SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

(AUTONOMOUS)

Dr. Visweswaraiah Road, (Bangalore-Tirupathi Bye-pass Road),
Murukambattu,Chittoor – 517127, Andhra Pradesh, India.

B.Tech
Course Structures and Syllabi
Under R20 Regulations

(Applicable for 2020-2021 Regular Students & 2021-2022 Lateral Students)

Department of Mechanical Engineering

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES, CHITTOOR,

(AUTONOMOUS)

Institute Vision

To emerge as a Centre of Excellence for Learning and Research in the domains of engineering, computing and management.

Institute Mission

IM1: Provide congenial academic ambience with state -of -art of resources for learning and research.

IM2: Ignite the students to acquire self-reliance in the latest technologies.

IM3: Unleash and encourage the innate potential and creativity of students.

IM4: Inculcate confidence to face and experience new challenges.

IM5: Foster enterprising spirit among students.

IM6: Work collaboratively with technical Institutes / Universities / Industries of National and International repute

Department Vision

To become a Centre of excellence in Mechanical Engineering studies and research.

Department Mission

DM1: Provide congenial academic ambience with necessary infrastructure and learning resources

DM2: Inculcate confidence to face and experience new challenges from industry and society.

DM3: Ignite the students to acquire self-reliance in the latest Technologies

DM4: Foster Enterprising spirit among students

Program Educational Objectives (PEOs)

Graduates of Mechanical Engineering shall

PEO1: Have Professional competency through the application of knowledge gained from subjects like Mathematics, Physics, Chemistry, Inter-Disciplinary and core subjects like Manufacturing Engineering, Thermal Sciences, CAD/CAM and Design & Development. **(Professional Competency)**.

PEO2: Excel in one's career by critical thinking towards successful services and growth of the organization or as an entrepreneur or through higher studies. **(Successful Career Goals).**

PEO3: Enhance knowledge by updating advanced technological concepts for facing the rapidly changing world and contribute to society through innovation and creativity. **(Continuing Education and Contribution to Society).**

Program Specific Outcomes (PSO's)

After the completion of the Program, The student shall able to,

PSO1: Apply the knowledge obtained in core areas for the design, analysis and manufacturing of mechanical systems and processes.

PSO2: Exhibit novel concepts on product development with the help of modern CAD/CAM integration, while ensuring best manufacturing practices.

Program Outcomes

Engineering Graduates will be able to:

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.

ACADEMIC REGULATIONS (R-20) FOR B. TECH

(Regular-Full Time)

(Effective for the students admitted into I year from the Academic Year 2020-2021- and II-year lateral entry from the Academic year 2021-2022 onwards)

Curriculum for Regular and Honors/Minors B. Tech Program of all Branches

1. Eligibility for Admission

1.1 Admission of the B. Tech program shall be made subjects to the eligibility qualifications and Specialization prescribed by the University for each Program from time to time and also as per the guidelines of Andhra Pradesh State Council of Higher Education (APSCHE).

1.2 Admission shall be made either on the basis of Merit / Rank Obtained by the Qualifying candidates in EAMCET/ECET or otherwise specified whichever is relevant.

2. Award of the Degree: A student will be declared eligible for the award of B. Tech. degree if he/she fulfills the following:

i. For regular entry students, shall pursues a course of study in not less than four and not more than eight academic years.

ii. For lateral entry students, shall pursue a course of study for not less than three academic years and in not more than six academic years.

iii. For regular entry students, after eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

iv. For lateral entry students, after six academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

v. For regular entry students shall register for 160 credits and must secure all the 160 credits. For lateral entry students shall register for 121 credits and secure all 121 credits

vi. A student shall be eligible for the award of B. Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160 credits for Regular entry students /121 credits for lateral entry students.

vii. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

3. Structure of the Undergraduate Engineering program:

All subjects / courses offered for the under graduate program in B.Tech. Degree programs are broadly classified as follows.

S.No	Course Classification	Course Category	Course Code
1	Foundation Courses	Humanities and Social Science including Management Courses	HSM
		Basic Science Courses	BSC
		Engineering Science Courses	ESC
2	Core Courses	Professional Core Courses	PCC
3	Elective Courses	Professional Elective Courses	PEC
		Open Elective Courses	OEC
4	Employability Enhancement Courses	Internship, Seminar and Project Work	PROJ
		Skill Oriented Courses / Skill Advanced Courses	SOC/SAC
5	Audit Courses	Mandatory Audit Courses	MAC
6	Minor / Honor Courses	Minor Courses / Honor Courses	MR/HR

4. Assigning of Credits:

i. 1 Hr. Lecture (L) per week – 1 Credit

ii. 1 Hr. Tutorial (T) per week – 1 Credit

iii. 1 Hr. Practical (P) per week – 0.5 Credits

iv. 2 Hours Practical (Lab) per week – 1 Credit

5. Induction Program for I. B. Tech Program

i. There shall be mandatory student induction program for fresher's, with a three-week duration before the commencement of first semester.

ii. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Department / Branch and Innovations etc., shall be included in the guidelines issued by AICTE.

6. Assessment

i. The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory as well as for practical subject and project work.

ii. The audit courses shall be evaluated for a maximum of 30 internal marks.

iii. For theory and practical subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Semester Examinations.

iv. A student has to secure not less than 35% of marks in the end semester examination and minimum 40% of marks in the sum total of Internal Examination and End Semester Examinations marks to earn the credits allotted to each course.

6.1 Internal Examination

6.1.1 For theory subjects, during the semester, there shall be two Mid-Term Examinations will be conducted.

6.1.2 Each Mid-Term Examination consists of objective paper for 10 marks and subjective paper for 15 marks with the duration of 1 hour 50 minutes (20 minutes for objective and 90 minutes for subjective paper).

6.1.3 The subjective paper shall contain 3 either-or type questions with equal Weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 15 marks; any fraction shall be rounded off to the next higher mark.

6.1.4 If the student is absent for the any internal examination, no re-exam or make up exam shall be conducted and marks for that examination shall be considered as zero.

6.1.5 First Mid-Term Examination shall be conducted for I & II units of syllabus and second Mid-Term Examinations shall be conducted for III, IV & V units.

6.1.6 However, 5 marks are awarded for 5 Assignments (unit-wise).

6.1.7 Final Internal marks shall be arrived at by considering the marks secured by the student in both the Mid-Term examinations with 80% weightage to the better mid exam and 20% to the other

For Example:

- Marks obtained in First Mid-Term: 25
- Marks obtained in Second Mid-Term: 25
- Internal Marks: (25x0.8) + (25x0.2) = 25
- Final internal marks = Internal Marks + Assignment marks

6.1.8 If the student is absent for any one Mid-Term Examinations, the final internal marks shall be arrived at by considering 80% Weightage to the marks securedby the student in the appeared examination and zero to the other.

For Example:

- Marks obtained in First Mid-Term: Absent
- Marks obtained in Second Mid-Term: 25
- Internal Marks: (25x0.8) + (0x0.2) = 20
- Final internal marks = Internal Marks + Assignment marks

6.1.9 For practical courses there shall be 30 internal marks. 15 marks allotted for Internal Practical Examination to be conducted before the last working day and 15 marks for Day-to-Day work in the laboratory shall be evaluated by the concerned laboratory teacher based on the regularity / record / viva-voce.

6.1.10 In a practical subject consisting of two parts (ex: Engineering Workshop & IT Workshop), Internal examination shall be evaluated as above for 30 marks in each part and final internal marks shall be arrived by considering the average of marks obtained in two parts.

6.1.11 The evaluation of the practical courses is done based on the rubrics designed for that curriculum component.

6.2 Semester End Examination

6.2.1 End examination of theory courses shall have the following pattern:

i. There shall be two parts, Part-A and Part-B.

ii. Part-A shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit.

iii. Part-B Shall be either-or type questions of 10 marks each. Student shall answer any one of it.

iv. Each of these questions from Part-B shall cover each unit of the syllabus.

6.2.2 End examination of practical courses shall have the following pattern:

i. End Semester Examination shall be for 70 marks.

ii. The end examination shall be conducted by the concerned laboratory teacher and senior expert in the same subject of the department.

iii. In a practical subject consisting of two parts (ex: Engineering Workshop & IT Workshop), the End Semester Examination shall be conducted for 35 marks ineach part.

iv. The evaluation of the practical courses is done based on the rubrics designed for that curriculum component.

6.3 Drawing Courses

6.3.1 For the subject having design and/or drawing, such as Engineering Drawing / Graphics.

6.3.2 The distribution shall be 30 marks for internal evaluation (15 marks for Day- to-Day work (unit wise chart work / Assignment) and for another 15 marks there shall be a two MID Term exams will be conducted) and 70 marks for semester end examinations.

6.3.3 There shall be two Mid-Term examinations in a semester for duration of 2hrs each for 15 marks with weightage of 80% to better mid marks and 20% for the other.

6.3.4 The internal subjective paper shall contain 3 either-or type questions with equalWeightage of 10 marks and the marks obtained for 3 questions shall be condensed to 15 marks; any fraction shall be rounded off to the next higher mark and there shall be no objective paper in internal examination.

6.3.5 The sum of Day-to-Day work evaluation / assignments and the internal MID Term test marks will be the final internal marks for the course.

6.3.6 In the end examination pattern for Engineering Drawing / Graphics there shall be 5 questions, either-or type, of 14 marks each.

6.4 Mandatory Audit Courses

6.4.1 Courses like Human Values and Ethics, Environmental Sciences, Constitution of India and Design Thinking for Innovation shall be included in the curriculum as non-credit mandatory audit courses.

6.4.2 However, attendance in the audit courses shall be considered while calculating aggregate attendance. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course.

6.4.3 The Internal Marks will be calculated similar to that of Theory course.

6.4.4 In grade sheet the completion of the course indicated as Pass – "P", and No marks or letter grade shall be allotted, for all non-credit mandatory audit courses.

6.4.5 Re-exam shall be conducted for failed candidates for every semester at a mutual convenient date of institution.

6.5 Professional Elective Courses

6.5.1 Students have to choose Professional Elective Courses PEC-I in V semester, PEC-II in VI semester and PEC-III, PEC-IV, PEC-V in VII semester, from the list of elective courses given.

6.5.2 Registration forms are invited from the students 10 days prior to the last instructional day of the preceding semester for registration process for offering the Professional Elective Courses.

6.5.3 There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

6.5.4 The assessments of Professional Elective Courses are same as regular theory courses.

6.6 Open Elective Courses

6.6.1 A student shall opt for any 4 courses from the list given by the institute from time to time, complying with the requirement of the prerequisite course(s), if any.

6.6.2 Students have to choose Open Elective Courses OEC-I in V semester, OEC-II in VI semester and OEC-III, OEC-IV in VII semester, from the list of elective courses given.

6.6.3 All Open Elective Courses are offered to the students of across all branches in general.

6.6.4 Registration forms are invited from the students 10 days prior to the last instructional day of the preceding semester for registration process for offering the Open Elective Courses.

6.6.5 However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during their Program.

6.6.6 There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

6.7 Massive Online Open Courses

6.7.1 MOOC courses under Professional Elective / Open Elective

6.7.2 A student shall be permitted to pursue up to a maximum of two elective courses (Professional Elective Courses or Open Elective Courses) under MOOCs during the Program. Each of the courses must be of minimum 12 weeks in duration for 3 credits. Attendance will not be monitored for MOOC courses.

6.7.3 Student has to pursue and acquire a certificate for a MOOC course only from the organizations / agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

6.8 Mandatory Internships

6.8.1 Students shall undergo two mandatory summer internships for a minimum of four weeks duration at the end of second and third year of the Program.

6.8.2 The internship can be done by the students at Local Industries, Government Organizations, Public Sector Companies, Research Laboratories, Construction agencies, Power Plants and also in software MNCs.

6.8.3 A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the Department Evaluation Committee nominated by the principal at the end of the semester for the evaluation of summer internship.

6.8.4 The performance of a student in each mandatory summer internships shall be evaluated with a maximum of 100 marks.

6.8.5 The report and the oral presentation shall carry 40% and 60% weightage respectively.

6.9 Project work and Internships

6.9.1 In the final semester, the student should undergo Internship / Project Work with well-defined objectives.

6.9.2 Students Project Batch will have maximum of four students comprising the fast and slow learners.

6.9.3 Every student shall be required to undertake a Project Work in the Institution / Internship cum Project Work in Local Industries / Government Organizations / Public Sector Companies / Research Laboratories / Construction agencies / Power Plants and also in software MNCs in consultation with Head of the Department and Department Project Evaluation Committee.

6.9.4 The Department project evaluation committee continuously monitors and evaluates the progress of the Project Work / Internship cum Project Work by conducting three reviews including abstract review during the project period.

6.9.5 During the project review meetings, batch presentation and individual contributions are monitored to assess individual student performance and also team performance.

6.9.6 The evaluation of the project is done based on the rubrics designed for that curriculum component.

6.9.7 At the end of the semester the candidate shall submit an Internship cum Project completion certificate along with project report on the work carried out during the project work at the industry.

6.9.8 A student shall be permitted to submit project report on the work carried out during the project work at the institution/department.

