive Viva			8	4	--	--	--	40	60	100
		Total			24	12				120	180	300

Format-1

Format-1

CBCS: Statement of Credit distribution	
College/School: School of Engineering & Technology Programme: M.Tech Duration: 4 Semester Annual/Semester: Semester	Credit range: 72-80 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr) or	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	18	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)			DSE-I(4)		
II	20	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)		SEC-1(2)	DSE-II(4)		
Provision to change the core papers							
III	20			SEC-1(2)	DSE-III(4) DSE-IV(4)		Seminar-1 (04) Dissertation Phase-I(06)
IV	12						Comprehensive Viva(04) Dissertation Phase-II(08)
Total Credits	**70**	06(Th)*4(Cr) = 24 02 (Pr)*2(Cr) = 04 **Total = 28**		2*2= 04 **= 04**	4(Th)*4(Cr)= 16 **= 16**		04+06 = 10 04+08 = 12 **=22**

Format-2

IIMTU-NEP Implementation: (M.Tech in Structural Engineering) **Format-2**

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES B.Tech EE	FIRST YEAR	SEMESTER -I	i) C1 (Th.4 Cr.)	4	4	40	Advanced Analysis of Structures	5		
			ii) C2(Th.4 Cr.+ P 2 Cr).	4 2	4 4	40 16	Advanced Concrete Design Advanced Concrete Design Lab	5		
			iii)C3 (Th.4 Cr.)	4	4	40	Theory of Elasticity	5		
			iv) DSE-1 (Th.4 Cr.)	4	4	40	Analysis & Design of Bridge Superstructures Computer Oriented Numerical Methods	5		
			v) SEC-I	2	-	-	MOOCS/SWAYAM	-		
		SEMESTER - II	i) C4 (Th.4 Cr.+ P 2 Cr.)	4 2	4 4	40 16	Finite Element Methods Finite Element Methods Lab	5		
			ii) C5(Th.4Cr.)	4	4	40	Pre-Stressed Concrete	5		
			iii) C6(Th.4Cr.)	4	4	40	Structural Dynamics	5		
			iv) DSE-2 (Th.4Cr.)	4	4	40	Design of Tall Buildings Advanced Foundation Design	5		
			v) SEC-II	2	-	-	MOOCS/SWAYAM	-		

Programme Outcome:
Annexure I

Programme Specific Outcome:
Annexure II

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR	SEMESTER -III	i) DSE-3 (Th. 4 Cr.)	4	4	40	Experimental Stress Analysis Stability of Structures	5		
			ii) DSE-4 (Th. 4 Cr.)	4	4	40	Advanced Steel Design Theory of Plates and Shells	5		
			iii) Seminar (P 4Cr.) iv) Dissertation (Phase-I)/ (P 6Cr.)	4 6	8 12	40 40	Seminar Dissertation (Phase-I)/SYNOPSIS	5		
		SEMESTER -IV	i) Dissertation (Phase-II) (P 8Cr.) ii) Comprehensive Viva (P 4Cr.)	8 4	16 8	40 30	Dissertation (Phase-II) Comprehensive Viva	5		

Programme Outcome:
Annexure I

Programme Specific Outcome:
Annexure II

Annexure I

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and
Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Annexure II

Programme Specific Outcome:

PSO1: To develop the professional skills in the area of construction & management and structural engineering.

PSO2 : Analyze and design the various structural components by using codal provisions.

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester-I

Programme: PG **Class: M.Tech in Structure Engineering**	Year:I Semester:I
Credits Theory:4 Practical:NA	Subject:**Advanced Analysis of Structures**
Course Code: MTSE-111	Title:**Advanced Analysis of Structures**

Course objectives:
- To understand the determinacy of structures.
- To learn the principals of structure analyses.
- Understand the utilization of matrix.
- To understand the behavior of non-linear analysis of structures.
- To evaluate the elasto-plastic analyses of frame.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks /4

L:4
T:1
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Static and kinematic indeterminacy, Principle of virtual work, Stiffness & Flexibility Matrices, Nonlinear analysis, material and geometrical nonlinearities,	8
II	Force-displacement methods, element approach. Application to continuous beams, plane and space Frame problems.	8
III	Formulation of stiffness matrix for a typical multistory apartment building and industrial structure.	8
IV	Nonlinear analysis, material and geometrical nonlinearities.	8
V	large deformation elasto-plastic analysis of Frames, introduction to incremental procedure.	8

Reference / Text Books:

1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Geve, CBS publications.
2. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
3. Structural Analysis by C.S.Reddy.
4. Matrix Structural Analysis by Kanchi.
5. Matrix Methods of Structural Analysis by J.Meek.
6. Structural Analysis by Ghali and Neyveli.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: By the end of the course, the students should have the- • To study the behavior statically determinant and indeterminate of beam, frame & trusses. • To identify the beams problems by matrix method. • To solve the problems of plane and space frame. • To classify the geometrical nonlinearities. • To evaluate the problems of deformations.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

Programme: PG **Class:M.Tech in Structure Engineering**	Year:I Semester: I
Credits Theory:4 Practical:NA	Subject:**Advanced Concrete Design**
Course Code: MTSE-112	Title:**Advanced Concrete Design**

Course Objectives:

- To understand the behavior of beams in flexure.
- Design the singly and doubly reinforced beam with shear effect.
- To understand the concept of tension member.
- To study the behavior and design of deep beam and corbel.
- To study the basic principal of connections.

Nature of Paper: Core

Minimum Passing Marks/Credits: 40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Basic Design Concepts:** Behavior in flexure, Design of singly reinforced rectangular sections, Design of doubly reinforced rectangular sections, Design of flanged beams, Design of shear, Design for Torsion, Limit state of Serviceability: Deflections of Reinforced concrete beams and slabs, short term deflection and long term deflection,	8
II	**Reinforced Concrete Design:** Design approach, stress-strain relationships for concrete and steel, theory for flexural strength, strength of members with flexure, strength of members with flexure and axial load, strength of members with shear, bond and anchorage, service load behavior.	8
III	**Tension members** Design of tension members, compression members, flexure members and beam-columns junctions, adopting codal provisions of IS:800. Components & its terminology, load estimation, choice of sections, analysis and design for Gantry Girders.	8
IV	**Design of Reinforced Concrete Deep Beams & Corbels:** Steps of Designing Deep Beams, Design by IS 456, Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels, Design of Procedure of Corbels, Design of Nibs.	8
V	**Welded Connections:** Advantages of welding, fundamentals and methods of welding, types of joints, welding symbols, inspection of welding, codal	8

	provisions, design of typical welded connections. Bolted connections, Types of bolts, codal provisions, design of typical bolted connections.	

Reference / Text Books:

1. Reinforced concrete design by KennathLeet, Tata Mc. Graw-Hill International, editions, 2nd edition, 1991.
2. Reinforced concrete structural elements – behaviour, Analysis and design by P. Purushotham, Tata Mc. Graw-Hill, 1994.
3. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3rd Edition, 2005.
4. Reinforced concrete structures, Vol.1, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2004.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

On completion of this course, students should be able to:

- To study the behavior of concrete structures with different safety components.
- To understand the preparation of reinforcement scheduled.
- To prepared the structural detailing drawing.
- Analyze the problems of corbel and give their detail drawing.
- Design welded connections as per codal provision.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

Programme: PG **Class: M.Tech in Structure Engineering**	Year:I Semester:I
Credits Theory:4 Practical:NA	Subject:**Theory of Elasticity**
Course Code:MTCT-113	Title:**Theory of Elasticity**

Course Objectives:

- Understand the principals of analyses of stress & strain.
- To utilization the principal of hooks law.
- To study the concept of 2-D problem in rectangular coordinate system.
- To determination of displacement and bending for simple beam.
- To know the behavior of prismatic bar.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction: Elasticity - notation for forces and stresses - components of stresses - components of strain - Hooks law.	8
II	Plane stress and plane strain analysis - plane stress - plane strain - differential equations of equilibrium - boundary conditions	8
III	Two dimensional problems in rectangular coordinates - solution by polynomials - Saint- Venant's principle - determination of displacements	8
IV	bending of simple beams - application of corier series for two dimensional problems - gravity loading. Two dimensional problems in polar coordinates	8
V	Torsion of Prismatic Bars - torsion of prismatic bars - bars with elliptical cross sections - other elementary solution - membrane analogy - torsion of rectangular bars - solution of torsion problems by energy method - use of soap films in solving torsion problems	8

Reference / Text Books:

1. Theory of Elasticity by Timoshenko, McGraw-Hill Publications.
2. Theory of Plasticity by J.Chakarbarthy, McGraw-Hill Publications.
3. Theory of Elasticity by Y.C.Fung.
4. Theory of Elasticity by Gurucharan Singh.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- To study the elasticity of different sections.
- Identify the stress and strain for different sections.
- To solve the problems of bending for beam.
- Analyze the torsion of prismatic bars and rectangular bars.
- To evaluate the torsion problem by energy method.

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Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

Programme: PG **Class:M.Tech in Structure Engineering**	Year:I Semester:I
Credits Theory:4 Practical:NA	Subject:**Analysis & Design of Bridge Superstructures**
Course Code:DESE-111	Title:**Analysis & Design of Bridge Superstructures**

Course Objectives:
- To understand the introduction of bridge.
- To know the different types of bridges.
- To study the load distribution system on bridges
- To study the design procedure of bridges.
- To check the stability of bridges for bearing.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Types of bridges, choice of bridge type	8
II	Longitudinal arrangement and economic spans. Load distribution theories: Courbons method, Hendry Jaeger method, Morice Little method, Grillage analogy	8
III	Design of T-type bridges. Introduction to Box girder bridges	8
IV	Steel bridges & Cable stayed bridge	8
V	Integral bridges, behavior, structural section & analysis. Design of neoprene bearings	8

Reference / Text Books:

1. Simon A. Burtonshaw-Gunn, "Risk and Financial Management in Construction", Gower Publishing, Ltd.,2009
2. Warneer Z, Hirsch, Urban Economics, Macmillan, New York, 1993
3. Eugene F. Brigham, Michael C. Ehrhardt, "Financial Management Theory and Practice", Cengageh Learning, 2010

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- To study the different types of bridges.
- Understand to draw the reinforcement detail drawing.
- To solve the problems of bridge for bearing.
- To analyze the calculation of bridge component parameter.
- To select the site for bridge construction.

Format-3

IIMTU-NEP IMPLEMENTATION
Year- I / Semester- I

Programme: PG **Class:M.Tech In Structure Engineering**	Year:I Semester:I
Credits Theory:4 Practical:NA	Subject:**COMPUTER ORIENTED NUMERICAL METHODS**
Course Code:DESE-112	Title:**COMPUTER ORIENTED NUMERICAL METHODS**

Course Objectives:

- Evaluate the linear equation by using different method.
- Understand the concept of interpolation.
- Analyze the finite difference and study their applications.
- To examine the solution of numerical differentiation and integration problems.
- To solve the ordinary differential equations.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Solutions of linear equations: Direct method – Cramer's rule, Guass – Elimination method- Gauss – Jordan elimination – Triangulation (LU Decomposition) method – Iterative methods Jacobi – Iteration method – Gauss – Siedel iteration, Successive over – relaxationmethod.Eigen values and eigen vectors: Jacobi method for symmetric matrices- Given's methodfor symmetric matrices-Householder's method for symmetric matrices-Rutishausermethod of arbitrary matrices – Power method.	8
II	Interpolation: Linear Interpolation - Higher order Interpolation - Lagrange Interpolation – Interpolating polynomials using finites differences- Hermite Interpolation -piece-wise and spline Interpolation.	8
III	Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas– Backward and forward and central differences- Derivation of Differentiation formulae using Taylor series-Boundary conditions- Beam deflection – Solution of characteristic value problems- Richardson's extrapolation- Use of unevenly spaced pivotal points-Integration formulae by interpolating parabolas-Numerical solution to spatial differential equations.	8
IV	Numerical Differentiation: Difference methods based on undetermined coefficients optimum	8

	choice of step length– Partial differentiation. Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – Lagrange interpolation method- Radaua integration method composite integration method – Double integration using Trapezoidal and Simpson's method.	
V	Ordinary Differential Equation: Euler's method – Backward Euler method – Mid point method – single step method, Taylor's series method- Boundary value problems.	8

Reference / Text Books:

1. Numerical methods for scientific and engineering computations. M.K.Jain- S.R.K.Iyengar – R.K.Jain Willey Eastern Limited.
2. Numerical methods by S.S.Shastry.
3. Applied numerical analysis by – Curtis I.Gerala- AddissionWasley – published campus.
4. Numerical methods for Engineers StevanC.Chopra, Raymond P.Canal Mc.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

After completing the course, students should be able to:

- To study the fundamental concept of integral transformation.
- Understand the concept complex variable and numerical techniques.
- Identify and solve the problems by most suitable method.
- To use the computational tools to solve the problems.
- To evaluate the fourier integral problem in the field of industrial engineering.