6.9.9 The project work submitted to the department shall be evaluated for 100 marks, out of which 30 marks are for internal evaluation and 70 marks for external viva-voce.

6.9.10 The internal evaluation shall be made by the Department Project Evaluation Committee, on the basis of three reviews given by each students / batch on the topic of his/her project.

6.9.11 The final viva-voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner nominated by the principal at the end of the Semester.

6.9.12 In case a student fails in viva voce he /she shall reappear as and when supplementary examinations are conducted.

6.9.13 The distribution of marks for the Internal assessment and End Semester Examination is given below:

Internal Assessment (30 Marks)			**End Semester Examination (70 Marks)**		
Review - I	Review - II	Review - III	Supervisor	Internal Examiner	External Examiner
10	10	10	20	25	25

6.10 Eligibility to appear for Semester End Examinations

6.10.1 A student shall be eligible to appear for Semester End Examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the courses in a semester.

6.10.2 Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

6.10.3 Students whose shortage of attendance is not condoned in any semester are not eligible to take their Semester End Examination of that class and their registration shall stand cancelled.

6.10.4 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.

6.10.5 A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

6.11 Issue of Photocopy of Answer Script

6.11.1 A student can request for the photo copy of answer script of any theory examination within one week after the declaring the results by paying fee.

6.11.2 The examination section shall issue a notification inviting applications for the issue of photocopy of answer script after publishing the results.

6.11.3 The application forms can be obtained from the examination section.

6.12 Revaluation

6.12.1 A candidate can apply for revaluation of his / her end examination answer paper in a theory course.

6.12.2 The examination section shall issue a notification inviting applications for the revaluation after publishing the results.

6.12.3 The application forms can be obtained from the examination section.

6.12.4 A candidate can apply for revaluation of answer scripts in not more than 5 courses at a time.

6.12.5 No revaluation for practical courses, comprehensive viva-voce / Examination and project work.

6.13 Challenge Valuation

6.13.1 A student can apply for challenge valuation by prescribed fee.

6.13.2 Challenging valuation shall be carried out by an external subject expert.

6.13.3 The challenging valuation should be done strictly as per the scheme of valuation supplied by the examination section in the presence of Principal.

6.13.4 The examination section shall issue a notification inviting applications for the challenging valuation after publishing the revaluation results.

6.13.5 The application forms can be obtained from the examination section.

7. Promotion Rules

7.1 A student shall be promoted from first year to second year if he fulfills the minimum attendance requirements.

7.2 A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to II-year IV Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II-year IV semester.

i. **One** regular and **three** supplementary examinations of I B. Tech I Semester.

ii. **One** regular and **two** supplementary examinations of I B. Tech II Semester.

iii. **One** regular and **one** supplementary examination of II B. Tech III Semester.

iv. **One** regular examination of II B. Tech IV semester.

7.3 A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to III-year 6th semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III-year 6th semester.

i. **One** regular and **five** supplementary examinations of I B. Tech I Semester.

ii. **One** regular and **four** supplementary examinations of I B. Tech II Semester.

iii. **One** regular and **three** supplementary examinations of II B. Tech III Semester.

iv. **One** regular and **two** supplementary examinations of II B. Tech IV Semester.

v. **One** regular and **one** supplementary examination of III B. Tech V Semester.

vi. **One** regular examination of III B. Tech VI Semester.

7.4 For Lateral entry student promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to III-year VI semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III-year VI semester.

i. One regular and three supplementary examinations of II B. Tech III Semester.

ii. One regular and two supplementary examinations of II B. Tech IV Semester.

iii. One regular and one supplementary examination of III B. Tech V Semester.

iv. One regular examination of III B. Tech VI Semester.

8. Extra-Curricular Activities

i. Students shall enroll, on admission, in any one of the personality and character development programs (NSS/YRC etc.,) and undergo training and attend a camp.

ii. The training shall include classes on hygiene and health awareness and also training in first-aid.

iii. National Service Scheme (NSS) and Youth Red Cross (YRC) will have social service activities in and around the Institution.

iv. A student will be required to participate in an activity for an hour in a week during their second and third years.

9. Skill Oriented / Skill Advanced Courses

i. There shall be 05 Mandatory Skill-Oriented Courses offered during III to VII semesters.

ii. The list of such courses shall be included in the curriculum structure of each branch of Engineering.

10. Curricular Framework for Honors Program

i. Under Graduate degree with Honors shall be issued by the Institution to the students who fulfill all the academic eligibility requirements for the B. Tech program and Honors program.

ii. Students of a Department are eligible to opt for Honors Program offered by the same Department / Discipline, subject to a maximum of two additional courses per semester.

iii. A student shall be permitted to register for Honors program at the beginning of IV semester provided that the student must have acquired a minimum average of 8.0 SGPA up to the end of II semester without any backlogs. In case of the declaration of the III semester results after the commencement of the IV semester and if a student fails to score the required minimum of 8.0 SGPA, his/her registration for Honors Program stands cancelled and he/she shall continue with theregular Program.

iv. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. In addition to fulfilling all the requisites of a Regular B.Tech . Program, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. , 160/121 credits).

v. Of the 20 additional Credits to be acquired, and 16 credits (four courses) shall be earned by undergoing specified courses listed as pools (two courses per pool either theory course or theory with lab component), and each carrying 4 credits. The remaining 4 credits (two courses) must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

vi. The courses offered in each pool (two courses per pool) shall be domain specific courses and advanced courses.

vii. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the academic council.

viii. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course.

ix. The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

x. The concerned BoS shall also consider courses listed under professional Elective Courses of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Program.

xi. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Honors will be shown in the transcript. None of the courses done under the dropped Honors will be shown in the transcript.

xii. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiii. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

11. Curricular Framework for Minor Program

i. Under graduate Degree with Minor Program shall be issued by the Institution to the students who fulfill all the academic eligibility requirements for the B. Tech program and Minor Program.

ii. Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Computer Science Engineering under this scheme; he/she will get Major degree of Mechanical Engineering with minor degree of Computer Science Engineering. Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B. Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

iii. The concerned BOS shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Virtual Realty, VLSI etc.

iv. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

v. The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

~~vi.~~ A student shall be permitted to register for Minors program at the beginning of IV semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8.0 SGPA (Semester Grade point average) upto the end of II semester without any history of backlogs. It is expected that the III semester results may be announced after the commencement of the IV semester. If a student fails to acquire 8.0 SGPA upto III semesters or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8.0 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

vii. A student shall earn additional 20 credits in the specified area to be eligible for to award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e., 160/121 credits).

viii. Of the 20 additional Credits to be acquired and 16 credits shall be earned by undergoing specified courses listed in course structure and each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

ix. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the BoS.

x. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Program.

xi. If a student drops or terminated from the Minor program, they cannot convert the earned credits into open or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xii. In case a student fails to meet the CGPA requirement for B. Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiii. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

12. Grading

After each subject is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Marks Range	Level	Letter Grade	Grade Point
≥ 90	Outstanding	S	10
80-89	Excellent	A	9
70-79	Very Good	B	8
60-69	Good	C	7
50-59	Fair	D	6
40-49	Satisfactory	E	5
< 40	Fail	F	0
-	Absent	Ab	0

13. Calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \frac{\sum(C_i \, X \, G_i)}{\sum C_i}$$

where, C_i is the number of credits of the i[th] subject and G_i is the grade point scored by the student in the i[th] course

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \frac{\sum(C_j \, X \, S_j)}{\sum C_j}$$

where 'S_j' is the SGPA of the j[th] semester and C_j is the total number of credits in that semester

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts

iv. While computing the SGPA/CGPA, the subjects in which the student is awarded Zero grade points will also be included.

v. *Grade Point:* It is a numerical weight allotted to each letter grade on a 10-pointscale.

vi. *Letter Grade:* It is an index of the performance of students in a said course.Grades are denoted by letters S, A, B, C, D, E and F.

vii. As per AICTE regulations, conversion of CGPA into equivalent percentage asfollows:

viii. Equivalent Percentage = (CGPA – 0.50) x 10.

14. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and are eligible for the award of B.Tech. Degree, he/she shall be placed in one of the following:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 4.0 < 5.5

15. With-Holding the Result

If the candidate has any dues not paid to the institution or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

16. Transitory Regulations and Gap – Year

i. Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations. Candidates who have been detained for attendance shortage or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered and they will be in the academic regulations into which they get readmitted.

ii. Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/ II year/ III year to pursue entrepreneurship full time. This period shall be counted for the maximum time forgraduation.

iii. An evaluation committee at university level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

iv. Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B. Tech from the date of commencement of class work and they will be in the academic regulations into which the candidate is presently rejoining.

17. Industrial Collaborations

i. Institution-Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge.

ii. The Departments are permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the departments can plan to have industrial collaborations in designing the minor tracks and to developthe content and certificate programs.

18. Community Service Project

i. Community Service Project should be an integral part of the curriculum, as an alternative to the Internships, whenever there is an exigency when students cannot pursue their internships.

ii. Every student should put in a minimum of 144 hours for the Community Service Project during the summer vacation. Each class/section should be assigned with a mentor.

iii. Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc

iv. A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded. The log book has to be countersigned by the concerned mentor/faculty in-charge.

v. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member. The final evaluation to be reflected in the grade memo of the student. The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college. Award of marks shall be made as per the guidelines of Internship.

vi. A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.

vii. The Community Service Project is a twofold one – First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed asa duplication of work by the Village or Ward volunteers; rather, it could be another primary source of data.

viii. Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like – Agriculture, Health, Marketing and Cooperation Animal Husbandry, Horticulture, Fisheries, Sericulture, Revenue and Survey, Natural Disaster Management, Irrigation, Law & Order, Excise and Prohibition, Mines and Geology, Energy, Internet, Free Electricity, Drinking Water etc.,

19. Transfer Details

i. Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.

20. Preservation of Records

i. The laboratory records, internal test papers and end examination answer booklets shall be preserved for minimum of 2 years from the date of completion of their degree in the institution.

21. Amendments to Regulations

The Academic Council of SITAMS (Autonomous) reserves the right to revise, amend or change the Regulations, Scheme of Examinations, and / or Syllabi or any other policy relevant to the needs of the society or industrial requirements etc., with the recommendations of the concerned Board(s) of Studies.

22. General

i. The academic regulations should be read as a whole for purpose of any interpretation. Malpractices rules- nature and punishments are appended.

ii. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.

23. Conduct and Discipline

i. Students shall conduct themselves within and outside the precincts of the Institute in a manner befitting the students of an Institute of National importance.

ii. As per the order of the Hon'ble Supreme Court of India, ragging in any form is banned: acts of ragging will be considered as gross indiscipline and will be severely dealt with.

iii. The following additional acts of omission and /or commission by the students within or outside the precincts of the college shall constitute gross violation of code of conduct and are liable to invoke disciplinary measures

a. Ragging
b. Lack of courtesy and decorum: indecent behavior anywhere within or outside the campus.
c. Willful damages or stealthy removal of any property /belongings of the Institute / Hostel or of fellow students
d. Possession, consumption of distribution of alcoholic drinks or any kind of hallucinogenic drugs
e. Mutilation or unauthorized possession of library books
f. Hacking in computer systems
g. Furnishing false statements to the disciplinary committee, or willfully withholding information relevant to an enquiry
h. Organizing or participation in any activity that has potential for driving fellow students along lines of religion caste batch of admission hostel or any other unhealthy criterion.
i. Resorting to noisy and unseemly behavior, disturbing studies of students.

j. Physical or mental harassment of fresher through physical contact or oral abuse
k. Adoption of unfair means in the examination
l. Organizing or participating in any group activity except purely academic and scientific Programmers in company with others in or outside campus without prior permission of the principal
m. Disturbing in drunken state or otherwise an incident in academic or students function or any other public event.

n. Not obeying traffic rules in campus not following safety practices or causing potential danger to oneself or other persons in any way.
o. Any other act or gross indiscipline

iv. Commensurate with the gravity of the offence the punishment may be reprimand fine and expulsion from the hostel debarment from an examination rustication for a specified period or even outright expulsion from the College.

v. The reprimanding Authority for an offence committed by students in the Hostel and in the Department or the classroom shall be respectively, the managers ofthe Hostels and the Head of the concerned Department

vi. In all the cases of offence committed by students in jurisdictions outside the purview the principal shall be the Authority to reprimand them.

vii. All Major acts of indiscipline involving punishment other than mere reprimand shall be considered and decided by the Principal Students Disciplinary Committee appointed by the principal.

viii. All other cases of Indiscipline of Students like adoption of unfair means in the examinations shall be reported to the Vice-Principal for taking appropriate action and deciding on the punishment to be levied.

ix. In all the cases of punishment levied on the students for any offence committed the aggrieved party shall have the right to appeal to the principal who shall constitute appropriate Committees to review the case.

NATURE OF MALPRACTICES/ IMPROPER CONDUCT PUNISHMENT	PUNISHMENT
1. (a) possesses or keeps access in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory/ practical) in which he/she is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) Expulsion from the examination hall and cancellation of the performance in that subject only.	Expulsion from the examination hall and cancellation of the performance in that subject Only.
1. (b) Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons inside or outside the exam hall in respect of any matter. Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he/she will be handed over to the police and a case is registered against him/her.	Expulsion from the examinations hall and cancellation of the performance in that subject only of all the candidates involved in case of an outsider He / She will be handed over to the police and a case is registered against him/her.

2. Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examinations hall and cancellation of the performance in that subject and all other subjects the candidates has already appeared including practical examinations and projects work and shall not be permitted to appear for the reaming examinations of the subjects of that semester/Year. The Hall Ticket of the candidate will be cancelled and retained by the CE.
3. Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

4. Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper or answer book or additional sheet, during or after the examination.	If the imposter is an outsider, he/shewill be handed over to the police and a case is registered against him/her. Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidateis subject to the academic regulations in connection with forfeiture of seat.
5. Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6. Refuses to obey the orders of the Chief - Superintendent / Assistant- Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall or causes any injury to his person or to any of his relatives whether by offensive words spoken or written or by signs or by visible representation or assaults the officer-in-charge, or any person on duty inside or outside the examination hall or any of his relatives, or indulges in any other act of misconduct or mischief which results in damage to or destruction of property in the examination hall or any part of the college	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates are also debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7. Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shallnot be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all the external examinations. The continuation of thecourse by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8. Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

9. Belongs to college, who is not a candidate for the particular examination or any person not connected with the college but indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college will be expelled from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a Police case will be registered against them.
10. Comes in a drunken state to the examination hall.	Expulsion from the examination hall and cancellation of the performance.
11. Copying is detected on the basis of internal evidence, such as, during valuation or during special scrutiny	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that Semester / year examinations.
12. If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal for further action to award suitable punishment.	

Note: Failing to read the regulation is not considered as an excuse

B.Tech R20 - COURSE STRUCTURE AND SYLLABI

Semester I (First Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	20HSM111	Communicative English for Engineers	3	0	0	3	30	70	100
2	20BSC111	Algebra and Calculus	2	1	0	3	30	70	100
3	20ESC111	Engineering Graphics	1	0	4	3	30	70	100
4	20ESC114	Basic Electrical and Electronics Engineering	2	1	0	3	30	70	100
5	20ESC115	Programming with Python	2	1	0	3	30	70	100
6	20HSM112	Communicative English Language Lab	0	0	3	1.5	30	70	100
7	20ESC116	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5	30	70	100
8	20ESC118	Programming with Python Lab	0	0	3	1.5	30	70	100
Contact Hours per week			10	3	13	-	-	-	-
Total Hours per week			26			-	-	-	-
Total credits						19.5	-	-	-
Total Marks							240	560	800

Semester II (First Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	20BSC121	Differential Equations and Transform Techniques	2	1	0	3	30	70	100
2	20BSC122	Engineering Chemistry	3	0	0	3	30	70	100
3	20BSC123	Engineering Physics	3	0	0	3	30	70	100
4	20MEC121	Engineering Mechanics	2	1	0	3	30	70	100
5	20MEC122	Material Science and Metallurgy	3	0	0	3	30	70	100
6	20BSC114	Engineering Chemistry Lab	0	0	2	1	30	70	100
7	20BSC115	Engineering Physics Lab	0	0	2	1	30	70	100
8	20ESC112	Engineering Workshop & IT Workshop	0	0	2	1	30	70	100
9	20MEC124	Computer Aided Drafting Lab	0	0	3	1.5	30	70	100
10	20MAC121	Human Values and Ethics	2	0	0	0	P	-	-
Contact Hours per week			15	2	9	-	-	-	-
Total Hours per week			26			-	-	-	-
Total credits						19.5	-	-	-
Total Marks							270	630	900

Semester III (Second Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	20BSC231	Numerical Methods and Probability Theory	3	1	0	4	30	70	100
2	20ESC231	Fluid Mechanics and Machinery	2	1	0	3	30	70	100
3	20MEC231	Engineering Thermodynamics	2	1	0	3	30	70	100
4	20MEC232	Manufacturing Technology	3	0	0	3	30	70	100
5	20MEC233	Mechanics of Solids	2	1	0	3	30	70	100
6	20MEC234	Computer Aided Design	2	0	0	2	30	70	100
7	20ESC232	Fluid Mechanics and Machinery Lab	0	0	3	1.5	30	70	100
8	20MEC235	Material Science Lab and Manufacturing Technology Lab	0	0	3	1.5	30	70	100
9	20MEC236	Mechanics of Solids Lab	0	0	3	1.5	30	70	100
Contact Hours per week			14	4	9	-	-	-	-
Total Hours per week			27			-	-	-	-
Total credits						22.5	-	-	-
Total Marks							270	630	900

Semester IV (Second Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	20HSM241	Principles of Management	3	0	0	3	30	70	100
2	20BSC243	Operation Research	2	1	0	3	30	70	100
3	20MEC241	Kinematics of Machinery	2	1	0	3	30	70	100
4	20MEC242	Metal Cutting and Machine Tools	2	1	0	3	30	70	100
5	20MEC243	Thermal Engineering	2	1	0	3	30	70	100
6	20MEC244	Automotive Systems	2	0	0	2	30	70	100
7	20MEC245	Computer Aided Machine Drawing Lab	0	0	3	1.5	30	70	100
8	20MEC246	Machine Tools Technology Lab	0	0	3	1.5	30	70	100
9	20MEC247	Thermal Engineering Lab	0	0	3	1.5	30	70	100
10	20MAC231	Environmental Sciences	2	0	0	0	P	-	-
11	-	Internship during Summer Vacation	-	-	-	-	-	-	-
Contact Hours per week			15	4	9	-	-	-	-
Total Hours per week			28			-	-	-	-
Total credits						21.5	-	-	-
Total Marks							270	630	900
1		Honors / Minor Courses*	3	1	-	4	30	70	100

I B.Tech. - I Semester

20HSM111	**COMMUNICATIVE ENGLISH FOR ENGINEERS (Common to All Branches)**	**L T P C** **3 - - 3**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To Provide Knowledge on developing Vocabulary and communicating in a verbal manner.
2. To understand in using of technology for societal aspects.
3. To recognize the importance on constructing Entrepreneurship Skills.
4. To Execute Contextual knowledge to recognize the need of ability to engage in independent and life- long learning in the broadest context of technological change.
5. To support and identify the earlier Medical Life Sciences used in India

UNIT –1: COMMUNICATION SKILLS FOR PROFESSIONALS (9)

Listening: Identifying the topic, specific pieces of information by listening by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions; introducing oneself and others. **Reading:** Skimming to get the main idea of a text, scanning to look for specific information. **Reading for writing:** Beginnings and endings of paragraphs. **Grammar and Vocabulary:** Articles and prepositions and word formation. Content words and function words.

UNIT –2: TECHNOLOGY WITH A HUMAN FACE A LECTURE BY E.F.SCHUMACHER (9)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/small groups on specific topics. **Reading:** Identifying sequence of ideas recognizing verbal techniques. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writings. **Grammar and Vocabulary:** Word formation (Derivation, Borrowing-coinage-compounding) Tenses.

UNIT –3: AZIM PREMJI-AN ENTREPRENEUR (9)

Listening: Identifying the topic, specific pieces of information by listening by listening to short audio texts. **Speaking:** Discussing daily routine activities. **Reading:** Phrasal verbs often used in daily conversations. **Writing:** Beginnings and endings of paragraphs. **Grammar and Vocabulary:** Letter writing (official) - voice of verbs.

UNIT –4: REFLECTIONS OF FUTURE THE YEAR –BY THEODORE J.GORDON (9)

Listening: Identifying the topic, specific pieces of information by listening by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions; introducing oneself and others. **Reading:** Skimming to get the main idea of a text, scanning to look for specific information. **Reading for writing:** Beginnings and endings of paragraphs. **Grammar and Vocabulary:** Direct and Indirect Speech-Email writing.

UNIT –5: Y.SUBBA ROW (9)

Listening: Identifying the topic, specific pieces of information by listening by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions; introducing oneself and others. **Reading:** Skimming to get the main idea of a text, scanning to look for specific information. **Reading for writing:** Beginnings

and endings of paragraphs introducing the topic summarizing the main idea and providing a transition to the next paragraph. **Grammar and Vocabulary:** Subject verb agreement-Report writing.

Total Hours: 45

On successful completion of the course, students will be able to		**POs**
CO1	Understand the concepts on developing vocabulary and communicating in a verbal manner.	**PO1, PO10, PO12**
CO2	Understand and develop knowledge on the use of Technology for social aspects.	**PO1, PO10, PO12**
CO3	Understand Acquiring skills to become an able Entrepreneur	**PO1, PO10, PO12**
CO4	Understand contextual knowledge to recognize the need of ability to engage in independent and life-long learning in the broadest context of technological change.	**PO1, PO10, PO12**
CO5	Understand the importance of Medical advancement and its uses on Human life in India..	**PO1, PO10, PO12**

TEXT BOOKS:

1. V.N.Sudheer, S.Riyaz Ahammed, N.R Tulasi Prasad, N.Lakshmi Sailaja,"Functinal English 1" The Department of English of SITAMS ,1/e. 2016
2. V.N.Sudheer, S.Riyaz Ahammed, N.R Tulasi Prasad, N.Lakshmi Sailaja,"Functinal English 2" The Department of English of SITAMS ,1/e. 2016

REFERENCE BOOKS:

1. K.Srinivasa Krishna , B.Kuberudu , "Business communication and softskills", Excel Books ,1/e 2008.
2. K.R. Lakshminarayana , "English for Technical communication" ,Scitech Publishers, 2/e, 2009
3. R.K. Bansal ,J.B. Harrison, "Spoken English", Orient Longman, Mumbai, 2/e,2009
4. Raymond Murphy ,Murphys English Grammar, Raymond Murphy Publishers , 2/e, 2006, Cambridge English Dictionary for advanced Learners.
5. Inspiring Lives by Dr. Jandhyala Ravindranath,Dr.M.Sarath Babu

REFERENCE WEBSITE:

1. www.english club.com
2. www.easyworldofenglish.com
3. www.languageguide.org/english/
4. www.bbc.co.uk/learningenglish
5. www.eslpod.com/index.html
6. www.myenglishpages.com

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	1	-	-	-	-	-	-	-	-	1	-	1
CO.2	1	-	-	-	-	-	-	-	-	1	-	1
CO.3	1	-	-	-	-	-	-	-	-	1	-	1
CO.4	1	-	-	-	-	-	-	-	-	1	-	1
CO.5	1	-	-	-	-	-	-	-	-	1	-	1
CO*	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**

I B.Tech. - I Semester

20BSC111	**ALGEBRA AND CALCULUS (Common to All Branches)**	**L T P C**
		2 1 - 3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To familiarize the students with the theory of matrices.
2. To explain the series expansion using means value theorem and basic concepts of partial derivatives and its applications
3. To learn the methods of evaluation of double and triple integrals
4. To explain the concept of vector differentiation
5. To explain the concept of vector integration

UNIT –1: MATRICES (9)

Rank - Echelon form and Normal form – Solution of linear system of homogeneous and non-homogeneous equations - Direct method: Gauss elimination method - Eigen values and Eigen vectors of a matrix and properties (without proofs) - Cayley-Hamilton theorem (without proof): Inverse and powers of a matrix. – Diagonalization of a matrix using similarity transformation only.

UNIT –2: DIFFERENTIAL CALCULUS AND ITS APPLICATIONS (9)

Rolle's Theorem, Lagrange's Theorem (without proof) - Taylor's and Maclaurin's series for single variable (simple examples) - Functions of several variables - Jacobian – Taylor's and Maclaurin's series for two variables - Maxima and minima of functions of two variables - Lagrangian method of undetermined multipliers with three variables only.

UNIT –3: MULTIPLE INTEGRALS (9)

Double and triple integrals: Evaluation of Double integrals (Cartesian and polar coordinates), Change of order of integration (Cartesian form only), Change of variables: double integration from Cartesian to polar coordinates, Evaluation of Triple integrals (Cartesian coordinates).

UNIT –4: VECTOR DIFFERENTIAL CALCULUS (9)

Introduction to Vector Differentiation, Scalar and Vector point functions - Gradient of a Scalar function, directional derivative, Divergence of a Vector function, Solenoidal vector, Curl of a Vector function, Irrotational vector, Laplacian operator.