Format-3

IIMTU-NEP IMPLEMENTATION
Year- I / Semester- I

Programme: PG **Class: M.Tech in Structure Engineering**	Year:I Semester:I
Credits Theory:NA Practical:2	Subject:**Advanced Concrete design Lab**
Course Code:MTCT-114P	Title:**Advanced concrete design Lab**

Course Objectives:

- Understand the properties of cement.
- Identify the gradation of aggregates.
- To check the hardness and toughness of aggregate.
- Check the quality of fre4sh concrete.
- Understand the durability aspect of concrete.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks/ 2

L:0
T:0
P:2 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=2 Credit (2Hrs./Week=2Credits)

Practical	Contents	No. of Lectures Allotted
Practical-1	Tests on cement - Consistency, Setting times, Soundness, Compressive Strength	2
Practical-2	Gradation Charts of Aggregates.	2
Practical-3	Bulking of fine Aggregate.	2
Practical-4	Aggregate Crushing and Impact value.	2
Practical-5	Workability Tests on Fresh self compacting concrete	2
Practical-6	Air Entrainment Test on fresh concrete.	2
Practical-7	Marsh cone test	2
Practical-8	Permeability of Concrete.	2

Reference / Text Books:

1. Rajaraman, V., Computer Oriented Numerical Methods, Prentice – Hall of India, 1995
2. Chapra S.C., and Canale R.P., Numerical Methods for Engineers, McGraw – Hill, 2004
3. Software Manuals

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30

BOS

Total:	50
Prerequisites for the course:	
Course Learning Outcomes: On completion of lab, students will be able to: • Describe the physical characteristics of aggregates, sources and manufacturing processes for gravels, engineering properties of aggregates, and how aggregates are classified. • Name the constituents of Portland cement concrete and proportion concrete mix designs. • Analysis the fieldwork and inspections necessary for successful results in concrete construction. • Conduct and document laboratory investigations. • Work in small teams with individuals of diverse cultural backgrounds.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I/ Semester- II

<table>
<tr><td colspan="2">Programme: PG
Class:M.Tech in Structure Engineering</td><td>Year:I
Semester:II</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:NA</td><td>Subject:Finite element methods</td></tr>
<tr><td colspan="2">Course Code:MTSE-121</td><td>Title:Finite element methods</td></tr>
<tr><td colspan="3">Course Objectives:
Understand the introduction and concept of FEM.
To study the principal of elasticity for strain displacement relation in matrix.
Analyze the stiffness matrix for 1-D & 2-D element.
Evaluate the shape function of 1-D & 2-D element.
Understand the different type of co-ordinate system.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits:40% Marks /4</td></tr>
<tr><td colspan="3">L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction: Concepts of FEM - steps involved - merits and demerits - energy principles – discrimination - Raleigh - Ritz method of functional approximation.</td><td>8</td></tr>
<tr><td>II</td><td>Principles of Elasticity: Stress equations - strain displacement relationships in matrix form plane stress, plane strain and axi-symmetric bodies of revolution with axisymmetric loading.</td><td>8</td></tr>
<tr><td>III</td><td>One dimensional FEM: Stiffness matrix for beam and bar elements - shape functions foe ID elements.</td><td>8</td></tr>
<tr><td>IV</td><td>Two dimensional FEM: Stiffness matrix for beam and bar elements - shape functions foe ID elements.</td><td>8</td></tr>
<tr><td>V</td><td>Natural coordinate system – area and volume coordinates - generation of element stiffness and nodal load matrices</td><td>8</td></tr>
<tr><td colspan="3">Reference / Text Books:
1. Finite element Methods by OC Zienkiewicz
2. Finite element analysis, theory and progarmming by GS Krishna Murthy.
3. Introduction to Finite element Method by Tirupathi Chandra Patila and Belugunudu</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- To study the bar and beam by FEM.
- Understand the concept of discretization of FEM problems.
- To solve the problems for shape function.
- Analyze the numerical problems by matrix method.
- Evaluate the problems of plane stress and plane strain.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

Programme: PG **Class:M.Tech in Structure Engineering**	Year:I Semester:II
Credits Theory:4 Practical:NA	Subject:**Pre-Stressed Concrete**
Course Code:MTSE-122	Title:**Pre-Stressed Concrete**

Course Objectives:

- Understand the principal of pre-stressed member.
- To study the different methods of pre-stressing.
- Design the pre-stress beam member.
- To design the flexure member sections.
- To identify the losses in pre-stress member

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**General Principles of Pre stressed Concrete :**Pre–tensioning and post – tensioning – Pre stressing by straight, concentric, eccentric, bent and parabolic tendons – Different methods and systems of pre stressing like Hoyer system, Freyssinet system, MagnelBlaton system – Lee-Mc call system.	8
II	**Deflections of Prestressed Concrete Beams :**Short term deflections of uncracked members– Prediction of long-time deflections – load – deflection curve for a PSC beam – IS code requirements for max.deflections	8
III	**Design of Section for Flexure :** Allowable stresses – Elastic design of simple beams having rectangular and I-section for flexure – kern lines – cable profile and cable layout.	8
IV	**Losses of Prestress :**Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete	8
V	Shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage, bending of member	8

Reference / Text Books:

1. APrestressed concrete by Krishna Raju, Tata McGraw Hill Book – Co ., New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. RamamruthamDhanpatRai& Sons, Delhi.

If the course is available as Generic Elective then the students of following departments may opt it. NA	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- Understand the utilization of pre-stressing by different method.
- Identify the stress for flexural member.
- To solve the problems of deflection in pre-stressed concrete beam.
- Analyze the losses in pre-stress beam.
- Design the pre-stressed beam member.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

Programme: PG **Class:M.Tech In Structure Engineering**	Year:I Semester:II
Credits Theory:4 Practical:NA	Subject:**Structural Dynamics**
Course Code:MTSE-123	Title:**Structural Dynamics**

Course Objectives:

- Understand the behavior of dynamic analysis.
- Understand the formulation of equation of motion.
- Analyze the behavior of vibration system.
- Understand the concept of SDOF & MDOF system.
- To study about the dynamic loading for vibration.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 4Hrs./Week=4Credits

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Structural Dynamics :**Fundamental objectives of dynamic analysis - Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principle of virtual work and Hamilton principle.	8
II	**Practical Vibration Analysis:** Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure	8
III	**Introduction to Earthquake Analysis:** Introduction - Excitation by rigid base translation - Lumped mass approach - SDOF and MDOF systems - I. S. Code methods of analysis for obtaining response of multi storeyed buildings.	8
IV	**Degree of Freedom Systems :**Formulation and solution of the equation of motion - Free vibration response	8
V	Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.	8

Reference / Text Books:

1. Dynamics of Structures by Clough &Penzien, McGraw Hill, New york
2. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi.
3. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
4. I.S: 1893 - 1984, "Code of practice for Earthquake resistant design of Structures" and latest I.S:

1893 - 2002 (version) Part-1.
If the course is available as Generic Elective then the students of following departments may opt it. NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

- Understand the effect of seismic forces on structures.
- To classify the role of vibration in structures.
- To solve the problems of earthquake resistance structures.
- Analyze the problems of lumped mass.
- To evaluate the dynamic loading problems

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

<table>
<tr><td colspan="2">Programme: PG
Class:M.Tech In Structure Engineering</td><td>Year:I
Semester:II</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:NA</td><td>Subject: Design of Tall Buildings</td></tr>
<tr><td colspan="2">Course Code:DSSE-123</td><td>Title: Design of Tall Buildings</td></tr>
<tr><td colspan="3">Course Objectives:
• Understand the principal of stability of tall building.
• To design the building for earthquake and wind effect.
• Evaluate the performance of tall structures for strength and stability.
• To evaluate the effect of shear wall.
• Understand the behavior of tubular structures</td></tr>
<tr><td colspan="3">Nature of Paper: DSE</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits:40% Marks /4</td></tr>
<tr><td colspan="3">L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Structural systems of tall buildings</td><td>8</td></tr>
<tr><td>II</td><td>Moment resistant, frames, braced frames</td><td>8</td></tr>
<tr><td>III</td><td>Eccentrically braced
frames, shear walls, coupled shear walls,</td><td>8</td></tr>
<tr><td>IV</td><td>frame shear wall interaction</td><td>8</td></tr>
<tr><td>V</td><td>Tubular structures; approximate and matrix oriented methods of design of tall buildings</td><td>8</td></tr>
<tr><td colspan="3">Reference / Text Books:
1. Simon A. Burtonshaw-Gunn, “Risk and Financial Management in Construction”, Gower Publishing, Ltd.,2009
2. Warneer Z, Hirsch, Urban Economics, Macmillan, New York, 1993</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

On completion of this course, students should be able to:

- To study the introduction of tall building structures.
- Identify the eccentric framed member.
- Prepared the structural detail drawing of tall building.
- Analyze the problems of shear wall for tall building.
- Design the tubular structures.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

Programme: PG **Class:M.Tech In Structure Engineering**	Year:I Semester:II
Credits Theory:4 Practical:NA	Subject: **Advanced Foundation Design**
Course Code:DESE-124	Title: **Advanced Foundation Design**

Course Objectives:

- Understand the behavior of soil for foundation purpose.
- Understand the design concept of foundation.
- Analyze of settlement of soil and foundation.
- To determine dynamic properties of soil.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Critical study of conventional methods of foundation design	8
II	Analysis of settlement of soil and foundations, foundations of in expensive and swelling soils	8
III	Dynamic soil properties, dynamic bearing capacity of shallow foundations, liquefaction of soils	8
IV	Machine foundations for reciprocating and rotary type machines, vibration isolation. Raft foundations	8
V	Well foundations,special footings and beams on elastic foundations,	8

Reference / Text Books:

1. 1. Dynamics of Structures by Clough &Penzien, McGraw Hill, New york
2. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi. Hill,5th Edition, July,2009

If the course is available as Generic Elective then the students of following departments may optit.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:
After completion of the course the student should be able -

- Determine the index properties of soil and classify the soil.
- To identity the effect footing.
- To differentiate the permeability of soil.
- To classify the compaction characteristics of soil.
- Analyze and design the foundation.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

Programme: PG **Class:M.Tech In Structure Engineering**	Year: I Semester:II
Credits Theory:NA Practical:2	Subject:**Finite Element Analysis (Methods) Lab**
Course Code:MTSE-124P	Title:**Finite Element Analysis (Methods) Lab**

Course Objectives:
- Analyses the stress for circular plate and rectangular L bracket.
- Analyze the stress of axi-symmetric body.
- Analyze the mode frequency for beam.
- Understand the behavior of harmonic analysis.
- Analyze the thermal stresses for 2-D member.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks/ Marks /2

L:0
T:0
P:2 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=2 Credit (2Hrs./Week=2Credits)