UNIT –5: VECTOR INTEGRAL CALCULUS (9)

Line Integral - Potential function - Surface and volume integrals - Green's, Stoke's and Gauss divergence theorem (without proofs) - Verification of Green's, Stoke's and Gauss divergence theorems.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	To solve system of homogenous and non-homogenous linear equations, find the Eigen values and Eigen vectors of a matrix and identify special properties of a matrix.	**PO1, PO2, PO3**
CO2	Illustrate series expansion of functions using mean value theorems, interpret partial derivatives as a function of several variables, Apply Jacobean concept to deal with the problems in change of variables, Evaluate maxima and minima of functions.	**PO1, PO2, PO3**
CO3	To evaluate double and triple integrals of functions of several variables	**PO1, PO2, PO3**
CO4	To illustrate the physical interpretation of gradient, divergence and curl and apply operator del to scalar and vector point functions.	**PO1, PO2, PO3**
CO5	To find line, surface, volume integrals and the work done in moving a particle along the path over a force field and apply Green's, Gauss divergence and Stokes theorem in evaluation of line, surface and volume integrals.	**PO1, PO2, PO3**

TEXT BOOKS:

1. T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, "Engineering Mathematics–I", S. Chand and Company Ltd, New Delhi.
2. T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad ."Mathematical Methods", S. Chand and Company Ltd, New Delhi.
3. Dr. B. S. Grewa,"Higher Engineering Mathematics", Khanna Publishers, Delhi, , 44/e, 2017

REFERENCE BOOKS:

1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishers, New Delhi.
2. N.P.Bali ,"A Text Book of Engineering Mathematics", Laxmi publications (P)Ltd, Delhi.
3. Dr. M. K. Venkata Ramana," Higher Engineering Mathematics", National Pub, Madras
4. E.Rukmangadachari, E.Keshava Reddy, "Engineering Mathematics-I", Pearson Educations, Chennai.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/110/105/111105111/
2. https://www.youtube.com/watch?v=8D3WViAyJvc
3. https://www.youtube.com/watch?v=fKzDtjq0ks4
4. https://www.youtube.com/watch?v=wMd4YRyBmjA
5. https://www.youtube.com/watch?v=ArkDa6d5h9I
6. https://www.youtube.com/watch?v=KgItZSst2sU
7. https://www.youtube.com/watch?v=-I3HUeHi1Ys
8. https://www.youtube.com/watch?v=SZCsFS9izfQ
9. https://www.youtube.com/watch?v=ma1QmE1SH3I

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	3	2	-	-	-	-	-	-	-	-	-
CO.5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

I B.Tech. - I Semester

20ESC111	**ENGINEERING GRAPHICS (Common to all Branches)**	**L T P C** **1 - 4 3**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To expose them to existing national standards related to technical drawings and develop knowledge of basic engineering curves.
2. To develop drawing skills for communication of concepts, ideas and design of projections of points, lines and planes.
3. To develop geometrical shapes and multiple views of projections of solids and sections of solids.
4. To develop drawing skills for communication of concepts, ideas and design the development of surfaces of objects and isometric views.
5. To develop geometrical shapes and multiple views of orthographic projections of solids and perspective views.

CONCEPTS AND CONVENTIONS (Not for Examination) (3)

Importance of drawings in engineering applications - Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets - Lettering, numbering and dimensioning – Basic geometrical constructions – Scales.

UNIT –1: ENGINEERING CURVES (9)

Engineering Curves: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method and rectangular hyperbola – Construction of cycloid, epi cycloid and hypo cycloid – Involutes of square, circle, pentagon and hexagon – Drawing of tangents and normal to the above curves.

UNIT –2: PROJECTION OF POINTS, LINES AND PLANE SURFACES (12)

Projection of Points: Principles of orthographic projection – First angle and third angle projections – Projection of points. **Projection of Lines:** Projection of straight lines (only first angle projections) inclined to one and both the principal planes – Determination of true lengths, true inclinations by rotating line and trapezoidal method and traces. **Projection of Planes:** Planes (polygonal and circular surfaces) inclined to both the principal planes by change of position method.

UNIT –3: PROJECTION OF SOLIDS AND SECTION OF SOLIDS (12)

Projection of Solids: Projection of simple solids like prisms, pyramids, cylinder and cone, when the axis is inclined to one principal plane. **Section of Solids:** Sectioning of right regular solids like prisms, pyramids, cylinder and cone, solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other plane – Obtaining true shape of section.

UNIT –4: DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTIONS (12)

Development of Surfaces: Development of lateral surfaces of simple and sectioned solids like prisms, pyramids, cylinder and cone. **Isometric Projection:** Principles of isometric projection – Isometric scale – Isometric views of simple solids and truncated solids like prisms, pyramids, cylinder and cone – Combination of two solid objects in simple vertical positions.

UNIT –5: ORTHOGRAPHIC PROJECTIONS AND PERSPECTIVE PROJECTIONS (12)
Orthographic Projections: Visualization principles – Plane of projections – Representation of three-dimensional objects – Layout of views – Sketching of multiple views from pictorial views of objects. **Perspective Projection:** Perspective projection of simple solids like prisms and pyramids by visual ray method.

Total Hours: 60

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Construct the Engineering curves and generate tangent and normal for those curves.	**PO1, PO2, P03, P10, PO12**
CO2	Draw the projection of points, lines and plane surfaces.	**PO1, PO2, P03, P10, PO12**
CO3	Draw the projection of solids, sections of solids like prisms, pyramids, cylinder and cone.	**PO1, PO2, P03, P10, PO12**
CO4	Draw the isometric projections and views and also develop the development of surfaces.	**PO1, PO2, P03, P10, PO12**
CO5	Draw the orthographic and perspective projections of solids.	**PO1, PO2, P03, P10, PO12**

TEXT BOOKS:

1. N.D. Bhatt and V. M. Panchal, "Engineering Drawing", Charotar Publishing House, 50th edition, 2010.
2. K.V.Natrajan , "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai. 2009.

REFERENCE BOOKS:

1. K.L.Narayana and P.Kannaiah, "Engineering Drawing", 2/e, 2012, Scitech Publishers.
2. Luzzader, Warren.J and Duff,John M, "Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. K.Venugopal and V.Prabhu Raja ,"Engineering Graphics", New Age International (P) Limited, 2008.
4. M.B.Shah and B.C.Rana , "Engineering Drawing", Pearson Education, 2/e, 2009.
5. Basant Agarwal and C.M.Agarwal ,"Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, , 2008,

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/102/112102304/
2. https://nptel.ac.in/courses/112/105/112105294/
3. https://nptel.ac.in/courses/112/103/112103019/
4. https://nptel.ac.in/courses/112/104/112104172/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	-	-	-	-	-	-	1	-	1
CO.2	3	2	2	-	-	-	-	-	-	1	-	1
CO.3	3	2	2	-	-	-	-	-	-	1	-	1
CO.4	3	2	2	-	-	-	-	-	-	1	-	1
CO.5	3	2	2	-	-	-	-	-	-	1	-	1
CO*	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**

I B.Tech. - I Semester

20ESC114	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common to Civil and Mechanical Branches)	L	T	P	C
		2	1	-	3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce electric circuits and its analysis using network theorems.
2. To impart knowledge on construction and operation of D.C. machines.
3. To learn construction and operation of A.C. machines and transformers.
4. To learn basic principles of all measuring instruments.
5. To demonstrate knowledge on overview of the principles, operation and application of basic electronic devices and Logic gates.

UNIT –1: INTRODUCTION TO ELECTRICAL ENGINEERING (9)

Ohm's Law – Basic circuit components–Kirchhoff's laws with simple problems – Types of sources, series, parallel circuits, star-delta Transformation – Network Theorems – Superposition and reciprocity – Thevenin's and Norton's Theorems and Maximum Power Transfer Theorem.

UNIT –2: DC MACHINES (9)

Principle of operation of DC generators – Types of DC generators – EMF equation in DC generator – OCC of a DC shunt generator – Principle of operation of DC motors – Types of DC motors – Torque equation – Losses and efficiency calculation in DC motors – Swinburne's test and brake test – Speed control of DC shunt motor.

UNIT –3: AC MACHINES (9)

Principles of operation of transformer – Constructional details – Losses and efficiency – Regulation of transformer – O.C and S.C tests – Principles of operation of three phase induction motor.

UNIT –4: MEASURING INSTRUMENTS (9)

Introduction – Classification of instruments–Operating principles – Essential features of measuring instruments – Moving coil and moving iron instruments – Dynamometer wattmeter and energy meter.

UNIT –5: ANALOG AND DIGITAL ELECTRONICS (9)

The P-N junction diode – Volt-Ampere characteristics – Applications of diode – Zener diode - Volt-Ampere characteristics – Bipolar Junction Transistor (BJT) – Operation of NPN transistor – Input-Output characteristics of CE configuration – Logic gates and truth tables–NOT, OR, AND, EX-OR, EX-NOR, Universal Gates - NAND, NOR Gates – Boolean algebra and De Morgan's Theorems.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate knowledge on basic circuit components and basic concepts of electrical engineering, Analyze Circuits by different network reduction techniques	**PO1, PO2**
CO2	Demonstrate knowledge on Construction and performance of DC Motors and Analyze Losses and Efficiency of motors	**PO1, PO2**
CO3	Demonstrate knowledge on Construction and performance of AC motor and transformer and Analyze Losses and Efficiency of motors and transformer	**PO1, PO2**
CO4	To understand and evaluate the calibration of different electrical measuring instruments	**PO1, PO2, PO3**
CO5	To Acquire sound knowledge on internal structure of PN junction, all the electronic devices. and logic gates	**PO1, PO2**

TEXT BOOKS:

1. M.S Naidu and S Kamakshaiah. "Basic Electrical Engineering",
2. T.K.Nagasarkar and M.S Sukhija "Basic Electrical Engineering"
3. N.Salivahanan, and N.Suresh Kumar "Electronic Devices and Circuits", TMH, 3rd Edition, 2012
4. Morris Mano, "Digital Design", 3/e, 2006, Prentice Hall of India, New Delhi

REFERENCE BOOKS:

1. DP Kothari and IJ Nagrath. "Theory and Problems of BEE".
2. V.K Mehtha "Principle of Electrical Engineering",S Chand Publications.
3. R.L. Boylestad "Introductory Circuit Analysis", Pearson,12th edition, 2013.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/108/105/108105112/
2. https://nptel.ac.in/courses/108/101/108101091/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	-
CO.2	3	2	-	-	-	-	-	-	-	-	-	-
CO.3	3	2	-	-	-	-	-	-	-	-	-	-
CO.4	3	2	2	-	-	-	-	-	-	-	-	-
CO.5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	-	-	-	-	-	-	-	-	-

I B.Tech. - I Semester

20ESC115	PROGRAMMING WITH PYTHON (Common to All Branches)	L T P C 2 1 - 3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To impart the basics of python and its IDEs.
2. To understand the basic data structure in python.
3. To familiarize with python GUI and files.
4. To develop broad understanding of various object-oriented concepts in python.
5. To introduce the python libraries for solving real-time problems.

UNIT –1: BASICS OF PYTHON (9)

Python programming Language: About Python- Introduction to various IDEs- IDLE- PyCharm, Spyder- Sublime text- Jupyter Notebook. **Literals:** Numeric literals - String literals- Variables and Identifiers: Variable assignment and keyboard input – Identifiers - keywords and other predefined identifiers. **Control Structures:** Sequential control- Selection control- Iterative control statements.

UNIT –2: LISTS, DICTIONARIES AND SETS (9)

Lists: List structures - Common list operations - List traversal - Lists in Python - Python list type – Tuples – sequences - Nested lists - Iterating over lists in python. **Dictionaries and Sets:** Dictionary types in Python - Set data type - Strings and its operations.

UNIT –3: FUNCTIONS AND TEXT FILES (9)

Functions: Function declaration - Category of Functions - Parameter Passing - Keyword Arguments in Python - Default Arguments in Python - Variable Scope, Lambda function.

Files: Fundamentals – opening, reading and writing text files, .csv and .xlsx files.

UNIT –4: OBJECT-ORIENTED CONCEPTS USED IN PYTHON (9)

Features of object-oriented programming - Fundamental concepts – Class – Encapsulation – Inheritance - Polymorphism. Object references - Turtle graphics - creating a Turtle Graphics Window - the "Default" Turtle - Fundamental Turtle Attributes and Behavior - Additional Turtle Attributes - Creating Multiple Turtles.

UNIT –5: INTRODUCTION TO PYTHON LIBRARIES (9)

Python Libraries - Introduction to Libraries - Creating and Exploring Packages - Numpy, SciPy, matplotlib, Pandas, Scikit-learn- seaborn.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Identify and apply the appropriate control statements for solving problems.	**PO1, PO2, PO5**
CO2	Demonstrate knowledge of basic data structures and functions.	**PO1, PO3, PO4**
CO3	Analyse and apply the appropriate file handling mechanism.	**PO1, PO2, PO5**
CO4	Identify and implement the suitable object-oriented concepts.	**PO1, PO2, PO5**
CO5	Evaluate the real-world problems using python packages.	**PO1, PO4, PO5**

TEXT BOOKS:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2016.
2. John V. Guttag., "Introduction to computation and programming using python: with applications to understanding data", PHI Publisher, 2016.
3. John Hunt, "A Beginners Guide to Python 3 Programming", Springer Publisheers, 2020.

REFERENCE BOOKS:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics", Prentice Hall, 2/e, 1992.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", SecondEdition,Shroff/O'ReillyPublishers,(http://greenteapress.com/wp/thinkpython/),
3. Charles Severance, "Python for everybody: exploring data in Python 3", Creative Commons Attribution-Non Commercial Share Alike 3.0 Unported License, 2016.

REFERENCE WEBSITE:

1. https://onlinecourses.swayam2.ac.in/aic20_sp33
4. https://onlinecourses.nptel.ac.in/noc22_cs32
5. https://spoken-tutorial.org
6. https://www.w3schools.com/python.
7. https://www.geeksforgeeks.org.