Practical	Contents	No. of Lectures Allotted
Practical-1	Stress analysis of a plate with a circular hole	2
Practical-2	Stress analysis of rectangular L bracket	2
Practical-3	Stress analysis of an axi-symmetric component	2
Practical-4	Stress analysis of beams (Cantilever, Simply supported, Fixed ends)	2
Practical-5	Mode frequency analysis of a 2 D component	2
Practical-6	Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)	2
Practical-7	Harmonic analysis of a 2D component	2
Practical-8	Thermal stress analysis of a 2D component	2

Reference / Text Books:
On completion of this course, students should be able to:
- To study the stresses of plate member and draw the diagram.
- Understand the utility of FEM software.
- Classify the mode of frequency in 2D component.
- Analyze the effect of harmonic analysis.
- Evaluate the shear stresses and thermal stress in FEM.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

- Able to use appropriate statistical method in transportation engineering problems.
- Capable of applying the rule of probability and discrete distributions in solving problems
- work on the various transportation software
- understand various GIS and Remote Sensing packages
- develop C programs for various numerical techniques

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

Programme: PG **Class: M.Tech In Structure Engineering**	Year:II Semester:III
Credits Theory:4 Practical:NA	Subject:**EXPERIMENTAL STRESS ANALYSIS**
Course Code:DESE-235	Title:**EXPERIMENTAL STRESS ANALYSIS**

Course Objectives:
•Explain the purpose of accurate mapping of all features under different spatial and temporal scales of all kinds of terrain and land under water bodies.
•Discuss on the advantages of remote sensing compared to traditional surveying techniques in terms of time, accuracy and output.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Basic equations and Plane Elasticity Theory: Introduction, Strain equations of Transformation, Compatibility, Stress-Strain Relations-Two dimensional State of Stress. The Plane-Elastic problem, The Plane-Strain Approach, Plane Stress, Airy's Stress function-Cartesian Co- ordinates-Two dimensional problems in Polar Co-ordinates, Polar Components of Stress in terms of Airy's Stress function, Forms. Principles of Experimental Approach: Merit of Experimental Analysis introduction, uses of experimental stress analysis-Advantages of experimental stress analysis, Different methods, Simplification of problems.	8
II	Strain Measurement using Strain Gauges: Definition of strain and its relation to Experimental Determinations, properties of strain-gauge systems, Types of strain gauges, Mechanical and Optical strain gauges. Electrical Strain Gauges - Introduction, LVDT - resistance strain gauge - various types - gauge factor, Materials for adhesion base, etc. Strain Rosettes: Introduction, The three element rectangular Rosette - The delta rosette - Corrections for Transverse strain effects.	8
III	Brittle Coating Method: Introduction, Coating stresses - Failure theories - Brittle coating Crack pattern - Crack detection - Types of Brittle coating - Test procedures for brittle coating analysis - Calibration procedures - Analysis of brittle coating data.	8
IV	Theory of Photo Elasticity: Introduction, Temporary double refraction - The stress optic law - Effects of stressed model in a Polaris cope for various arrangements – Fringe sharpening, Brewster stress optic law.	8

V	Two Dimensional Photo Elasticity: Introduction, Isochromatic Fringe patterns – Isoclinic fringe patterns, passage of light through plane Polaris cope and circular Polaris cope, Isoclinic fringe pattern - Compensation techniques - calibration methods, separation methods, scaling Model to Proto type stress- Materials for photo - elasticity, properties of photo elastic materials.	8

Reference / Text Books:

1. Experimental Stress Analysis by J.W.Dally and W.F.Riley
2. Experimental Stress Analysis by Dr. Sadhu Singh
3. Experimental Stress Analysis by Dove and Adams

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

- To study the relation between stress-strain.
- Identify the problems of measurement of strain.
- To compute the problems of brittle coating.
- Evaluate the effect of stressed model.
- Analyze the problem of isochromatic fringe.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

Programme: PG **Class:M.Tech in Structure Engineering**	Year:II Semester:III
Credits Theory:4 Practical:NA	Subject:**STABILITY OF STRUCTURES**
Course Code:DESE-236	Title:**STABILITY OF STRUCTURES**

Course Objectives:

- Understand the role of principal of stability of structures.
- Analyze the effect of shear stress on buckling.
- Understand the critical stress diagram and design formula for various end condition.
- Understand the role of pure torsion for thin walled bars.
- Knowing the role of lateral buckling of simply supported beam and rectangular plate.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Beam Columns: Differential equations for beam columns- beam columns with concentrated loads – continuous lateral loads-couples- beam columns with built in ends – continuous beams with axial load – application of trigonometrically series – Effects of initial curvature on deflections – Determination of allowable stresses.	8
II	Elastic Buckling of bars and frames: Elastic Buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns- Buckling of frames-large deflections of buckled bars-Energy methods- Buckling of bars on elastic foundations- Buckle line of bar with intermediate compressive forces - Buckling of bars with change in cross-section – Effect of shear force on critical load- built up columns.	8
III	In Elastic Buckling: Buckle line of straight bar- Double modulus theory – Tangent modulus theory, Inelastic lateral Buckling. Experiments and design formulae: Experiments on columns – Critical stress diagram – Empirical formulae for design – various end conditions.	8
IV	Torsion Buckling: Pure torsion of thin walled bars of open cross section – Non-uniform torsion of thin walled bars of open cross section- Torsional buckling – Buckling by torsion and flexure.	8
V	Lateral buckling of simply supported Beams: Beams of Rectangular cross-section subjected to pure bending. Buckling of simply supported Rectangular plates: Derivation of equation of plate subjected to constant	8

	compression in one and two directions.	

Reference / Text Books:
1. B S Smith & A Coull, *Tall Building Structures:* - John Wiley & Sons.
2. W. Schueller, *High Rise Building Structures*: John Wiley & Sons.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
- Define the problems of beam column by differential equation.
- Explain the elastic buckling of bars and frame.
- Apply the empirical formula for various design various end condition.
- Analyze the problems for torsion buckling.
- Evaluate the derivation of equation of plate.

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

Programme: PG **Class: M.Tech in Structure Engineering**	Year:II Semester:III
Credits Theory:4 Practical:NA	Subject:**ADVANCED STEEL DESIGN**
Course Code:DESE-237	Title:**ADVANCED STEEL DESIGN**

Course Objectives:

- Understand the principal of connections and load transfer mechanism.
- Understand the effect of shear on connection.
- Analysis and design of beam connection member & purlins.
- Understand the concept of design of truss girder.
- Analysis and design of the steel bunkers.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**SIMPLE CONNECTIONS –RIVETED, BOLTED PINNED AND WELDED CONNECTIONS**: Riveted connections-Bolted Connections- Load Transfer Mechanism – Failure of Bolted Joints – Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate – Strength and Efficiency of the Joint – Combined Shear and Tension – Slip – Critical Connections – Praying Action – Combined Shear and Tension for Slip- Critical Connections. Design of Groove welds- Design of Fillet Welds- Design of Intermittent fillet welds- Failure of Welds.	8
II	**ECCENTRIC AND MOMENT CONNECTIONS:** Introduction – Beams – Column Connections- Connections Subjected to Eccentric Shear – Bolted Framed Connections- Bolted Seat Connections – Bolted Brackete Connections. Bolted Moment Connections – Welded Framed Connections – Welded Brackete Connections - Moment Resistant Connections.	8
III	**Analysis and Design of Industrial Buildings :** Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular truss, truss for a railway platform. Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions. Design of bracings.	8

IV	**DESIGN OF STEEL TRUSS GIRDER BRIDGES :** Types of truss bridges, component parts of a truss bridge, economic proportions of trusses, self weight of truss girders, design of bridge compression members, tension members; wind load on truss girder bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing.	8
V	**Design of Steel Bunkers and Soils** Introduction – Janseen's Theory – Airy's Theory – Design of Parameters – Design Criteria – Analysis of Bins – Hopper Bottom –Design of Bins.	8

Reference / Text Books:

1. B S Smith & A Coull, *Tall Building Structures:* - John Wiley & Sons.
2. W. Schueller, *High Rise Building Structures*: John Wiley & Sons.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

- To understand the steel structure drawing.
- Identify the different types of connections.
- To compute the moment resistance member.
- To analyze the truss girder.
- To design the steel structures and steel bunkers.

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

Programme: PG **Class: M.Tech in Structure Engineering**	Year:II Semester:III
Credits Theory:4 Practical:NA	**Subject: THEORY OF PLATES & SHELLS**
Course Code:DESE-238	**Title: THEORY OF PLATES & SHELLS**

Course Objectives:
- Understand the principal of cylindrical bending and pure bending in plates.
- Evaluate the deflection of rectangular plate by small deflection theory.
- Understand the study of symmetrical loading of plates.
- Understand the role of utilization of plates in elastic.
- To know the role of buckling for plates.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Cylindrical Bending:** Different kind of plates – Assumptions - Derivation of differential equation for cylindrical bending of long rectangular plates - Analysis of uniformly loaded rectangular plates with edges simply supported and fixed subjected to uniform load. **Pure Bending of Plates :**Slope and curvature of slightly bent plates – Relations between moments and curvature - Particular cases of pure bending - Strain energy in pure bending – Energy methods like Ritz and Galerkin Methods to rectangular plates subjected to simple loadings.	8
II	**Small Deflection Theory of Thin Rectangular Plates:** Assumptions – Derivation of Governing differential equation for thin plates – Boundary conditions –simply supported plate under sinusoidal load – Navier’s solution – Application to different cases– Levy’s solution For various boundary conditions subjected to different Loadings like uniform and hydrostatic pressure.	8
III	**Circular Plates:** Symmetrical loading – Relations between slope, deflection, moments and curvature– Governing differential equation – Uniformly loaded plates with clamped and simplysupported edges– Central hole – bending by moments and shearing forces uniformly distributed. **Orthotropic Plates:** Introduction – Bending of anisotropic plates - Derivation of governing differential equation – Determination of Rigidities in various cases like R.C. slabs, corrugated sheet – Application to the theory of grid works.	8

IV	**Plates on Elastic Foundations:** Governing differential equation – deflection of uniformly loaded simply supported rectangular plate – Navier and Levy type solutions - Large plate loaded at equidistant points by concentrated forces.	8
V	**Buckling of Plates:** Governing equation for Bending of plate under the combined action of in- plane loading and lateral loads – Buckling of rectangular plates by compressive forces acting in one and two directions in the middle plane of plate **Finite Difference Methods:** Introduction - Application to rectangular plates subjected to simple loading.	8

Reference / Text Books:

1. Theory of Plates and Shells by Timoshenko, McGraw Hill Book Co., New York.
2. Theory and Analysis of Plates by P. Szilard, Prentice Hall.
3. Theory of Plates by Chandrasekhar, University Press.
4. Plate Analysis by N. K. Bairagi, Khanna Publishers. New Delhi.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

- To study of cylindrical bending and pure bending plates.
- Understand the small deflection theory.
- To classify the circular and orthotropic plates.
- To analyze the utilization of plates on elastic foundation.
- Evaluate the buckling in plates.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Structural Engineering</td><td>Year: II
Semester: III</td></tr>
<tr><td>Credits
Theory: NA
Practical: 6</td><td colspan="2">Subject: DISSERTATION (PHASE – I)</td></tr>
<tr><td>Course Code: MTTE-232</td><td colspan="2">Title: DISSERTATION (PHASE – I)</td></tr>
<tr><td colspan="3">Course Objectives:
1. Research Skills: Develop advanced research abilities, including problem identification, data collection, analysis, and drawing meaningful conclusions.
2. Innovation: Encourage innovative solutions to engineering challenges, contributing to the field's knowledge and advancement.
3. Technical Communication: Enhance written and oral communication skills for effectively sharing complex technical information.
4. Project Management: Develop project management skills to effectively plan, execute, and complete a research project.
5. Contributions to Engineering: Aim to make a significant, practical, and ethical contribution to the chosen field of engineering through the dissertation research.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /6</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (12Hrs./Week=6Credits)</td></tr>
</table>