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	3	2	2	2	3	-	-	-	-	-	-	1
CO.2	3	2	2	2	3	-	-	-	-	-	-	1
CO.3	3	2	2	2	3	-	-	-	-	-	-	1
CO.4	3	2	2	2	3	-	-	-	-	-	-	1
CO.5	3	2	2	2	3	-	-	-	-	-	-	1
CO*	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

I B.Tech. - I Semester

		L	T	P	C
20HSM112	**COMMUNICATIVE ENGLISH LANGUAGE LAB (Common to All Branches)**	**-**	**-**	**3**	**1.5**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To provide Knowledge on developing Soft Skills and its techniques.
2. To understand Knowledge on the use of technology for giving Presentations.
3. To apply gained information in Preparing Resume.
4. To analyze the use of body language while participating in Group Discussions.
5. To execute the complete knowledge on facing Job Interviews.

LIST OF EXERCISES:

1. Introduction and importance of Soft Skills
2. Attributes of Soft Skills
3. Categories of Soft Skills- (Social, Thinking, Negotiating)
4. Exhibiting, Identifying, and Improving your Soft Skills
5. Acquiring Soft Skills (Train yourself)
6. Soft Skills practicing tips
7. Power Point presentation on Scientific/Technical Topics.
8. Designing a Resume
9. Resume Styles
10. Preparing Model Resumes
11. Group Discussion
12. Group Discussion strategies
13. Mock GDs.
14. Job Interviews
15. Interview Techniques
16. Model Interview questions – Mock Interview

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Remembering the concepts on developing Soft Skills and its techniques. (Topics from 1 to 5)	**PO1**
CO2	Understand and Develop Knowledge on the use of technology in giving presentations. (Topic No:6)	**PO5**
CO3	Apply one's skills in Preparing a Resume before applying for a job. (Topic 7 to 9)	**PO6**
CO4	Analyze and execute body language while participating in Group Discussions. (Topics 10 to 12)	**PO2**
CO5	Evaluate by weighing one's communicative skills in facing Job Interviews through Mock Interviews. (Topics 13 to 15)	**PO10**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-		-	-	-	-	-	-	-	-	-
CO2	-	-		-	3	-	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-
CO	**3**	**3**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**3**	**-**	**-**

I B.Tech. - I Semester

		L	T	P	C
20ESC116	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (Common to Civil and Mechanical Branches)**	-	-	3	1.5

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To gain practical experience on fundamental electric laws.
2. To gain practical experience on verification of theorems.
3. To evaluate the performance characteristics of DC and AC Machines
4. To gain practical experience on basic electronic devices and Circuits
5. To gain practical experience on different logic gates

LIST OF EXPERIMENTS: MATERIAL SCIENCE LAB

1. Verification of KCL and KVL
2. Verification of Superposition Theorem.
3. Verification of Thevinins Theorem.
4. Verification of Maximum Power Transfer Theorm.
5. Magnetization Characteristics of D.C Shunt Generator & determination of Critical Resistance.
6. Load Test on Three Phase Squirrel Cage Induction Motor.
7. Swinburne's Test of DC Shunt Machine.
8. Speed Control of DC Shunt Motor.
9. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
10. OC & SC Tests on Single- Phase Transformer to Find the Efficiency.
11. Volt-Ampere Characteristics of P-N Junction Diode and Zener Diode
12. Verification of Basic Logic gates- AND, OR, NOT.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Understand the fundamental electrical laws in engineering applications.	**PO1**
CO2	Verify different network theorems and digital circuits practically.	**PO2**
CO3	Design electrical circuits for measuring complicated electrical parameters.	**PO3**
CO4	Investigate DC and AC Machines like Induction Motor for solving complex problems.	**PO4**
CO5	Follow the ethical principles in implementing the experiments.	**PO8**
CO6	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO7	Communicate verbally and in written form, the understanding about the experiments.	**PO10**
CO8	Continue updating their skills related to electronic circuits	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-		-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

I B.Tech. - I Semester

20ESC118	PROGRAMMING WITH PYTHON LAB (Common to All Branches)	L	T	P	C
		-	-	3	1.5

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the basic IDEs in python.
2. To gain expertise for problem solving using control structures in python
3. To develop the python programs using functions.
4. To solve various engineering problems using different data structures.
5. To gain knowledge on python libraries.

RECOMMENDED SYSTEMS/SOFTWARE REQUIREMENTS:

1. For Windows: IDLE/ Spyder python development environment.
2. For Linux: Default python version installed/ higher version.

LIST OF TASKS:

TASK-1: BASICS

a) Develop a simple python script to illustrate numeric literals and string literals.
b) Write a Python Program to Convert Kilometres to Miles.

TASK-2: LOOPS

a) Write a python Program to Make a Simple Calculator
b) Write a python program that reads a rating from the user and indicates whether the performance was unacceptable, acceptable or meritorious. The amount of the employee's raise should also be reported. Your program should display an appropriate error message if an invalid rating is entered. (The amount of an employee's raise is $2400.00 multiplied by their rating).

Rating	Meaning
0.0	Unacceptable performance
0.4	Acceptable performance
0.6 or more	Meritorious performance

TASK-3: LOOPS

a) Write a program containing a pair of nested while loop that displays the integer values 1–100. Ten numbers per row - with the columns aligned as shown below

```
 1  2  3  4  5  6  7  8  9 10
11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30
                .
                .
91 92 93 94 95 96 97 98 99 100
```

b) Display the integer values 1–100 as given in question 3a) using only one while loop.

TASK-4: DICTIONARIES

a) Write a Python script to generate all the possible spellings of the last four digits of any given phone number – use Dictionaries.

TASK-5: STRINGS

a) Write a program to figure out if the register number format is correct or not using a Python code. (Hint: sample register number format- 20751A0500). Use string methods to solve the above problem.

TASK-6: FUNCTIONS

a) Write a function that generates a random password. The password should have a random length of between 7 and 10 characters. Each character should be randomly selected from positions 33 to 126 in the ASCII table. Your function will not take any parameters. It will return the randomly generated password as its only result. Display the randomly generated password in your file's main program. Your main program should only run when your solution has not been imported into another file.

TASK-7: PATTERN PRINTING

a) Write a python program to print half pyramid pattern with star (asterisk)

```
*
* *
* * *
* * * *
* * * * *
```

b) Write a python program to print the characters/alphabets in right-angled triangle pattern.

```
A
B C
D E F
G H IJ
K L M N O
P Q RS T U
V W X Y Z
```

TASK-8: TURTLE

a) Write a python program to draw the basic shapes using turtle (Hint: Square, circle, triangle).

TASK-9: FILES

a) Write a python script to create a simple text file. Write the contents into the created file and read the contents from the file and display the same on to the console screen.

b) Write a python script to Create and write on excel file using xlsxwriter module.

c) Write a python script to write the contents into a csv file.

TASK 10: FILE HANDLING

Write a python program to perform the following tasks:

a) Copy the contents of one file into another file.

b) Count number of lines in a file.

c) Count number of characters in a file.

d) Count number of words in a file.

TASK 11: INHERITANCE

a) Write a python program to illustrate the inheritance concept.

TASK-12: MATH LIBRARIES

a) Write a python program to calculate area of a circle. Use the pi constant in the math module in your calculations. ($\text{Area of the circle} = \pi r^2$)

b) Write a python program to calculate Volume of a sphere. Use the pi constant in the math module in your calculations. ($\text{Volume of a sphere} = \frac{4}{3}\pi r^3$).

TASK-13: PANDAS

a) Write a Pandas program to create a line plot of the historical stock prices of a company between two specific dates.

TASK-14: PANDAS

a) Write a Pandas program to create a bar plot of the trading volume of a company stock between two specific dates.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Learn various problem-solving approaches and ability to identify an appropriate approach to solve the problem	**PO1**
CO2	Implement conditionals and loops to design the python programming	**PO2**
CO3	Implement lists, set, tuples and dictionaries to develop python program.	**PO3**
CO4	Able to modulate the given problem using structural approach of programming	**PO4**
CO5	Build Python Programs using packages to solve real-time problems.	**PO5**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding about the experiments.	**PO10**
CO9	Continue updating their skill related to lists, tuples and dictionaries implementing programs in future.	**PO12**

REFERENCE BOOKS:

1. John V. Guttag., "Introduction to computation and programming using python: with applications to understanding data", PHI Publisher, 2016.
2. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2016.
3. John Hunt, "A Beginners Guide to Python 3 Programming", Springer Publisheers, 2020.

REFERENCE WEBSITES:

1. https://onlinecourses.swayam2.ac.in/aic20_sp33
2. https://onlinecourses.nptel.ac.in/noc22_cs32
3. https://spoken-tutorial.org
4. https://www.w3schools.com/python.
5. https://www.geeksforgeeks.org.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

I B.Tech. - II Semester

20BSC121	DIFFERENTIAL EQUATIONS AND TRANSFORMATION TECHNIQUES (Common to All Branches)	L	T	P	C
		2	1	-	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To learn the methods of solving the ordinary differential equations of first & higher order and applications of first order ordinary differential equations.
2. To learn partial differential equations and how they can serve as models for physical processes and also master the technique of separation of variables to solve partial differential equation.
3. To learn the concepts of Laplace Transforms and inverse Laplace Transforms and to explore the solving initial value problems by using Laplace transform method.
4. To develop skill to design Sine and Cosine waves with the help of Fourier series
5. To learn the concepts of Fourier transform and inverse Fourier Transform.

UNIT –1: ORDINARY DIFFERENTIAL EQUATIONS (9)

Differential Equations of First Order and First Degree: Formation – Linear and Bernoulli's equations – Applications to L-R and C-R circuit's problems. **Linear Differential Equations of Higher Order:** Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type eax, Sin ax, Cos ax, polynomials in x, e^{ax} v(x) & xm v(x) - Method of variation of parameters.

UNIT –2: PARTIAL DIFFERENTIAL EQUATIONS (9)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solution of first order linear (Lagrange's) equation and Non-Linear (standard forms) equations - Solution of PDE by the Method of separation of variables.

UNIT –3: LAPLACE TRANSFORMS (9)

Definition of Laplace transform, Laplace transform of standard functions - Laplace Transform of Unit step function, Dirac's delta function and Periodic function – Properties of Laplace Transforms(without proof): Linear property, First shifting theorem, Change of Scale Property, Second shifting theorem, Multiplication & Division by t, Transform of Derivatives & Integrals - Inverse transform - Convolution theorem(without proof) – Application: Solution of ordinary differential equations of first and second order with constant coefficients.

UNIT –4: FOURIER SERIES (9)

Determination of Fourier coefficients, Euler's formulae, Dirichlet's conditions - Fourier series of periodic functions, even and odd functions - Fourier series in an arbitrary interval - Half-range Fourier sine and cosine expansions.

UNIT –5: FOURIER TRANSFORM (9)

Fourier integral theorem (without proof) - Fourier sine and cosine integrals - Fourier transform – Fourier sine and cosine transforms - Properties - Inverse transforms - Finite Fourier transforms.

Total Hours: 45

On successful completion of the course, students will be able to		POs
CO1	To identify whether the given differential equation of first order is linear or Bernoulli and to solve the higher order linear differential equations with constant coefficients.	**PO1, PO2, PO3**
CO2	Apply a range of techniques to find solutions of standard PDE's and outline the basic properties of standard PDE's	**PO1, PO2, PO3**
CO3	To understand the concepts of Laplace transform and elementary functions, general functions using its properties and special functions.	**PO1, PO2, PO3**
CO4	To understand finding Fourier series expression of the given function.	**PO1, PO2, PO3**
CO5	Understand Fourier transforms and properties of Fourier transforms	**PO1, PO2, PO3**

TEXT BOOKS:

1. K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad,"Engineering Mathematics–I", T, S. Chand and Company Ltd, New Delhi.
2. T.K.V. Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad,"Mathematical Methods", S. Chand and Company Ltd, New Delhi.
3. Dr. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 44/e, 2017.

REFERENCE BOOKS:

1. Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, "Fundamentals of Fluid Mechanics", McGraw Hill, New York, 5/e, 2008.
2. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishers, New Delhi.
3. Dr. M. K. Venkata Ramana, "Higher Engineering Mathematics", National Pub & Co, Madras.
4. N.P.Bali , "A Text Book of Engineering Mathematics", Laxmi publications (P)Ltd, New Delhi.
5. E.Rukmangadachari, E.Keshava Reddy, "Engineering Mathematics-II", Pearson Educations, Chennai.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/111/106/111106100/
2. https://www.youtube.com/watch?v=OBhZvyhc8JQ&t=982s
3. https://nptel.ac.in/courses/111/106/111106100/
4. https://www.youtube.com/watch?v=3zCdNO2xp3s
5. https://www.youtube.com/watch?v=XU5hUrh6-18&t=948s
6. https://nptel.ac.in/courses/111/106/111106139/
7. https://www.youtube.com/watch?v=LGxE_yZYigI
8. https://www.youtube.com/watch?v=6spPyJH6dkQ
9. https://www.youtube.com/watch?v=GFKggEkKtLM

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	3	2	-	-	-	-	-	-	-	-	-
CO.5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

I B.Tech. - II Semester

20BSC122	ENGINEERING CHEMISTRY (Common to Civil and Mechanical Branches)	L T P C 3 - - 3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To learn different purification methods and analyze the impurities present in water.
2. To develop skill to describe the mechanism and control of corrosion.
3. To train the students on the fundamentals and applications of polymers.
4. To understand and apply the concepts of electrochemistry effectively.
5. To introduce basic principles of spectroscopy and chromatography

UNIT –1: WATER AND WATER FOR INDUSTRIAL PURPOSE (9)

Water: Sources of water - Types of Impurities in Water - Hardness of water - Temporary and permanent hardness - Estimation of hardness by EDTA Method and numerical problems - Analysis of water - Dissolved oxygen - Disadvantages of hard water - Methods of treatment of water for domestic purpose - Sterilization - Chlorination, Ozonisation. **Water for Industrial Purpose:** Water for steam making - Boiler troubles - Priming and foaming, Boiler corrosion, Scales and sludge, Caustic embrittlement - Water treatment - Internal treatment - Colloidal, Phosphate, Calgon, Carbonate and Sodium aluminate conditioning of water - External treatment - Ion - exchange process - Demineralization of brackish water – Reverse osmosis.