Unit	Contents	No. of Lectures Allotted
I	**Select a Research Topic:** Choose a topic that aligns with the program's guidelines.	NA
II	**Review the Literature and Gap Identification:** Conduct an extensive review of existing literature to understand the current state of knowledge in your chosen area.	NA
III	**Formulate Research Questions or Objectives:** Clearly define the research questions or objectives that your dissertation will address.	NA
IV	**Research Methodology:** Define the methods to achieve the research objective.	NA
V	**Collect and Analyze Data**: Implement your research methodology to collect data or conduct experiments. Analyze the data using appropriate statistical or analytical techniques.	NA

Reference / Text Books: NA
If the course is available as Generic Elective, then the students of following departments may opt it. NA

<table>
<tr><td colspan="2" align="center">Evaluation/Assessment Methodology</td></tr>
<tr><td colspan="2" align="right">Max. Marks</td></tr>
<tr><td>1. Internal
2. External</td><td align="center">80
120</td></tr>
<tr><td align="right">Total:</td><td align="center">200</td></tr>
<tr><td colspan="2">Prerequisites for the course:</td></tr>
<tr><td colspan="2">Course Learning Outcomes:
• Research Skills: Develop the ability to design, execute, and report on a research project, including problem identification and methodology.
• Innovation and Critical Thinking: Demonstrate creativity and critical thinking in addressing engineering challenges with innovative solutions.
• Communication Proficiency: Exhibit clear technical writing skills and the ability to communicate research findings effectively.
• Project Management: Manage research projects, including resource allocation and time management, to meet objectives and deadlines.
• Contribution to the Field: Produce a dissertation that makes an original and meaningful contribution to the field of engineering.</td></tr>
</table>

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- IV

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Structural Engineering</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: NA
Practical: 8</td><td>Subject: DISSERTATION (PHASE – II)</td></tr>
<tr><td colspan="2">Course Code: MTTE-241</td><td>Title: DISSERTATION (PHASE – II)</td></tr>
<tr><td colspan="3">Course Objectives:
1. Research Skills: Develop advanced research abilities, including problem identification, data collection, analysis, and drawing meaningful conclusions.
2. Innovation: Encourage innovative solutions to engineering challenges, contributing to the field's knowledge and advancement.
3. Technical Communication: Enhance written and oral communication skills for effectively sharing complex technical information.
4. Project Management: Develop project management skills to effectively plan, execute, and complete a research project.
5. Contributions to Engineering: Aim to make a significant, practical, and ethical contribution to the chosen field of engineering through the dissertation research.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /8</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.= 1 Credit (16Hrs./Week=8 Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>NA</td><td>Collect and Analyze Data: Implement your research methodology to collect data or conduct experiments. Analyze the data using appropriate statistical or analytical techniques.</td><td>NA</td></tr>
<tr><td>NA</td><td>Draft the Dissertation</td><td>NA</td></tr>
<tr><td>NA</td><td>Finalize and Submit: Make any final revisions as required by sectunity committee. Prepare the final, formatted version of dissertation.</td><td></td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	80 120
Total:	200
Prerequisites for the course:	

Course Learning Outcomes:

- **Research Skills:** Develop the ability to design, execute, and report on a research project, including problem identification and methodology.
- **Innovation and Critical Thinking**: Demonstrate creativity and critical thinking in addressing engineering challenges with innovative solutions.
- **Communication Proficiency:** Exhibit clear technical writing skills and the ability to communicate research findings effectively.
- **Project Management**: Manage research projects, including resource allocation and time management, to meet objectives and deadlines.
- **Contribution to the Field:** Produce a dissertation that makes an original and meaningful contribution to the field of engineering.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- IV

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Structural Engineering</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: NA
Practical: 4</td><td>Subject: COMPREHENSIVE VIVA</td></tr>
<tr><td colspan="2">Course Code: MTTE-242</td><td>Title: COMPREHENSIVE VIVA</td></tr>
<tr><td colspan="3">Course Objectives:
1. Demonstrate Research Knowledge: Assess the student's in-depth understanding of the research, including background, methods, and results.
2. Critical Thinking and Problem-Solving: Evaluate the ability to think critically and apply problem-solving skills to the research.
3. Effective Communication: Assess the student's capacity to present complex technical information clearly and engage in scholarly discussions.
4. Ethical Considerations: Ensure that research adheres to ethical standards and that the student can discuss ethical implications.
5. Overall Competency: Determine if the student has met educational objectives, displayed mastery of the field, and demonstrated readiness for the award of the M.Tech degree.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /4</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.= 1 Credit (8Hrs./Week= 4 Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>NA</td><td>Prepare Visuals: Create clear and informative figures, tables, and charts to illustrate your data and findings.</td><td>NA</td></tr>
<tr><td>NA</td><td>Presentation and Defense: Prepare for your dissertation defense, which may involve presenting your research findings and answering questions from your committee. Address any concerns or revisions raised during the defense.</td><td>NA</td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	40 60
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- **In-Depth Understanding of Research:** The student demonstrates a deep understanding of the research topic, showcasing comprehensive knowledge of the background, literature review, research methods, and results.
- **Critical Thinking and Problem-Solving Skills:** The student exhibits strong critical thinking abilities and effectively applies problem-solving skills in addressing questions and challenges related to the research.
- **Effective Communication:** The student effectively communicates complex technical information, presenting research findings in a clear, organized, and engaging manner during the viva.
- **Ethical Awareness and Implications:** The student acknowledges and discusses the ethical considerations related to their research, demonstrating an understanding of ethical principles and implications.
- **Comprehensive Competency and Scholarly Engagement:** The student's performance in the comprehensive viva demonstrates a high level of overall competency in the field of engineering, including interdisciplinary thinking (if applicable), and readiness for the award of the M.Tech degree.

School of Engineering & Technology

ACADEMIC HAND BOOK

POSTGRADUATE DEGREE COURSE
IN
TRANSPORTATION ENGINEERING

Evaluation Scheme

M.Tech. in Transportation Engineering

M. Tech. in Transportation Engineering
First Year, First Semester

<table>
<tr><th rowspan="3">S.No.</th><th rowspan="3">Subject Code</th><th rowspan="3">Subject</th><th colspan="3" rowspan="2">Periods</th><th rowspan="2">Credit</th><th colspan="5">Evaluation Scheme</th><th rowspan="3">Subject Total</th></tr>
<tr><th colspan="3">Theory</th><th colspan="2">Practical</th></tr>
<tr><th>L</th><th>T</th><th>P</th><th></th><th>CT</th><th>TA</th><th>ESE</th><th>TA</th><th>ESE</th></tr>
<tr><td>1</td><td>MTTE-111</td><td>Highway Traffic Analysis and Design</td><td>4</td><td>0</td><td>0</td><td>4</td><td>20</td><td>10</td><td>70</td><td>--</td><td>--</td><td>100</td></tr>
<tr><td>2</td><td>MTTE-112</td><td>Pavement Materials Characterization</td><td>4</td><td>0</td><td>0</td><td>4</td><td>20</td><td>10</td><td>70</td><td>--</td><td>--</td><td>100</td></tr>
<tr><td>3</td><td>MTTE-113</td><td>ADVANCED TRAFFIC ENGINEERING</td><td>4</td><td>0</td><td>0</td><td>4</td><td>20</td><td>10</td><td>70</td><td>--</td><td>--</td><td>100</td></tr>
<tr><td rowspan="2">4</td><td>DETE-111</td><td>Pavement Analysis and Design</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">20</td><td rowspan="2">10</td><td rowspan="2">70</td><td rowspan="2">--</td><td rowspan="2">--</td><td rowspan="2">100</td></tr>
<tr><td>DETE-112</td><td>Advanced Railway Engineering</td></tr>
<tr><td>5</td><td>MTTE-114 P</td><td>Transportation Engineering Lab</td><td>--</td><td>--</td><td>3</td><td>2</td><td>--</td><td>--</td><td>--</td><td>20</td><td>30</td><td>50</td></tr>
<tr><td>6</td><td>*NECC-111</td><td>Industrial Visits/Seminar on the reports of visit</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>25*</td><td>--</td><td>25*</td></tr>
<tr><td>7</td><td>*NECC-112</td><td>University Social Responsibility</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>25*</td><td>--</td><td>25*</td></tr>
<tr><td>8</td><td>*NECC-114</td><td>MOOCS</td><td>--</td><td>--</td><td>4</td><td>2</td><td>--</td><td>--</td><td>--</td><td>50</td><td>--</td><td>50</td></tr>
<tr><td colspan="3">Total</td><td>16</td><td>0</td><td>7</td><td>20</td><td>80</td><td>40</td><td>280</td><td>70</td><td>30</td><td>500</td></tr>
<tr><td colspan="13">*Note: NECC-111 &NECC-112 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student need to qualify it but the marks will not be added in total marks.</td></tr>
</table>

M. Tech. in Transportation Engineering
First Year, Second Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTTE-121	LAND USE & REGIONAL TRANSPORTATION PLANNING	4	0	0	4	20	10	70	--	--	100
2	MTTE-122	Strength and Deformation Behavior of Soil	4	0	0	4	20	10	70	--	--	100
3	MTTE-123	Environmental Impact Assessment	4	0	0	4	20	10	70	--	--	100
4	DETE-123	TRANSPORTATION SYSTEM PLANNING AND MANAGEMENT	4	0	0	4	20	10	70	--	--	100
	DETE-124	Planning and Design of Airport										
5	MTTE-124(P)	CAD in Transportation Engineering Lab	--	--	2	2	--	--	--	20	30	50
6	*NECC-121	Industrial Visits/Seminar on the reports of visit	--	--	--	--	--	--	--	25*	--	25*
7	*NECC-122	University Social Responsibility	--	--	--	--	--	--	--	25*	--	25*
8	NECC-124	MOOCS	--	--	4	2	--	--	--	50	--	50
Total			16	0	6	20	80	40	280	70	30	500

*Note: NECC-121 &NECC-122 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Student need to qualify it but the marks will not be added in total marks.

M. Tech. in Transportation Engineering
Second Year, Third Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	DETE-235	Project Management	4	0	0	4	20	10	70	--	--	100
	DETE-236	Remote sensing and GPS for Transportation Engineering										
2	DETE-237	High Rise Structure	4	0	0	4	20	10	70	--	--	100
	DETE-238	Geometric Design of Highway										
3	MTTE-231	Seminar			8	4	--	--	--	--	200	200
4	MTTE-232	Dissertation(Phase-I)/SYNOPSIS			12	6	--	--	--	80	120	200
5	*NECC-231	Industrial Visits/Seminar on the reports of visit	--	--	--	--	--	--	--	25*	--	25*
6	*NECC-232	University Social Responsibility	--	--	--	--	--	--	--	25*	--	25*
8	NECC-234	MOOCS/Swayam	--	--	--	2	--	--	--	50	--	50
Total			8	0	20	20	40	20	140	130	320	650

*Note: NECC-231 &NECC-232 are Noncredit courses (Audit Courses) and will be evaluated on the basis of report presented by the student of his/her industrial visits and social visits respectively during the semester. Students need to qualify it but the marks will not be added in total marks.

M. Tech. in Transportation Engineering
Second Year, Fourth Semester

S.No.	Subject Code	Subject	Periods			Credit	Evaluation Scheme					Subject Total
							Theory			Practical		
			L	T	P		CT	TA	ESE	TA	ESE	
1	MTTE-241	Dissertation(Phase-II)	0	0	16	8	--	--	--	80	120	200
2	MTTE-242	Comprehensive Viva	0	0	8	4	--	--	--	40	60	100
Total					24	12				120	180	300

Format-1

Format-1

CBCS: Statement of Credit distribution	
College/School: School of Engineering & Technology Programme: M.Tech Duration: 4 Semester Annual/Semester: Semester	Credit range: 72-80 (suggested by CBCS Committee)

Sem.	Cr	Core Course/ Foundation Course Th (6 cr) or	Ability Enhancement Compulsory Course (AECC)	Skill Enhancement Course (SEC)	Discipline Specific Elective (DSE)	Generic Elective (GE)	Research Project (RP)
I	18	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)			DSE-I(4)		
II	20	C-1 (4 Credit)+P-1(2Credit) C-2 (4 Credit) C-3 (4 Credit)		SEC-1(2)	DSE-II(4)		
Provision to change the core papers							
III	20			SEC-1(2)	DSE-III(4) DSE-IV(4)		Seminar-1 (04) Dissertation Phase-I(06)
IV	12						Comprehensive Viva(04) Dissertation Phase-II(08)
Total Credits	**70**	06(Th)*4(Cr) = 24 02 (Pr)*2(Cr) = 04 **Total = 28**		2*2= 04 **= 04**	4(Th)*4(Cr)= 16 **= 16**		04+06 = 10 04+08 = 12 **=22**

Format-2

IIMTU-NEP Implementation: (M.Tech in Transportation Engineering) **Format-2**

Program	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester	Prerequisite	Elective (For other faculty)
CERTIFICATE COURSES B.Tech EE	FIRST YEAR	SEMESTER -I	i) C1 (Th.4 Cr.)	4	4	40	Highway Traffic Analysis and Design	5		
			ii) C2(Th.4 Cr.).	4	4	40	Pavement Materials Characterization	5		
			iii)C3 (P 2)	2	4	8	Transportation Engineering Lab			
			iii)C4 (Th.4 Cr.)	4	4	40	Advanced Traffic Engineering	5		
			iv) DSE-1 (Th.4 Cr.)	4	4	40	Pavement Analysis and Design Advanced Railway Engineering	5		
			v) SEC I	2	-	-	MOOCS/ Swayam			
		SEMESTER - II	i) C5 (Th.4 Cr.)	4	4	40	Land Use & Regional Transportation Planning	5		
			ii) C6 (P 2)	2	4	20	CAD Transportation Engineering Lab	-		
			iii) C7 (Th.4Cr.)	4	4	40	Strength and Deformation Behavior of Soil	5		
			iv) C8 (Th.4Cr.)	4	4	40	Environmental Impact Assessment	5		
			v) DSE-2 (Th.4Cr.)	4	4	40	Transportation System Planning And Management Planning and Design of Airport	5		
			vi) SEC II	2	-	-	MOOCS/ Swayam	-		

*** Industrial Training of 4 Weeks/5Weeks to be completed between the semesters break**

Programme Outcome:
Annexure I

Programme Specific Outcome:
Annexure II

Programme	Year	Semester (15 weeks)	Paper	Credit	Periods per Week	Periods (Hours) per Semester	Paper Title	Unit (Periods per semester)	Prerequisite	Elective (For other faculty)
	SECOND YEAR	SEMESTER -III	i) DSE-3 (Th. 4 Cr.)	4	4	40	Project Management Remote sensing and GPS for Transportation Engineering	5		
			ii) DSE-4 (Th. 4 Cr.)	4	4	40	High Rise Structure Geometric Design of Highway	5		
			iii) Seminar (P 4Cr.) iv) Dissertation (Phase-I)/ (P 6Cr.)	4 6	8 12	40 40	Seminar Dissertation (Phase-I)/SYNOPSIS	5		
		SEMES TER -IV	i) Dissertation (Phase-II) (P 8Cr.) ii) Comprehensive Viva (P 4Cr.)	8 4	16 8	40 30	Dissertation (Phase-II) Comprehensive Viva	5		

Programme Outcome:

Annexure I

Programme Specific Outcome:

Annexure II

Annexure I

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and

Research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Annexure II

PSO1: Plan, analyse, design, prepare cost estimates and execute all kinds of transportation Engineering Projects.

PSO2: Apply modern time construction techniques, well equipment's and management tools so as to complete the project within specified time and limited funds.

Format-3

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

Programme: PG **Class:M.Tech Transportation Engineering**	Year : I Semester : I
Credits Theory:4 Practical:NA	Subject: Highway Traffic Analysis and Design
Course Code: MTTE-111	Title: Highway Traffic Analysis and Design

Course Objectives:

- Learn the relationships between the parameters of traffic flow and the types of flow theories.
- Learn the concept of design vehicle and design volume to be considered along with the concept of roadway capacity and level of service.
- Learn the probabilistic aspects of vehicle arrivals, gap acceptance and delays/ **E** - PCU concept and its limitations - Road user facilities – Parking facilities - Cycle tracks and cycle ways - Pedestrian facilities.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, Parking studies, Accident studies.	8
II	Elements of design - Alignment - Cross sectional elements - Stopping and passing sight distance. Horizontal curves -Vertical curves. Design problems – Hill Roads.	8
III	Traffic regulation and control - Signs and markings - Traffic System Management - Design of at-grade intersections – Principles of design – Channelisation -	8
IV	Design of rotaries –Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination.	8
V	Grade separated intersections - Geometric elements for divided and access controlled highways and expressways – Road furniture - Street lighting. Traffic Safety – Principles and Practices – Road Safety Audit.	8

Reference / Text Books:

1. ITE Hand Book, Highway Engineering Hand Book, McGraw - Hill.
2. AASHTO A Policy on Geometric Design of Highway and Streets
3. R. J. Salter and N. B. Hounsel, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: CO1 Have knowledge about to road system, highway and traffic engineering. CO2 Describe the basic components of transport system and infrastructure, their role, importance and characteristics. CO3 Design and conduct traffic surveys to collect traffic data. CO4 Design of traffic signals. CO5 Apply engineering principles to identify and investigate traffic problems and to devise and evaluate sustainable solutions.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

Programme: PG **Class:M.Tech Transportation Engineering**	Year : I Semester : I
Credits Theory:4 Practical:NA	Subject: **Pavement Materials Characterization**
Course Code: MTTE-112	Title: **Pavement Materials Characterization**
Course Objectives: • The main objective of this course is to provide students with a thorough understanding of the important factors in pavement design and analysis. • The focus will be on practices of pavement design highway agencies	
Nature of Paper: Core	
Minimum Passing Marks/Credits : 40% Marks/4	
L:4 T:1 P:0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	**Subgrade Soil Characterization:** Properties of subgrade layers; different types of soils, Mechanical response of soil; Soil Classification; Index.	8
II	basic properties of soil; A critical look at the different laboratory and in - situ procedures for evaluating the mechanical properties of soils viz. SPT, DCPT, CPT, CBR, Plate Load test & resilient modulus; Suitability of different type of soil for the construction of highway embankments and pavement layers; Field compaction and control. Dynamic properties of soil: FWD test.	8
III	**Introduction to Soil Stabilization:** Physical and Chemical modification: Stabilization with admixtures like cement, lime, calcium chloride, fly ash and bitumen. Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control. Introduction to Ground improvement techniques; Introduction to Geo textiles and synthetic applications.	8
IV	**Aggregate Characterization:** Origin, Classification, Types of aggregates; Sampling of aggregates; Mechanical and shape properties of aggregates, Aggregate texture and skid resistance, polishing of aggregates; Proportioning and Blending of aggregates: Super pave gradation, Fuller and Thompson's Equation, 0.45 power maximum density graph; Use of locally available materials in lieu of aggregates.	8
V	**Bitumen and Bituminous Concrete Mix Characterization:** Bitumen sources and manufacturing, Chemistry of bitumen, bitumen structure, Rheology of bitumen, Elastic modulus, Dynamic modulus, visco-elastic and fatigue properties, creep test, stiffness modulus of bitumen mixes using	8

	shell homographs; Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties	

Reference / Text Books:

1. Yoder and Witczak, Priniciples of Pavement Design, John Wiley and Sons
2. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.
3. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylorand Francis Group)
4. W.Ronald Hudson, Ralph Haas and Zeniswki, Modern Pavement Management, McGraw Hill and Co.
5. Relevant IRC Code

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

CO1 Knowledge of various Pavement Materials.
CO2 Learning of Conventional and Advanced Characterization of Pavement Materials.
CO3 Finding practical solution to Mix design of Pavement Materials.
CO4 Determine the proportions of ingredients required for the mix design of both asphalt mixtures and cement concrete.
CO5 Characterize the pavement materials including soil, aggregate, asphalt, cement, asphalt mixtures, cement concrete.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

<table>
<tr><td colspan="2">Programme: PG
Class:M.Tech Transportation Engineering</td><td>Year : I
Semester : I</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:NA</td><td>Subject: Advanced Traffic Engineering</td></tr>
<tr><td colspan="2">Course Code: MTTE-113</td><td>Title: Advanced Traffic Engineering</td></tr>
<tr><td colspan="3">Course Objectives:
Provide an insight on traffic and its components, factors affecting road traffic and the design of intersection.
Explain sampling of data, analysis and interpretation of data in conducting various surveys. Explain traffic movements, types of intersections, islands, crossings and their design.
Provide an insight on traffic and its components, factors affecting road traffic and the design of intersection.
Explain traffic movements, types of intersections, islands, crossings and their design.
Explain sampling of data, analysis and interpretation of data in conducting various surveys.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits : 40% Marks /4</td></tr>
<tr><td colspan="3">L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction to Traffic Engineering: Properties of Traffic Engineering Elements, Road Vehicle performance</td><td>8</td></tr>
<tr><td>II</td><td>Traffic Studies
Volume studies, Speed studies, Origin and destination studies and parking studies</td><td>8</td></tr>
<tr><td>III</td><td>Traffic Control devices: Various Traffic Control devices, Principles of Intersection Design, Design of signalized and un-signalized intersections, Signal Coordination</td><td>8</td></tr>
<tr><td>IV</td><td>Traffic Regulations and Statistical methods Traffic Safety and Level-of-service Accidents, Lighting, Capacity and Level-of-service analysis
Uninterrupted traffic Flow Theory
Fundamentals of Traffic flow theory, Uninterrupted Traffic flow including Macroscopic and Microscopic Traffic flow models</td><td>8</td></tr>
<tr><td>V</td><td>Interrupted traffic Flow Theory
Fundamentals of Interrupted Traffic Flow, Shockwave Analysis, Car following theory, Queuing Theory, Vehicle arrival: Gap and Gap acceptance
Simulation of Traffic Systems</td><td>8</td></tr>
<tr><td colspan="3">Reference / Text Books:</td></tr>
</table>

1. Kadiyali, L. R., Traffic Engineering and Transport Planning,. Khanna Publishers 2011
2. O'Flaherty C A, "Transport Planning and Traffic Engineering", Butterworth Heinemann, Elsevier, Burlington, MA 2006.
3. Mannering Fred L., Kilarski Walter P. and Washburn Scott S., Principles of Traffic Engineering and Traffic Analysis, Third Edition, Wiley.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

CO1 Able to acquire and apply knowledge of traffic, its components, factors affecting road traffic intersection design.
CO2 Able to apply the knowledge of sampling data in conducting various surveys and analysis.
CO3 Capable of understanding traffic movements and designing islands, intersections and road lightings.
CO4 Capable of designing signals, redesigning the existing signals.
CO5 Able to remember traffic regulations, impact of noise pollution, air pollution and the method of controlling them

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

<table>
<tr><td colspan="2">Programme: PG
Class:M.Tech Transportation Engineering</td><td>Year : I
Semester : I</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:NA</td><td>Subject: Pavement Analysis and Design</td></tr>
<tr><td colspan="2">Course Code: DETE-111</td><td>Title: Pavement Analysis and Design</td></tr>
<tr><td colspan="3">Course Objectives:
• Identify and categorize the factors affecting design and performance of pavements.
• Explain the basic methods and concepts used to analyses flexible and rigid pavements.
• Explain different design methods for flexible and rigid pavement design.
• Study design of flexible and rigid pavement using IRC, Asphalt Institute, and AASHTO methods.</td></tr>
<tr><td colspan="3">Nature of Paper: DSE</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits : 40% Marks/4</td></tr>
<tr><td colspan="3">L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Introduction: Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airport pavements, functions of pavement components</td><td>8</td></tr>
<tr><td>II</td><td>Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads, aircraft loading, gear configuration and tyre pressure. Drainage – Estimation of flow, surface drainage, sub-surface drainage systems, design of sub-surface drainage structures</td><td>8</td></tr>
<tr><td>III</td><td>Flexible Pavement Design: Empirical, semi-empirical and theoretical approaches, design of highway and airport pavements by IRC, AASHTO Methods, applications of pavement design software</td><td>8</td></tr>
<tr><td>IV</td><td>Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and airports as per IRC, AASHTO, design of joints. Design of continuously reinforced concrete pavements. Reliability; Use of software for rigid pavement design</td><td>8</td></tr>
<tr><td>V</td><td>Pavement Management: Pavement failures, maintenance of highways, structural and functional condition evaluation of pavements, pavement management system.</td><td>8</td></tr>
</table>

Reference / Text Books:

1. Yoder and Witczak, Priniciples of Pavement Design, John Wiley and Sons.
2. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.
3. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group).
4. W.Ronald Hudson, Ralph Haas and Zeniswki, Modern Pavement Management, McGraw Hill and Co.
5. Relevant IRC Code.