UNIT –2: SCIENCE OF CORROSION (9)

Definition - Types of corrosion - Dry corrosion (Direct chemical attack) - Wet corrosion - Theories of corrosion and mechanism - Electro chemical theory of corrosion - Galvanic corrosion - Concentration cell corrosion - Oxygen absorption type - Factors influencing the corrosion - Control of corrosion - Cathodic protection - Sacrificial anode and impressed current cathodic protection method.

UNIT –3: POLYMERS (9)

Polymerization reactions - Basic concepts - Types of polymerizations - Addition polymerization with mechanism - condensation polymerization - Plastics - Thermosetting and thermoplastics - Composition, Properties and Engineering applications of teflon, bakelite, nylon and rubber - Processing of natural rubber and compounding. Elastomers: Buna S - Buna N - Polyurethane Rubber and Silicone Rubber.

UNIT – 4: PHASE RULE, STRUCTURAL MATERIALS AND REFRACTORIES (9)

Phase Rule: Definition – Terms involved in phase rule – Phase rule equation – Phase diagrams – One component system (water system) – Two component system (lead- silver system). **Structural Materials:** Cement – Composition of Portland cement – Analysis – Setting and hardening of cement (reactions) and manufacture of Portland cement. **Refractories:** Definition – Classification with examples – Criteria of a good refractory material – Causes for the failure of refractory materials.

UNIT –5: FUELS AND LUBRICANTS (9)

Fuels: Definition and classification of fuels – Liquid fuels – Classification of petroleum, refining of petroleum – Synthetic petrol – Bergius Process - Gaseous fuels-natural gas, produce gas, water gas, coal gas and bio gas. **Lubricants:** Principles and functions of lubricants – Properties of lubricants – Viscosity – Flash and fire points – Cloud and pour points – Aniline point – Neutralization number.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	To understand the fundamentals of water technology and developanalytical skills in determination hardness of water and to acquire awareness to societal issues on quality of water.	**PO1, PO2,PO3, PO6**
CO2	Acquire the knowledge in corrosion phenomenon and develop skills inthe design of methods for control of corrosion	**PO1, PO2, PO3**
CO3	Acquire knowledge on polymeric materials and to prepare polymericmaterial for environmental safety and society need.	**PO1, PO3,PO6, PO7**
CO4	Analyze the effect of cement materials, causes for the failure ofrefractory materials and understanding of phase rule.	**PO1, PO2**
CO5	Apply the basic knowledge of fuel chemistry and lubricants to identifythe quality of fuels and lubricants.	**PO1, PO2**

TEXT BOOKS:

1. Prof. K. N. Jayaveera, Dr. G. V. Subba Reddy and Dr. C. Ramachandraiah, "Chemistry for Engineers", Tata McGraw Hill Publishers, New Delhi, 4/e, 2009.
2. Jain and Jain, "Text book of Engineering Chemistry", Dhanat Rai Publishing Company, New Delhi.15/e, 2008
3. Text book of Engineering Chemistry, 18/e, 2008, S. S. Dara, S. Chand & Co, New Delhi.

REFERENCE BOOKS:

1. Dr. K. B. Chandrasekhar, Dr. U.N. Dash, Dr. Sujatha Mishra, Scitech Publications(India) Pvt. Ltd, Hyderabad,"Engineering Chemistry, 5/e, 2009.
2. B.Viswanath, M. Aulice Scibioh, "Fuel Cells Principles and Applications", Universities press, Hyderabad, 4/e, 2008.
3. Skoog and West, "Principles of Instrumental analysis",6/e Thomson,2007.
4. Glasston & Lewis, Dhanptharai Publishers, Physical Chemistry, New Delhi ,12/e, 2009.
5. JC Kuriacose and J. Rajaram," Engineering Chemistry (Vol.1&2)", Tata McGraw Hill Publishers, New Delhi, 5/e, 2004.

REFERENCE WEBSITE:

1. https://www.youtube.com/watch?v=zVZ9c6EXfTA
2. https://nptel.ac.in/courses/113/104/113104082/
3. https://nptel.ac.in/courses/104/105/104105039/
4. https://nptel.ac.in/courses/104/106/104106132/
5. https://www.digimat.in/nptel/courses/video/103108100/L01.html

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	2	2	2	-	-	2	-	-	-	-	-	-
CO.2	2	2	2	-	-	-	-	-	-	-	-	-
CO.3	2	-	2	-	-	2	2	-	-	-	-	-
CO.4	2	2	-	-	-	-	-	-	-	-	-	-
CO.5	2	2	-	-	-	-	-	-	-	-	-	-
CO*	**2**	**2**	**2**	**-**	**-**	**2**	**2**	-	-	-	-	-

I B.Tech. - II Semester

20BSC123	**ENGINEERING PHYSICS**	**L T P C**
	(Common to Civil and Mechanical Branches)	**3 0 - 3**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To enlighten the periodic arrangement of atoms in crystals, Bragg's law and to provide fundamentals related to structural analysis through powder diffraction method.
2. To identify the importance of the optical phenomenon i.e. interference and diffraction related to its Engineering applications.
3. To understand the mechanisms of Lasers and the propagation of light wave through optical fibres along with engineering applications
4. To acquire the knowledge in dielectric, magnetic materials and nano materials and their applications in different fields of Engineering
5. To familiarize the concepts of theoretical acoustics to practical use in engineering field. To explain the significance of ultrasound and its application in NDT for diversified engineering application.

UNIT –1: CRYSTALLOGRAPHY AND X-RAY DIFFRACTION (9)

Crystallography: Space lattice, Basis, unit cell and lattice parameters – Bravais Lattice – Crystal systems – Packing fraction – Coordination number – Packing fraction of SC, BCC & FCC . **X-Ray Diffraction:** Bragg's law – Bragg's X-ray diffractometer – Crystal structure determination by Powder method.

UNIT –2: WAVE OPTICS (9)

Interference: Interference – Principle of superposition – Interference of light – Conditions for sustained interference – Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index. **Diffraction:** Diffraction – Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit.

UNIT –3: LASERS AND FIBER OPTICS (9)

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – Nd-YAG laser – He-Ne laser – Applications of lasers. **Fiber Optics:** Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Propagation Losses (Qualitative) – Applications.

UNIT –4: ENGINEERING MATERIALS (9)

Dielectric Materials: Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarization (Qualitative) – Lorentz internal field – Clausius-Mossotti equation. **Magnetic Materials:** Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials. **Nanomaterials:** Introduction – Surface

area and quantum confinement – Physical properties: electrical and magnetic properties – Synthesis of nanomaterials – Top-down – Ball Milling – Bottom-up – Chemical Vapour Deposition – Applications of nanomaterials.

UNIT –5: ACOUSTICS AND ULTRASONIC (9)

Acoustics: Introduction – Requirements of acoustically good hall – Reverberation – Reverberation time – Sabine's formula (Derivation using growth and decay method) – Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedies. **Ultrasonics:** Introduction – Properties – Production by piezoelectric methods – Detection – Non-Destructive Testing – Pulse echo system through transmission and reflection modes – Applications.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Enlighten the periodic arrangement of atoms in crystals, Bragg's law and to provide fundamentals related to structural analysis throughpowder diffraction method	**PO1, PO2**
CO2	Identify the importance of the optical phenomenon i.e. interferenceand diffraction related to its Engineering applications.	**PO1, PO2**
CO3	Understand the mechanisms of Lasers and the propagation of lightwave through optical fibres along with engineering applications	**PO1, PO2**
CO4	Acquire the knowledge in dielectric, magnetic materials and nano materials and their applications in different fields of Engineering	**PO1, PO2,PO12**
CO5	Familiarize the concepts of theoretical acoustics to practical use in engineering field. To explain the significance of ultrasound and its application in NDT for diversified engineering application.	**PO1, PO2**

TEXT BOOKS:

1. Palanisamy ,"Engineering Physics", Palanisamy, Scitech Publications
2. K.Thyagarajan ,"Engineering Physics", McGraw Hill Publications
3. Maninaidu,"Engineering Physics", Pearson Publications

REFERENCE BOOKS:

4. Kittel ,"Solid State Physics", Wiley Publications
5. Gaur and Gupta , "Engineering Physics", Dhanpatrai Publications

REFERENCE WEBSITE:

1. https://www.youtube.com/watch?v=PEXSH8dB-Uk
2. https://www.youtube.com/watch?v=YvrwVK9ZqQY
3. https://www.digimat.in/nptel/courses/video/115107095/L01.html
4. https://www.youtube.com/watch?v=6QUFuZpCgGw
5. https://www.youtube.com/watch?v=etjZmdmrjSU
6. https://nptel.ac.in/courses/115/105/115105122/
7. https://nptel.ac.in/courses/108/108/108108122/
8. https://nptel.ac.in/courses/118/104/118104008/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	-
CO.2	3	2	-	-	-	-	-	-	-	-	-	-
CO.3	3	2	-	-	-	-	-	-	-	-	-	-
CO.4	3	2	-	-	-	-	-	-	-	-	-	2
CO.5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**-**	**-**	-	**-**	-	**-**	-	**-**	-	**2**

I B.Tech. - II Semester

20MEC121	ENGINEERING MECHANICS (Common to Civil and Mechanical Branches)	L T P C 2 1 - 3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To apply the methods to determine the resultant forces and itsequilibrium.
2. To analyze the bodies subjected to friction, simple frames and apply.
3. To apply the concepts of centroids/center of gravity of various sections
4. To analyze the kinematics of a body undergoing rectilinear, curvilinear motion.
5. To apply the Dynamic equilibrium principles and work energy equations tosolve appropriate problems.

UNIT –1: STATICS OF PARTICLES (9)

Statics of Particles: Laws of mechanics – Parallelogram, triangular and polygon law of forces – Lame's theorem – Force and its characteristics – Resultant of coplanar forces – Equilibrium of a particle (plane) – Equilibrium of a particle in space – Equivalent forces – Principle of transmissibility. **Equilibrium of Rigid Bodies:** Law's of equilibrium – Free body diagram – Action and reaction forces – Moments and couples – Moment of a force about a point and axis – Varignon's theorem (all particles only analytical method).

UNIT –2: ANALYSIS OF FRAMES, VIRTUAL WORK AND FRICTION (9)

Perfect Frames: Simple trusses – Analysis of trusses by method of joints and sections (analytical method only) – Simple frames. **Virtual Work:** Principle of virtual work – Applying the virtual work in mechanical efficiency of real machines. **Friction:** Laws of friction – Co-efficient of friction – Angles of friction – Angle repose – Friction on horizontal and inclined plane – Friction on ladder and wedges.

UNIT –3: DISTRIBUTED FORCES (9)

Centre of Gravity: Centroid and centre of gravity – First moments of areas and lines – Centroids of simple and composite sections by method of moments – Centers of gravity and centroids of volumes – Theorems of Pappus-Guldinus. **Moment of Inertia:** Second moment of inertia of an area – Parallel and perpendicular axis theorem – Radius of gyration – Moments of inertia of simple and composite areas – Polar moment of inertia – Product of inertia – Principal axes and principal moments.

UNIT –4: KINEMATICS (9)

Kinematics of Particles: Equations of motion – Position, velocity and acceleration – Constant and variable acceleration – Rectilinear and curvilinear motion – Motion under gravity – Projectile motion – Rectangular, tangential and normal components of velocity and acceleration – Radius of curvature. **Kinematics of Rigid Bodies:** Translation and rotation about a fixed axis – General plane motion in velocity and acceleration.

UNIT –5: KINETICS (9)

Kinetics of Particles: Newton's laws of motion and gravitation – Dynamic equilibrium (D'alembret's principle). – Motion on rough and inclined surfaces – Motion of two bodies connected by strings – Linear and angular momentum of a particle – Principle of work and energy – Power and efficiency – Principle of conservation of energy – Principle of impulse and momentum – Impacts.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Demonstrated and applied the knowledge of the various methods to determine the resultant forces and its equilibrium acting on a particle in two and three dimensional.	**PO1, PO2, PO3, PO4**
CO2	Analyze the bodies subjected to friction, simple frames andapply principle of virtual work to find reactions.	**PO1, PO2, PO3, PO4**
CO3	Find the location of centroid, center of gravity and moment ofinertia for the given appropriate sections.	**PO1, PO2, PO3, PO4**
CO4	Analyze the kinematics of a body undergoing rectilinear, curvilinear motion.	**PO1, PO2, PO3, PO4**
CO5	Apply the dynamic equilibrium principles and work energy equations to solve appropriate problems.	**PO1, PO2, PO3, PO4**

TEXT BOOKS:

1. Ferdinand P. Beer, E. Russell Johnston, David Mazurek, Phillip J. Cornwell, Brian Self, Sanjeev Sanghi," Vector Mechanics for Engineers", Tata McGraw-Hill Education Pvt., Ltd.,12/e, 2019,
2. J. L. Meriam, L. G. Kraige and J. N. Bolton, Engineering Mechanics: Statics, SI Version, & Engineering Mechanics: Dynamics, SI Version, John Wiley & Sons, Inc.,2017.