If the course is available as Generic Elective then the students of following departments may opt it. NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

CO1 Describe the basic components of transport system and infrastructure, their role, importance and characteristics.
CO2 Analyze the stresses and strains in a flexible pavement using multi-layered elastic theory.
CO3 Analyze stresses and strains in a rigid pavement using Westergaard’s theory.
CO4 Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods.
CO5 Design a rigid pavement using IRC and AASHTO methods.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

Programme: PG **Class:M.Tech Transportation Engineering**	Year : I Semester : I
Credits Theory:4 Practical:NA	Subject: **Advanced Railway Engineering**
Course Code: DETE-112	Title: **Advanced Railway Engineering**

Course Objectives:

•Explain the various modes of transportation with their relative merits and demerits.

•List the various types of roads and road patterns; explain the importance of 20 year road development plans and current road projects in the country.

•Explain the factors affecting development of harbors and ports and elements in harbor and port planning.

•Categorize various the national waterways in the country with their important characteristics.

Nature of Paper: DSE

Minimum Passing Marks/Credits : 40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Track and track stresses, Train resistances and hauling power of locomotives ;	8
II	Railway track components: Important features, Railway curves, Super elevation, Gradients and grade compensation,	8
III	Points and crossing and their design approaches. ; Construction and maintenance of railway track	8
IV	Control of train movements; Signals and interlocking. Modernization of railways and future trends;	8
V	Track standards and track rehabilitation.	8

Reference / Text Books:

1. J.S. Mundrey, Railway Track Engineering, Tata McGraw Hill Co. Ltd., 3rd Edition,2000.
2. M.M. Agarwal, Railway Track Engineering, Standard Publishers, 1st Ed. 2005.
3. S. Chandra and Aqarwal, Railway Engineering, Oxford University Press, 1st Ed. Feb 2008.
4. A.D. Kerr, Fundamentals of Railway Track Engineering, Simmons Boardman Pub Co.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: CO1 An ability to identify, formulates, and solves complex engineering problems by applying principles of engineering, science, and mathematics. CO2 An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. CO3 An ability to communicate effectively with a range of audiences. CO4 An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. CO5 An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- I

<table>
<tr><td colspan="2">Programme: PG
Class:M.Tech Transportation Engineering</td><td>Year : I
Semester : I</td></tr>
<tr><td colspan="2">Credits
Theory:NA
Practical:2</td><td>Subject: Transportation Engineering Lab</td></tr>
<tr><td colspan="2">Course Code: MTTE-114P</td><td>Title: Transportation Engineering Lab</td></tr>
<tr><td colspan="3">Course Objectives:
• Explain the properties of aggregates and different test procedure of conduction and specifications
• Explain procedures of conducting tests on neat bitumen and modified bitumen
• Explain Roth futch method of marshal mix design
• Explain CBR test to know the strength characteristics of soil</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits : 50% Marks/2</td></tr>
<tr><td colspan="3">L:0
T:0
P:2 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=2 Credit (2Hrs./Week=2Credits)</td></tr>
<tr><td>Practical</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>Practical-1</td><td>Tests on Aggregate
Aggregate Crushing value Test, Ten percent fine value Test, Blending of aggregate, Aggregate Impact value Test, Angularity no, specific gravity & bulk density of aggregate Test, Stripping value of aggregate Test</td><td>2</td></tr>
<tr><td>Practical-2</td><td>Tests on Bitumen
Bitumen content by centrifugal extractor apparatus Test, Ductility Test, Softening point Test, Penetration value and grade of bitumen Test, Specific gravity Test</td><td>2</td></tr>
<tr><td>Practical-3</td><td>Test on Sub-grade Soil
CBR Test, CBR test by dynamic cone penetrometer, North Dakota cone Test</td><td>2</td></tr>
<tr><td>Practical-4</td><td>Marshall Stability Test
Manual:
1. Highway Materials testing– S.K. Khanna& C.E.G. Justo. Nem Chand & Brothers.</td><td>2</td></tr>
<tr><td colspan="3">Reference / Text Books:
1. Rajaraman, V., Computer Oriented Numerical Methods, Prentice – Hall of India, 1995
2. Chapra S.C., and Canale R.P., Numerical Methods for Engineers, McGraw – Hill, 2004
3. Software Manuals</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

- To learn to operate the various apparatus used in testing of highway materials
- To evaluate the characteristics of aggregates and bitumen
- To interpret the test results

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Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

Programme: PG **Class:M.Tech Transportation Engineering**	Year : I Semester : II
Credits Theory:4 Practical:NA	Subject: **Land Use & Regional Transportation Planning**
Course Code: MTTE-121	Title: **Land Use & Regional Transportation Planning**

Course Objectives:

- Explain different transit modes, routing management activities including demand analysis.
- Provide information on functioning, designing and scheduling of transit terminal design, fleet management, and cost benefit analysis and bus transit operation.

Nature of Paper: Core

Minimum Passing Marks/Credits:40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Urbanization; urban forms and structures, Delineation of regions,	8
II	Land use transportation models; Transit oriented land use planning,	8
III	Regional and intercity travel demand estimation,	8
IV	Freight travel demand modeling,	8
V	Regional network planning, Policy formulation and evaluation	8

Reference / Text Books:

1. Blundon, W. R. and J Black, The Land Use Transport System, 2nd Edition, Australian NatlUniv Press 1984.
2. Eric Koomen and Judith Borsboom-van Beurden, Land-Use Modelling in Planning Practice (GeoJournal Library), 1st Edition, Springer 2011.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:
CO1 Understand the connection between transportation, land use, and urban development
CO2 Understand the impacts of transportation planning on public health, the environment, and social equity
CO3 Be able to fully articulate the history, theory, and application of transportation planning in the United States
CO4 Be intelligent consumers and producers of literature relating to transportation, land use, and urban development
CO5 Possess the necessary foundation for an introductory position in transportation planning

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I/ Semester- II

Programme: PG **Class:M.Tech Transportation Engineering**	Year : I Semester : II
Credits Theory:4 Practical:NA	Subject:**Strength and Deformation Behavior of Soil**
Course Code: MTTE-122	Title: **Strength and Deformation Behavior of Soil**

Course Objectives:

- Explain the origin, formation, and classification of soil, index properties and their determination, types of soil exploration programs.
- Provide information about shear strength of soil and its measurement, elastic properties of soil.

Nature of Paper: Core

Minimum Passing Marks/Credits : 40% Marks/4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Physico-Chemical aspects, Failure theories, Yield criteria, Elastic and Plastic Analysis of soil, Mohar's diagram; Stresses in Soil.	8
II	Description of state of stress and strain at a point, stress distribution problems in elastic half pace. Boussinessqu, WestergardMindlin and Kelvin problems.Distribution of contact pressure.Analysis of Elastic settlement.	8
III	**Soil Plasticity:** Shear Strength of Soils: Experimental determination of shear strength, Types of Tests base on drainage condition and their practical significance, Skempton's and hankel's pore water pressure.	8
IV	Coefficients, Stress Path, Shear strength of unsaturated soil, Row's stress dilatancy theory. Constitutive Models: Constitutive Models in Soil Mechanics.	8
V	Isotropic Elastic, Anisotropic Plasticity and Viscous Models. Representing Soil Behavior using these Models. ; Advances in Constitutive models.	8

Reference / Text Books:

1. A.P.S. Selvadurai, Plasticity &Geomechanics, Cambridge University Press, 2002
2. W.F. Chen, Limit Analysis & Soil Plasticity, Elsevier Scientific, 1975.
3. C. S. Desai and J. T. Christian, Numerical Methods in Geotechnical Engineering, McGrew Hill, New York.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

CO1 The students obtain knowledge on compressibility parameters of soil mass.

CO2 The students are able to select the shear strength to design different structures for different conditions of loading, drainage and failure criteria.

CO3 The students can estimate the stress path in soil under drainage condition.

CO4 The students can describe the mathematical models for solving different problems in soil mechanics.

CO5 Illustrate the deformation behavior of soil mass.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

<table>
<tr><td colspan="2">Programme: PG
Class:M.Tech Transportation Engineering</td><td>Year : I
Semester : II</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:NA</td><td>Subject: Environmental Impact Assessment</td></tr>
<tr><td colspan="2">Course Code: MTTE-123</td><td>Title: Environmental Impact Assessment</td></tr>
<tr><td colspan="3">Course Objectives:
• To understand the significance of environmental impact assessment in different engineering projects
• To summarize the different environmental impact assessment approaches.
• To determine the forecasting tools for evaluating the environmental impacts
• To explain the environmental management system ideas
• Create plans for environmental management.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits : 40% Marks /4</td></tr>
<tr><td colspan="3">L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Role of EIA as a tool for Sustainable Development. Concept of Carrying Capacity and Limits to growth in terms of population, Food, Resources, Capital, Energy, Land Services etc.</td><td>8</td></tr>
<tr><td>II</td><td>Impact Assessment: Environmental, Social and Economic issues, Issues in collection of baseline data, preliminary concept of Natural Resource Accounting,</td><td>8</td></tr>
<tr><td>III</td><td>Concept of Screening, Initial environmental examination (IEE), Environmental Impact Assessment (EIA).</td><td>8</td></tr>
<tr><td>IV</td><td>Environmental Impact Statement (EIS), and Strategic Environmental Assessment., Rapid and Comprehensive EIA. Methodologies: Including Checklists, Matrices and Networks, EIA: Case studies and Issues.</td><td>8</td></tr>
<tr><td>V</td><td>Procedures for Environmental Clearance by the Government of India, Mitigation Strategies, Environmental Management, Appropriate Setting of Industries and Projects for minimizing impacts. Concept of Zoning Atlas.</td><td>8</td></tr>
</table>

Reference / Text Books: 1. Environmental Impact Assessment - Larry, W. Canter McGraw-Hill. 2. Introduction to Environmental Impact Assessment - John Glasson, R. Theriveland A. Chandwic, Routledge, Taylor & Francis. 3. Methods of Environmental Impact Assessment - Peter Morris, RikiTherivel, Routledge, Taylor & Francis. 4. A Practical Guide to Environmental Impact Assessment - Paul, A Erickson, CBS Publishers & Distributors Pvt Ltd.	
If the course is available as Generic Elective then the students of following departments may opt it. NA	
Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: CO1 Determine appropriate steps to sustainable growth. CO2 Recognize the environmental impact assessment procedure. CO3 Inculcate the decision-making power to propose measures based on the effects on the environment. CO4 Determine the forecasting techniques for the evaluation of various environmental impacts. CO5 Gain knowledge about the significance of environmental impact assessment in different engineering projects.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