REFERENCE BOOKS:

1. S S Bhavikatti, Engineering Mechanics, New Age International Ltd, 2019.
2. R.C Hibbeler, Engineering Mechanics, Pearson Education Ltd, 2017.
3. A K Tayal, "Engineering Mechanics Statics and Dynamics", Umesh publications, New Delhi ,14/e, 2010.
4. N.H.Dubey, "Engineering Mechanics Statics and Dynamics", Tata McGraw-Hill Education Pvt. Ltd, Noida, 1/e, 2012.
5. Andrew Pytel, Jaan Kiusalaas, Ishan Sharma,"Engineering Mechanics – Statics, (SI Edition)", Cengage Learning, 3/e, 2010.
6. Andrew Pytel, Jaan Kiusalaas and Ishan Sharma, "Engineering Mechanics – Dynamics, (SI Edition)", Cengage Learning, 3/e, 2010.

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1. https://nptel.ac.in/courses/112/103/112103109/
2. https://nptel.ac.in/courses/122/104/122104015/
3. https://www.digimat.in/nptel/courses/video/112106180/L01.html
4. https://nptel.ac.in/courses/112/106/112106286/
5. https://nptel.ac.in/courses/112/105/112105164/
6. https://nptel.ac.in/courses/112/103/112103108/
7. https://nptel.ac.in/courses/122/104/122104014/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	2	-	-	-	-	-	-	-	-
CO.2	3	2	2	2	-	-	-	-	-	-	-	-
CO.3	3	2	2	2	-	-	-	-	-	-	-	-
CO.4	3	2	2	2	-	-	-	-	-	-	-	-
CO.5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-

I B.Tech. - II Semester

20MEC122	MATERIAL SCIENCE AND METALLURGY	L	T	P	C
		3	-	-	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Constructing the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.
2. Selecting and applying various heat treatment processes and its microstructure formation.
3. Applying the different types of ferrous and non-ferrous alloys and their uses in engineering field.
4. Applying the different polymer, ceramics and composites and their uses in engineering field.
5. Applying the various mechanical testing procedures and failure mechanism in engineering field.

CRYSTALLOGRAPHY (Not for Examination) (2)

Crystal structure – Cubic systems SC, BCC, FCC and HCP structure – Space and Bravais lattices –Unit cell – Miller indices – Packing factor in cubic systems – Co-ordination number.

UNIT –1: CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS (7)

Crystal Defects: Point, line, Surface and volume defects. **Constitution of Alloys:** Solidification – Solid solutions – Hume-Rothery rule – Gibb's phase rule – Cooling curves. **Phase Diagrams:** One component system– Lever rule – Binary phase diagrams of Cu-Ni, Al-Cu, and Fe-Fe3C– Iron-iron carbide equilibrium diagram – Isomorphous, eutectic, eutectoid, peritectic, peritectoid.

UNIT –2: HEAT TREATMENT (9)

Effect of alloying elements on iron – Isothermal transformation diagrams – Cooling curves superimposed on TTT diagrams and CCT diagrams – Critical cooling rate – Annealing and its types – Normalizing – Hardening and its methods – Hardenability and Jominy end quench test – Tempering, martempering, austempering and maraging – Carburizing, nitriding, cyaniding and carbonitriding – Case hardening, flame hardening, induction hardening, vacuum and plasma hardening – Sintering.

UNIT –3: FERROUS AND NON-FERROUS METALS (9)

Ferrous Materials: Effect of alloying elements on steel (Mn, Si, Cr, Mo, V, Ti, W) – Specification, classification, composition, properties and applications of carbon steels, alloy steels, stainless steels, tool steels, maraging steels and HSLA steels – Classification, structure, composition, properties and applications of gray, ductile, white, malleable cast irons and compacted graphite iron. **Non- Ferrous Materials:** Copper and copper alloys – Brass, bronze and cupronickel – Aluminum and its alloys – Gun metal – Bearing materials – Tin and its alloys – Magnesium and nickel alloys – Shape memory alloys – Titanium alloys.

UNIT –4: NON-METALLIC MATERIALS (9)

Polymers: Mechanical behavior of polymers – Commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastics – Strengthening of polymers. **Engineering Ceramics:** Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON – Intermetallics. **Composites Materials:** Classification, properties and applications composites – Particle-reinforced, fiber-reinforced and structural composites – Introduction of hybrid composites and nano composites.

UNIT –5: MECHANICAL DEFORMATION AND TESTING (9)

Mechanical Properties: Deformation of metals – Elastic and plastic deformation – Slip and twinning – Fundamentals of fracture mechanics, Griffith's theory, ductile and brittle fracture. **Material Testing:** Testing of materials under tension, compression and shear – Hardness tests (Brinell, Vickers and Rockwell) – Charpy and Izod impact tests – Fracture, fatigue and creep test.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Apply the knowledge of engineering fundamentals of alloys and Phase diagram of various materials and the classification of micro structure in steel and cast iron.	**PO1, PO2,PO3, PO4**
CO2	Acquire the knowledge of engineering fundamentals for treatment process and identify appropriate techniques used in all the heat treatment process with an understanding of its limitations.	**PO1, PO2,PO3**
CO3	Understand the engineering knowledge of ferrous and non-ferrous metal and its alloys and identify the engineering applications.	**PO1, PO3**
CO4	Understand the engineering knowledge of polymers, ceramics and composites and identify the engineering application of polymers, ceramics and composites.	**PO1, PO3**
CO5	Understand the engineering knowledge of mechanical properties and its deformation mechanisms.	**PO1, PO3,PO4**

TEXT BOOKS:

1. Materials Science and Engineering: An Introduction, William D. Callister, 9/e, 2014,Wiley India Pvt. Ltd.
2. Introduction to Physical Metallurgy, Sidney H Avner, 2/e, 2013, Tata McGraw-HillEducation Pvt. Ltd., Noida.

REFERENCE BOOKS:

1. Engineering Materials 1, An Introduction to Properties, Applications and Design, David
2. R.H. Jones and Michael Ashby, 5/e, 2018, Butterworth-Heinemann, Elsevier Publishers.
3. The Science and Engineering of Materials, SI Edition, Pradeep Fulay, Wendelin Wright and Donald R. Askeland, 6/e, 2011, Cengage Learning, India.

4. A Text book of Material Science and Metallurgy, O.P.Khanna, 2010, Dhanpat Rai Publications.
5. Materials Science and Engineering: A First Course, V. Raghavan, 6/e, 2015, Prentice- Hall of India, Pvt. Ltd.
6. Elements of Material Science and Engineering, Lawrence H.Vanvlack, 6/e, 2002, Pearson Education, New Delhi.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/113/102/113102080/
2. https://nptel.ac.in/courses/122/102/122102008/
3. https://nptel.ac.in/courses/112/108/112108150/
4. https://nptel.ac.in/courses/113/107/113107078/
5. https://nptel.ac.in/courses/113/105/113105081/
6. https://nptel.ac.in/courses/113/106/113106034/
7. https://nptel.ac.in/courses/113/104/113104004/
8. https://nptel.ac.in/courses/113/104/113104014/
9. https://nptel.ac.in/courses/113/108/113108054/
10. https://nptel.ac.in/courses/113/105/113105028/
11. https://nptel.ac.in/courses/113/106/113106032/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	2	3	-	-	-	-	-	-	1
CO.2	3	2	2	2	3	-	-	-	-	-	-	1
CO.3	3	2	2	2	3	-	-	-	-	-	-	1
CO.4	3	2	2	2	3	-	-	-	-	-	-	1
CO.5	3	2	2	2	3	-	-	-	-	-	-	1
CO*	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

SREENIVASAINSTITUTEOFTECHNOLOGYANDMANAGEMENTSTUDIES
(Autonomous)
DEPARTMENT MECHANICAL ENGINEERING
(Accredited by NBA)

I B.Tech. - II Semester

20BSC114	**ENGINEERING CHEMISTRY LAB (Common to All Branches)**	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To provide solid foundation in chemistry laboratory to solve engineering problems.
2. To apply the theoretical principles and perform experiments on hardness of water,dissolved oxygen, alkalinity and acidity.
3. To experience the importance of theory by using analytical equipment's like redwood viscometer and conductometry

LIST OF EXPERIMENTS:

1. Preparation of Standard EDTA solution and Estimation of Hardness of Water
2. Preparation of Standard EDTA and Estimation of Copper
3. Estimation of dissolved oxygen in given water sample
4. Estimation of alkalinity of water
5. Estimation of Acidity of water sample.
6. Preparation of Standard Potassium Dichromate and Estimation of Ferrous Iron
7. Preparation of Standard Potassium Dichromate and Estimation of Copper by Iodometry
8. Determination of strength of the given Hydrochloric acid against standard sodiumhydroxide Solution by Conductometric titration
9. Conductometric titration of BaCl2 Vs Na2SO4 (Precipitation Titration).
10. Determination of viscosity of the given oils through Redwood viscometer

COURSE OUTCOMES:

On the successful completion of this course, the student should be able to,		**POs related to COs**
CO1	Prepare standard solutions.	**PO1**
CO2	Acquire knowledge about volumetric analysis of estimation copper byEDTA and by Iodometry	**PO2**
CO3	Acquire analytical skills in estimation of hardness of water, Alkalinity and Acidity of water, dissolved oxygen in water and estimation of ironthrough laboratory methods	**PO3**
CO4	Acquire skills to use instrumental techniques for the determination ofelectrical conductance of electrolytes and viscosity of lubricants	**PO4**
CO5	Provide solutions for environmental issues through determination ofquality of water	**PO6**
CO6	Communicate verbally and in written form pertaining to results of theExperiments	**PO8**
CO7	Learns to perform experiments involving chemistry in future years.	**PO9**
CO8	Communicate verbally and in written form, the understanding aboutthe experiments.	**PO10**
CO9	Continue updating their skill related to chemistry laboratory.	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	3	-	-	-	-	-	-
CO6	-	-	-	-	-			3	-	-	-	-
CO7	-	-	-	-	-	-	-		3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	-	**3**	**-**	**3**	**3**	**3**	**-**	**3**

I B.Tech. - II Semester

		L	T	P	C
20BSC115	**ENGINEERING PHYSICS LAB (Common to All Branches)**	**-**	**-**	**2**	**1**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the concepts of interference, diffraction and their applications.
2. To understand the role of optical fiber parameters in communication.
3. Recognize the importance of energy gap in the study of conductivity
4. To Illustrates the properties of Magnetic and their applications
5. To understand and evaluate the properties of materials and sounds

LIST OF EXPERIMENTS:

1. Diffraction grating - Measurement of wavelength of given Laser.
2. To determine the frequency of AC using Sonometer
3. Determination of magnetic field along the axis of a current carrying circular coil -Stewart Gees method
4. Determination of numerical aperture and acceptance angle of an optical fiber
5. Determination of particle size using a laser source
6. Parallel fringes – Determination of thickness of thin object using wedge method
7. Newton's rings – Determination of radius of curvature of given plano convex lens
8. B-H curve – Determination of hysteresis loss for a given magnetic material
9. Determination of Energy band gap of semiconductor
10. To find the rigidity modulus of the material using torsional pendulum

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Demonstrate Knowledge on measurement of various physical quantities using optical methods and fundamentals of magnetic fields	**PO1**
CO2	Identify different physical properties of materials like band gap, magnetic field intensity etc, for engineering and technological applications	**PO2**
CO3	Provide valid conclusions on phenomena Interference and Diffraction	**PO4**
CO4	Follow the ethical principles in implementing the experiments	**PO8**
CO5	Do experiments effectively as an individual and as a team member ina group.	**PO9**
CO6	Communicate verbally and in written form, the understanding aboutthe experiments.	**PO10**
CO7	Continue updating their skill related to physics for engineering applications in future.	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

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I B.Tech. - II Semester

20ESC112	**ENGINEERING WORKSHOP AND IT WORKSHOP (Common to All Branches)**	**L**	**T**	**P**	**C**
		-	**-**	**2**	**1**

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To provide exposure to the students with hands on experience on various basic engineering practices in civil, mechanical and electrical engineering.
2. To include training on PC Hardware, Internet & World Wide Web and Productivity Tools including Word, Excel and Power Point.