<table>
<tr><td colspan="2">Programme: PG
Class:M.Tech Transportation Engineering</td><td>Year : I
Semester : II</td></tr>
<tr><td colspan="2">Credits
Theory:4
Practical:NA</td><td>Subject: TRANSPORTATION SYSTEM PLANNING AND MANAGEMENT</td></tr>
<tr><td colspan="2">Course Code: DETE-123</td><td>Title: TRANSPORTATION SYSTEM PLANNING AND MANAGEMENT</td></tr>
<tr><td colspan="3">Course Objectives:
Graduates of the Program will contribute to the development of transportation infrastructure that is sustainable.
Graduates of the program, as part of an organization or as Entrepreneurs, will continue to learn to harness evolving technologies.
Graduates of the program will be professional Transportation Engineers with ethical and societal responsibility.
Recall basic concepts and methods of urban transportation planning in the India.
Summarize methods of designing, conducting and administering surveys to provide the data required for transportation planning</td></tr>
<tr><td colspan="3">Nature of Paper: DSE</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits : 40% Marks /4</td></tr>
<tr><td colspan="3">L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>General
Importance of transportation, transportation planning methodology, hierarchical levels of planning and its relation to rural, urban areas. Long range planning, Passenger and goods transportation, General concept and process of transport planning, Land-use transport interactions, Socio-economic characteristics of Land use.</td><td>8</td></tr>
<tr><td>II</td><td>Transportation Systems
Multi modal transportation system; Characteristics of Mass Transit systems including technical, Demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System-Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities.</td><td>8</td></tr>
<tr><td>III</td><td>Urban Transportation Planning Studies
Urban Travel Characteristics, Private and Public Behavior analysis, Transportation demand Surveys, Delineation of the urban area, zoning, Origin-Destination Studies, Home Interviews, trip Classification and Socio- Economic</td><td>8</td></tr>
</table>

	variables in trip making projections.	
IV	**Planning Methodology and Systems analysis** Study of existing network-trip generation techniques, Category analysis, multiple regressions techniques, Modal split analysis, Trip distribution techniques, Growth Factor model, Gravity models, Opportunity models and multiple regression models.	8
V	Traffic assignment methods, Minimum Path tree-All or nothing assignment and capacity restraint techniques, analysis and evaluation techniques.	8

Reference / Text Books:

1. Khanna,S.K.,Justo, C.E.G., andVeeraragavan, A., `Highway Engineering',NemChandand Bros, Roorkee
2. S.C.Saxena and S.P.Arora "A text book of Railway Engineering", DhanpatRai publications
3. Vukan R. Vuchic, Urban Transit Systems and Technology, Wiley and Son, New York, 2005.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

CO1 Plan rural road network using different approaches
CO2 Identify the cause of a pavement failure
CO3 Design drainage facility for rural roads
CO4 Plan and schedule linear projects like highway construction
CO5 Understand the fundamental concepts planning linear projects

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I / Semester- II

Programme: PG **Class:M.Tech Transportation Engineering**	Year : I Semester : II
Credits Theory:4 Practical:NA	Subject: **Planning and Design of Airport**
Course Code: DETE-124	Title: **Planning and Design of Airport**

Course Objectives:
- Learn the objectives, benefits and the telecommunications in ITS.
- Learn about the functional areas, user needs and services in ITS.
- Learn the concepts of ITS operations and applications.

Nature of Paper: DSE

Minimum Passing Marks/Credits : 40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Classification of airports- ICAO standards ; Planning for airport- Airport components- Zoning laws; Runways- orientation and geometric design- Runway patterns ;	8
II	Taxiways- alignment geometry and turning radius- exit taxiways; Aprons- planning and design ;	8
III	Design principles of critical, semi-critical, non-critical airport pavements- FAA and PCA methods; Airport hangars- their planning and design criteria;	8
IV	Airport landscaping, grading and drainage general aspects; Airport terminal and amenities;	8
V	Airport lighting and marking.	8

Reference / Text Books:

1. N.J. Ashford, P.H. Wright, Airport Engineering, 3rd Edition, 1992, John Wiley
2. R.M. Horonjeff, F.X. McKelvey, W.J Sproule, Seth Young, Planning and
3. Design of Airports, TMH International Publishers, Fifth Edition, 2009
4. Khanna, Arora and Jain, Planning and Design of Airports, Nemchand Bros., 2001
5. Wells, Alexander; Young, Seth, Airport Planning & Management, McGraw
6. Hill,5th Edition, July,2009
7. De N. Richard, &Odoni, Airport Systems: Planning, Design, and Management, McGraw Hill Amedeo, 1st Edition, 2004.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: CO1 Appreciate the advantages of ITS and suggest the appropriate technologies for field conditions. CO.2 Able to suggest the appropriate system/s in various functional areas of transportation. CO3 carry out the design of airports. CO4 carry out the design of waterways. CO5 understand the factors that affect airport designing	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-I/ Semester- II

Programme: PG **Class:M.Tech Transportation Engineering**	Year : I Semester : II
Credits Theory:NA Practical:2	Subject: **CAD in Transportation Engineering Lab**
Course Code: MTTE-124P	Title: **CAD in Transportation Engineering Lab**

Course Objectives:
•Explain different statistical methods used in transportation engineering problems, measures of central tendency, correlations methods.
•Illustrate the use of probability and discrete distributions in transportation engineering problems

Nature of Paper: Core

Minimum Passing Marks/Credits : 50% Marks/2

L:0
T:0
P:2 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=2 Credit (2Hrs./Week=2Credits)

Practical	Contents	No. of Lectures Allotted
Practical-1	Transportation Software – Mx Road, REI heads, HDM4, TRIPS, MIGRAN	2
Practical-2	GIS and Remote Sensing Packages – ArcGIS, Geo-Concept,GRAM++, ENVI, ERDAS	2
Practical-3	Imagine Computer Aided Drafting - DBMS concepts - Civil Engineering Databases – Data entry & Reports. Spreadsheet concepts – Worksheet calculations in Civil Eng, - Regression & Matrix Inversion.	2
Practical-4	Development of C programs to solve problems using numerical techniques	2
Practical-5	Roots of an equation using Newton – Raphson method.	2
Practical-6	Solution of linear simultaneous equations using Gauss elimination.	2
Practical-7	Matrix inversion using Gauss Jordan method	2
Practical-8	Linear regression line of given points.	2

Reference / Text Books:
1. Rajaraman, V., Computer Oriented Numerical Methods, Prentice – Hall of India, 1995
2. Chapra S.C., and Canale R.P., Numerical Methods for Engineers, McGraw – Hill, 2004
3. Software Manuals

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	30
Total:	50
Prerequisites for the course:	

Course Learning Outcomes:

- Able to use appropriate statistical method in transportation engineering problems.
- Capable of applying the rule of probability and discrete distributions in solving problems
- work on the various transportation software
- understand various GIS and Remote Sensing packages
- develop C programs for various numerical techniques

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

Programme: PG **Class:M.Tech Transportation Engineering**	Year : II Semester : III
Credits Theory:4 Practical:NA	Subject: **Remote sensing and GPS for Transportation Engineering**
Course Code: DETE-236	Title: **Remote sensing and GPS for Transportation Engineering**

Course Objectives:
•Explain the purpose of accurate mapping of all features under different spatial and temporal scales of all kinds of terrain and land under water bodies.
•Discuss on the advantages of remote sensing compared to traditional surveying techniques in terms of time, accuracy and output.

Nature of Paper: DSE

Minimum Passing Marks/Credits : 40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
	GIS Definition – Map and map analysis – Automated cartography – History and development of GIS – Hardware requirement – Type of data – Spatial and non- spatial data – Data structure– Vector and raster – Files and data formats – Data compression. **Transportation Systems** Multi modal transportation system; Characteristics of Mass Transit systems including technical, Demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System- Elevated, Surface and Underground construction, Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities **Urban Transportation Planning Studies** Urban Travel Characteristics, Private and Public Behavior analysis, Transportation demand Surveys, Delineation of the urban area, zoning, Origin-Destination Studies, Home Interviews, trip Classification and Socio- Economic variables in trip making projections	8
II	Spatial analysis – Data retrieval – Query – Overlay – Vector data analysis – Raster data analysis – Modeling in GIS – Digital Elevation Model – DTM – Types of output data –Output devices – Sources of errors – Types of errors – Elimination – Accuracies - The Global Positioning system and its applications.	8

III	Concepts and foundations of remote sensing - electromagnetic spectrum - EMR interaction with atmosphere, water vapour, ozone - Basic principles of photogrammetry – Spectral Signature and Spectral Signature curves - Remote sensing platforms and sensors.	8
IV	Satellite system parameters, sensor parameters, earth resources and meteorological satellites, microwave sensors, Data Acquisition and interpretation - Visual Image Interpretation – Visual Image Interpretation Equipment - Digital Image Processing – Classification. Applications of Remote sensing and GPS in Transportation Engineering: Intelligent Transport System, Urban Transport Planning, Accident Studies, Transport System Management, Road Network Planning	8
V	**Planning Methodology and Systems analysis** Study of existing network-trip generation techniques, Category analysis, multiple regressions techniques, Modal split analysis, Trip distribution techniques, Growth Factor model, Gravity models, Opportunity models and multiple regression models, Traffic assignment methods, Minimum Path tree-All or nothing assignment and capacity restraint techniques, analysis and evaluation techniques	8

Reference / Text Books:

1. Principles of Remote Sensing, Paul Jumani, ELBS, 1985.
2. Computer processing of remotely sensed Images an Introduction – Paul M.Mather, John Wiley & Sons, 1989.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

CO1 Explain and to comprehend large tracks of earth surface with less time and cost but more accuracy.
CO2 Work on the various transportation software.
CO3 understand various GIS and Remote Sensing packages.
CO4 Develop C programs for various numerical techniques.
CO5 Understand the fundamental concepts planning linear projects.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

Programme: PG **Class:M.Tech Transportation Engineering**	Year:II Semester:III
Credits Theory:4 Practical:NA	Subject: **High Rise Structure**
Course Code: DETE-237	Title: **High Rise Structure**

Course Objectives:
- Discuss the need of Infrastructure Management in planning and maintaining the Infrastructures
- Discuss the performance of Infrastructures, causes of failure, rating method.
- To study design criteria for tall structures.
- To familiarize the students about stability analysis of tall structures.
- To study behavior of various structural systems under wind loads.

Nature of Paper: DSE

Minimum Passing Marks/Credits : 40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Analysis of tall building frames, Lateral load analysis, multi bay frames, gravity loads, Settlement of foundation.	8
II	Analysis of shear walls - plane shear walls, in filled frames, coupled frames, frames with shear walls.	8
III	Principle of three dimensional analysis of tall buildings; perforated cores, pure torsion in thin tubes,	8
IV	Bending and warping of perforated cores. Analysis of floor system in tall buildings, Vierendal girders, diagrid floors.	8
V	Elastic and inelastic stability of frames and shear walls. Analysis of thermal stresses.	8

Reference / Text Books:

1. B S Smith & A Coull, *Tall Building Structures:* - John Wiley & Sons.
2. W. Schueller, *High Rise Building Structures*: John Wiley & Sons.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100
Prerequisites for the course:	
Course Learning Outcomes: CO1 To apply all types loads on tall buildings according IS code CO2 To analyze and Design tall buildings. CO3 To understand behavior of various structural systems under different loading conditions. CO4 To design towers, chimneys and shear walls. CO5 To check stability of tall structures against buckling, Torsion.	

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

Programme: PG **Class:M.Tech Transportation Engineering**	Year : II Semestr : III
Credits Theory:4 Practical:NA	Subject: **Project Management**
Course Code: DETE-235	Title: **Project Management**
Course Objectives: • Formulate the development and application of models for pavement management. • Discuss the need of application of methods of prioritization and application of innovative methods. • To be aware of the organizational structure of transport corporations and their interactions. • To learn about depot facilities and terminals. • To understand economic analysis of transport projects.	
Nature of Paper: DSE	
Minimum Passing Marks/Credits : 40% Marks /4	
L:4 T:1 P:0 (In Hours/Week) Theory - 1 Hr. = 1 Credit Practical- 2 Hrs.=1 Credit 4Hrs./Week=4Credits)	

Unit	Contents	No. of Lectures Allotted
I	Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization. Work definition: Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Risk Management. Expedition — for documenting multiple and complex projects; Pro Chain® — for scheduling with the critical chain method; Crystal Ball® — for risk analysis; Vensim® — for system dynamics analysis	8
II	Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, CPM/PERT Networks. Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with resource Constraints: Resource Leveling and Resource Allocation.	8
III	Specific methodologies for planning: Critical Path Method (CPM); Precedence Diagramming Method (PDM); Program Evaluation and Review Technique (PERT); Graphical Evaluation and Review Technique (GERT); Queue - Graphical Evaluation and Review Technique (GERT); Simulation Language for Alternative Modeling (SLAM);	8
IV	Dynamic Planning and Control Methodology (DPM); Critical Chain Planning; Resource Loading. Time Cost Trade off: Crashing Heuristic. Project Implementation: Project Monitoring and Control with PERT/Cost, Contract Management, Project Procurement Management; Post Project	8

	Analysis.life-cycle and post-mortem analysis.	
V	Computers applications in Project Management, Such as Microsoft® Project, Primavera Project Planner®, Primavera® Monte Carlo, Crystal Ball® and Pro Chain® are available to the project manager for deterministic and probabilistic planning. Primavera® P3 — for deterministic time and resource scheduling; Primavera® Monte Carlo — for probabilistic time and resource scheduling; Primavera®	8

Reference / Text Books:

1. Cleland and King, VNR Project Management Handbook.
2. Wiest and Levy, Management guide to PERT/CPM, PHI.
3. Horald Kerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBS Publishers, 2002.
4. S. Choudhury, Project Scheduling and Monitoring in Practice.
5. P. K. Joy, Total Project Management: The Indian Context, Macmillan India Ltd.

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology

	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report	
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course:

Course Learning Outcomes:

- Acquire knowledge statistical methods and computer application of accident analysis.
- Analyzing the factors affecting the construction of new roads.
- Understand the Motor Vehicle Act and statutory provision for road transport. Also the students will be able to do scheduling of route, vehicle and crew.
- design the depots and terminals
- Do economic evaluation of the transportation projects and will understand the concepts of the Private Public Partners.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

Programme: PG **Class:M.Tech Transportation Engineering**	Year: II Semester:III
Credits Theory:4 Practical:NA	Subject: **Geometric Design of Highway**
Course Code: DETE-238	Title: **Geometric Design of Highway**

Course Objectives:
Able to recognize and use current pavement design procedures.
•Understanding common design and construction features important to the performance of both asphalt and concrete pavements.

Nature of Paper: DSE

Minimum Passing Marks/Credits : 40% Marks /4

L:4
T:1
P:0 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction: - Importance of geometric design, design controls and criteria; Highway cross, Section elements: Pavement unevenness, camber, carriage way, traffic separators, kerbs, road margins, right of way.	8
II	Sight distance: Stopping sight distance (SSD), PIEV Theory, OSD, Overtaking zones, Sight distance at intersections.	8
III	Designs of Horizontal alignment: Design speed, horizontal curves, super elevation, radius of horizontal curves, widening of pavement on horizontal curves.	8
IV	Horizontal transition curve: Objects of providing transition curves and its types.	8
V	Design of vertical alignment: Gradient, vertical curves.	8

Reference / Text Books:

1. L.R. Kadiyalli, *Traffic Engineering and Transport Planning*, Khanna Publishers, 7th Edition, 2008.
2. C.A.O'Flaherty, *Transport Planning and Traffic Engineering*, Arnold, 1997.
3. R. P. Roess, E. S. Prassas, & W.R. Mc Shane, *Traffic Engineering*, Prentice Hall, 3rd Edition, 2004
4. May, *Traffic Flow Fundamentals*, Prentice Hall, 1989
5. F. L. Mannering, *Principles of Highway Engineering and Traffic Analysis*, 4th Edition, 2008, John Wiley

If the course is available as Generic Elective then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	10
4) Research Project Report Seminar On Research Project Report	
5) ESE	70
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- To understand the geometric design of highway.
- Ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to function multi-disciplinary teams
- An ability to identify, formulate, and solve engineering problems
- An understanding of ethical and professional responsibility

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- III

<table>
<tr><td>Programme: PG
Class: M. Tech in Transportation Engineering</td><td colspan="2">Year: II
Semester: III</td></tr>
<tr><td>Credits
Theory: NA
Practical: 6</td><td colspan="2">Subject: DISSERTATION (PHASE – I)</td></tr>
<tr><td>Course Code: MTTE-232</td><td colspan="2">Title: DISSERTATION (PHASE – I)</td></tr>
<tr><td colspan="3">Course Objectives:
1. Research Skills: Develop advanced research abilities, including problem identification, data collection, analysis, and drawing meaningful conclusions.
2. Innovation: Encourage innovative solutions to engineering challenges, contributing to the field's knowledge and advancement.
3. Technical Communication: Enhance written and oral communication skills for effectively sharing complex technical information.
4. Project Management: Develop project management skills to effectively plan, execute, and complete a research project.
5. Contributions to Engineering: Aim to make a significant, practical, and ethical contribution to the chosen field of engineering through the dissertation research.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /6</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1 Credit (12Hrs./Week=6Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>I</td><td>Select a Research Topic: Choose a topic that aligns with the program's guidelines.</td><td>NA</td></tr>
<tr><td>II</td><td>Review the Literature and Gap Identification: Conduct an extensive review of existing literature to understand the current state of knowledge in your chosen area.</td><td>NA</td></tr>
<tr><td>III</td><td>Formulate Research Questions or Objectives: Clearly define the research questions or objectives that your dissertation will address.</td><td>NA</td></tr>
<tr><td>IV</td><td>Research Methodology: Define the methods to achieve the research objective.</td><td>NA</td></tr>
<tr><td>V</td><td>Collect and Analyze Data: Implement your research methodology to collect data or conduct experiments. Analyze the data using appropriate statistical or analytical techniques.</td><td>NA</td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	80 120
Total:	200
Prerequisites for the course:	

Course Learning Outcomes:

- **Research Skills:** Develop the ability to design, execute, and report on a research project, including problem identification and methodology.
- **Innovation and Critical Thinking**: Demonstrate creativity and critical thinking in addressing engineering challenges with innovative solutions.
- **Communication Proficiency:** Exhibit clear technical writing skills and the ability to communicate research findings effectively.
- **Project Management**: Manage research projects, including resource allocation and time management, to meet objectives and deadlines.
- **Contribution to the Field:** Produce a dissertation that makes an original and meaningful contribution to the field of engineering.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- IV

Programme: PG **Class: M. Tech in Transportation Engineering**	Year: II Semester: IV
Credits Theory: NA Practical: 8	Subject: **DISSERTATION (PHASE – II)**
Course Code: MTTE-241	Title: **DISSERTATION (PHASE – II)**

Course Objectives:

1. **Research Skills**: Develop advanced research abilities, including problem identification, data collection, analysis, and drawing meaningful conclusions.
2. **Innovation**: Encourage innovative solutions to engineering challenges, contributing to the field's knowledge and advancement.
3. **Technical Communication**: Enhance written and oral communication skills for effectively sharing complex technical information.
4. **Project Management**: Develop project management skills to effectively plan, execute, and complete a research project.
5. **Contributions to Engineering**: Aim to make a significant, practical, and ethical contribution to the chosen field of engineering through the dissertation research.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks /8

L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.= 1 Credit (16Hrs./Week=8 Credits)

Unit	Contents	No. of Lectures Allotted
NA	**Collect and Analyze Data**: Implement your research methodology to collect data or conduct experiments. Analyze the data using appropriate statistical or analytical techniques.	NA
NA	**Draft the Dissertation**	NA
NA	**Finalize and Submit:** Make any final revisions as required by sectunity committee. Prepare the final, formatted version of dissertation.	

Reference / Text Books:
NA

If the course is available as Generic Elective, then the students of following departments may opt it.
NA

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	80 120
Total:	200
Prerequisites for the course:	

Course Learning Outcomes:

- **Research Skills:** Develop the ability to design, execute, and report on a research project, including problem identification and methodology.
- **Innovation and Critical Thinking**: Demonstrate creativity and critical thinking in addressing engineering challenges with innovative solutions.
- **Communication Proficiency:** Exhibit clear technical writing skills and the ability to communicate research findings effectively.
- **Project Management**: Manage research projects, including resource allocation and time management, to meet objectives and deadlines.
- **Contribution to the Field:** Produce a dissertation that makes an original and meaningful contribution to the field of engineering.

Format-3

IIMTU-NEP IMPLEMENTATION
Year-II / Semester- IV

<table>
<tr><td colspan="2">Programme: PG
Class: M. Tech in Transportation Engineering</td><td>Year: II
Semester: IV</td></tr>
<tr><td colspan="2">Credits
Theory: NA
Practical: 4</td><td>Subject: COMPREHENSIVE VIVA</td></tr>
<tr><td colspan="2">Course Code: MTTE-242</td><td>Title: COMPREHENSIVE VIVA</td></tr>
<tr><td colspan="3">Course Objectives:
1. Demonstrate Research Knowledge: Assess the student's in-depth understanding of the research, including background, methods, and results.
2. Critical Thinking and Problem-Solving: Evaluate the ability to think critically and apply problem-solving skills to the research.
3. Effective Communication: Assess the student's capacity to present complex technical information clearly and engage in scholarly discussions.
4. Ethical Considerations: Ensure that research adheres to ethical standards and that the student can discuss ethical implications.
5. Overall Competency: Determine if the student has met educational objectives, displayed mastery of the field, and demonstrated readiness for the award of the M.Tech degree.</td></tr>
<tr><td colspan="3">Nature of Paper: Core</td></tr>
<tr><td colspan="3">Minimum Passing Marks/Credits: 50% Marks /4</td></tr>
<tr><td colspan="3">L: 0
T: 0
P: 12 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.= 1 Credit (8Hrs./Week= 4 Credits)</td></tr>
<tr><td>Unit</td><td>Contents</td><td>No. of Lectures Allotted</td></tr>
<tr><td>NA</td><td>Prepare Visuals: Create clear and informative figures, tables, and charts to illustrate your data and findings.</td><td>NA</td></tr>
<tr><td>NA</td><td>Presentation and Defense: Prepare for your dissertation defense, which may involve presenting your research findings and answering questions from your committee. Address any concerns or revisions raised during the defense.</td><td>NA</td></tr>
<tr><td colspan="3">Reference / Text Books:
NA</td></tr>
<tr><td colspan="3">If the course is available as Generic Elective, then the students of following departments may opt it.
NA</td></tr>
</table>

Evaluation/Assessment Methodology	
	Max. Marks
1. Internal 2. External	40 60
Total:	100
Prerequisites for the course:	

Course Learning Outcomes:

- **In-Depth Understanding of Research:** The student demonstrates a deep understanding of the research topic, showcasing comprehensive knowledge of the background, literature review, research methods, and results.
- **Critical Thinking and Problem-Solving Skills:** The student exhibits strong critical thinking abilities and effectively applies problem-solving skills in addressing questions and challenges related to the research.
- **Effective Communication:** The student effectively communicates complex technical information, presenting research findings in a clear, organized, and engaging manner during the viva.
- **Ethical Awareness and Implications:** The student acknowledges and discusses the ethical considerations related to their research, demonstrating an understanding of ethical principles and implications.
- **Comprehensive Competency and Scholarly Engagement:** The student's performance in the comprehensive viva demonstrates a high level of overall competency in the field of engineering, including interdisciplinary thinking (if applicable), and readiness for the award of the M.Tech degree.