A. ENGINEERING WORKSHOP

Trade for Exercises:

1. **Carpentry:** Two exercises from: Middle T lap joint – Dove tail lap joint – Mortise and tenon joint from out of 300 x 50 x 35 mm soft wood stock.
2. **Sheet Metal:** Two exercise from: square tray – Open scoop – Frustum of pyramid from out of 22- or 20-gauge G.I. sheet.
3. **Fitting:** Two exercises from: square joint – V joint – Dove tail joint from out of 50 x 50 x 5 mm M.S. flat piece.
4. **House Wiring:** Two exercise from: Two lamps controlled by one switch in series and parallel – One lamp controlled by 2 two-way switches (stair case) – Wiring for fluorescent lamp.
5. **Plumbing:** Two exercise from: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

3. **Machining:** Exercise on drilling and tapping.

Trade for Exercises:

1. Lathe machine.
2. Grinding machine.
3. Arc and gas welding.

COURSE OUTCOMES (Engineering Workshop):

On successful completion of the course, students will be able to		**POs**
CO1	Demonstrate the knowledge on different tools used in carpentry, fitting, sheet metal, house wiring and plumbing sections and also basic machining process	**PO1**
CO2	Analyze the basic pipeline connection using different joints	**PO2**
CO3	Design and develop simple components by using different materialsincludes wood, GI sheet and MS plates	**PO3**
CO4	Apply basic electrical engineering tools on the house wiring practice	**PO5**
CO5	Follow the ethical principles in while doing the exercises.	**PO8**
CO6	Do the exercises effectively as an individual and as a team member in a group	**PO9**
CO7	Communicate verbally among team members and in written form, theunderstanding about the trade exercises.	**PO10**
CO8	Continue updating their skill related to trades.	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

B. IT WORKSHOP

PC Hardware

1. Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

2. Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video shall be given as part of the course content.

3. Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

4. Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

5. **Hardware Troubleshooting:** Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

6. **Software Troubleshooting:** Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

LaTeX and Word

7. **Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
8. Using LaTeX and Word to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Excel

9. Excel Orientation:The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.
10. Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

LaTeX and MS/equivalent (FOSS) tool Power Point

11. Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and PowerPoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

12. Second Exercise helps students in making their presentations interactive. Topic covered during this Exercise includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Internet& World Wide Web

13. **Internet & World Wide Web -Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

    Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.

14. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated by the student to the satisfaction of the instructors. Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computers to be safe on the internet. They need to first install an antivirus software, configure their personal firewall and windows update on their computer.

Course Outcomes (IT Workshop):

On the successful completion of this course, the student should be able to,		POs related to COs
CO1	Acquire knowledge on computer system such as system unit, input devices, and output devices connected to the computer.	**PO1**
CO2	Demonstrate the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.	**PO2**
CO3	Demonstrate the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.	**PO3**
CO4	Familiarize with parts of MS Office, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.	**PO5**
CO5	Follow the ethical principles in implementing the programs	**PO8**
CO6	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO7	Communicate verbally and in written form, the understanding about the experiments and	**PO10**
CO8	Continue updating their skill related to MS Office, Internet and Computer in future.	**PO12**

Reference books:

1. Comdex Information Technology course tool kit , 2003, Vikas Gupta, WILEY Dream tech, New Delhi
2. The Complete Computer upgrade and repair book, 3/e, 2008, Cheryl A Schmidt, WILEY Dream Tech,New Delhi
3. Introduction to Information Technology, 2008, ITL Education Solutions limited, Pearson Education, New Delhi
4. PC Hardware and A+ Handbook, 2004, Kate J. Chase, Microsoft press
5. LaTeX Companion,2/e, 2002, Leslie Lamport, Addison Wesley, New Delhi
6. IT Essentials PC Hardware and Software Companion Guide, 3/e, 2008, David Anfinson and Ken Quamme, CISCO Press, Pearson Education, New Delhi
7. IT Essentials PC Hardware and Software Labs and Study Guide, 3/e, 2008, Patrick Regan, CISCO Press, Pearson Education, New Delhi
8. Troubleshooting, Maintaining and Repairing PCs, 5/e, 2008, S.J.Bigelow, TMH, New Delhi

I B.Tech. - II Semester

20MEC124	COMPUTER AIDED DRAFTING LAB	L	T	P	C
	(Common to Civil and Mechanical Engineering)	-	-	3	1.5

Course Educational Objectives:

1. To understand the design of the engineering components in a machine
2. To develop a skill on creating the 2D and 3D models of components
3. To understand part drawing and Assembly of components in a machine

List of Exercises:

1. Study of capabilities of software for Drafting and Modeling - Coordinate systems (absolute, relative, polar, etc.) - Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a title block with necessary text and projection symbol.
3. Draw the two dimensional diagram and follow with the principles of dimensioning.
4. Drawing of curves like parabola, spiral, involute using B-spline or cubic spline.
5. Drawing of front view and top view of simple solids like prisms, pyramids, cylinder, cone, etc. with dimensioning.
6. Drawing sectional views of prisms, pyramids, cylinder, cone, etc.
7. Draw the development of surfaces on simple objects like prisms, pyramids, cylinder, cone, etc.
8. Creation of 3D models of simple objects and obtaining 2D multi-view drawings from 3D model.
9. Drawing front view, top view and side view of objects from the given pictorial views. (eg. V-block, base of a mixie, simple stool, objects with hole and curves.)
10. Drawing of simple 3D mechanical components like bolt, nut, screws, shafts, gears and other machine components etc.
11. Drawing of a plan of residential building (two bed rooms, kitchen, hall, etc.)
12. Drawing of a simple steel truss.

Course Outcomes:

On the successful completion of this course, the student should be able to,		POs related to COs
CO1	Create knowledge on technical drawings and presentations of models from mechanical engineering disciplines.	**PO1**
CO2	Analyze the 2D diagrams for developing the models.	**PO2**
CO3	Generate 3D models for various machine components using Autodesk AutoCAD.	**PO3**
CO4	Select appropriate tools to complete the designing process in AUTOCAD	**PO5**
CO5	Follow ethical principles in designing laboratory and procedures used in software tools.	**PO8**
CO6	Develop the design model in AUTOCAD as an individual.	**PO9**
CO7	Communicate verbally and in written form, the understandings about the experiments.	**PO10**
CO8	Continue updating their skill in designing software package and procedure for various innovation components.	**PO12**

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

I B.Tech. - II Semester

20MAC121	**HUMAN VALUES AND ETHICS**	**L**	**T**	**P**	**C**
	(Common to All Branches)	**2**	**-**	**-**	**-**

Course Educational Objectives:

1. To provide Knowledge in remembering Human Values.
2. To understand about Human Esteem.
3. To apply basic guidelines on Value Education.
4. To analyze the concepts of Happiness and Prosperity.
5. To evaluate the value of one's body as an instrument.

UNIT – 1: HUMAN VALUES **(6)**

Morals – Values – Ethics – Human Values – Integrity - Work Ethic – Service – Learning – Civic Virtue

UNIT – 2: HUMAN ESTEEM **(6)**

Respect for others – living peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Cooperation – Commitment – Empathy – Self Confidence – Character – Spirituality.

UNIT – 3: VALUE EDUCATION **(6)**

Understanding the need – Basic guidelines – content and process for value education – self exploration –its content and process – Natural acceptance and experiential validation as the mechanism for self exploration.

UNIT – 4: HAPPINESS AND PROSPERITY **(6)**

Continuous Happiness and Prosperity – Basic Human aspirations – right understanding – relationship and physical facilities – the basic requirements for fulfillment of aspirations.

UNIT – 5: UNDERSTANDING THE BODY **(6)**

Understanding the body as an instrument of 'I' ('I' being the doer, seer, and enjoyer) – understanding Harmony in the family – the basic unit of human interaction.

Total Hours: 30

Course Outcomes:

On successful completion of the course, students will be ableto		**POs related to Cos**
CO1	Remember the concepts on developing Human Values and Ethics.	**PO1, PO8, PO12**
CO2	Understand and Develop Knowledge on Human Esteem.	**PO1, PO8, PO12**
CO3	Apply basic guidelines on Value Education.	**PO1, PO8, PO12**
CO4	Analyze and follow How to maintain happiness and Prosperity.	**PO1, PO8, PO12**
CO5	Evaluate the Value of Oneself as an instrument.	**PO1, PO8, PO12**

Text Books:

1. A Text Book on Professional Ethics and Human Values by R.S. Naagarazan, Newage International Publishers, New Delhi -2014
2. Human Values and Professional Ethics by Jayshree Suresh & B.S.Raghavan, S. Chand & Company, New Delhi – 2010
3. The text book R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174- 46781-2 b.
4. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010 Human Values, New Age International Publishers.

Relevant Websites, Movies and Documentaries:

1. Value Education websites, http://uhv.ac.in, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story
6. Gandhi A., Right Here Right Now, Cyclewala Productions

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	1	-	-	-	-	-	-	3	-	-	-	3
CO.2	1	-	-	-	-	-	-	3	-	-	-	3
CO.3	1	-	-	-	-	-	-	3	-	-	-	3
CO.4	1	-	-	-	-	-	-	3	-	-	-	3
CO.5	1	-	-	-	-	-	-	3	-	-	-	3
CO*	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**3**

II B.Tech. - III Semester

		L	T	P	C
20BSC231	**NUMERICAL METHODS AND PROBABILITY THEORY** (Common to CIVIL, MECH, ECE, CSE & AIML)	**3**	**1**	**-**	**4**

PRE-REQUISITES: A Course on Algebra & Calculus, Differential equations & Transform Techniques

COURSE EDUCATIONAL OBJECTIVES:

1. To develop skill to analyze appropriate method to find the root of the Algebraic and Transcendental Equations and to develop skill to apply the concept of interpolation for the Prediction of required values
2. To learn the method of evaluation of numerical integration and to solve ordinary differential equations numerically using numerical methods
3. To develop skill to analyze the discrete and continuous data
4. To develop skill to analyze the discrete and continuous data using appropriate Statistical Distributions like Binomial, Poisson, Normal etc., and To inculcate skill to investigate different applications of statistical distributions and the corresponding conclusions required for the analysis of sample data.
5. To develop skill in testing of hypotheses and Tests of significance for small and large samples

UNIT – 1: SOLUTION OF ALGEBRAIC, TRANSCENDENTAL EQUATIONS & INTERPOLATION (9)

Solution of Algebraic and Transcendental Equations: Introduction - The Bisection method - The method of False position - The Iteration method - Newton-Raphson method (Single Variable).

Interpolation: Introduction - Finite differences - Forward differences, Backward differences - Newton's forward, Newton's backward - Lagrange's method of interpolation.

UNIT – 2: NUMERICALINTEGRATION AND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (9)

Numerical integration: Trapezoidal rule - Simpson's 1/3 Rule - Simpson's 3/8 Rule.

Numerical solution of Ordinary Differential equations: Solution by Taylor's series - Picard's method of successive approximations - Euler's method - Runge-Kutta methods.

UNIT - 3: PROBABILITY, RANDOM VARIABLES (9)

Probability: Sample space and events - Probability - The axioms of probability - Some elementary theorems - Conditional probability - Baye's theorem.

Random variables: Discrete and continuous distributions – Statistical Parameters (Mean, Variance and Standard Deviation) of distribution functions.

UNIT -4: PROBABILITY DISTRIBUTIONS & SAMPLING THEORY (9)

Binomial - Poisson and Normal distributions - Related properties.

Sampling distribution: Populations and samples - Sampling distributions of mean (σ: known and unknown) - Proportions - Sums and differences.

UNIT - 5: TEST OF HYPOTHESIS AND TEST OF SIGNIFICANCE (9)

Test of Hypothesis: Means - Hypothesis concerning one and two means - Type I and Type II errors - One tail, two-tail tests.
Test of Significance: Student's t-test - F-test - Chi-square test of goodness of fit.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs related to COs**
CO1	Demonstrate knowledge in solving algebraic and transcendental equations by various mathematical methods and Design novel mathematical methods for constructing the interpolating polynomials to the given	**PO1,PO2**
CO2	Demonstrate knowledge infinding the numerical values to integrals through different mathematical methods and solving ordinary differential equations numerically through various methods and Design novel mathematical methods for solving the ordinary differential equations.	**PO1,PO2**
CO3	Demonstrate knowledge on use the probability and Random Variables in the field of engineering	**PO1,PO2,PO3**
CO4	Demonstrate knowledge in probability distributions and develop analytical skills for the problems involving means, probability distributions and standard deviations sampling techniques for decision making in uncertain environments	**PO1,PO2,PO3**
CO5	Demonstrate knowledge in testing of hypotheses and Tests of significance for small and large samples and Develop skills for analyzing the data with suitable tests of significance for practical situations through probability	**PO1,PO2,PO3,PO4**

TEXT BOOKS:

1. S.C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", 10/e, 2001, S. Chand and Company Publishers, New Delhi.
2. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad , "Probability and Statistics", 2012, S. Chand and Company Publishers, New Delhi.

REFERENCE BOOKS:

1. V. Ravindranath, T.S.R. Murthy,"Probability and Statistics, 2011, I.K. International Pvt. Ltd, New Delhi.
2. Johnson A. Richard, Miler &Fruends,"Probability and Statistics for Engineers", 6/e, 2006, Pearson Education, New Delhi.
3. Dr. B. S. Grewal, "Higher Engineering Mathematics", 34/e, 1999, Khanna Publishers, Delhi
4. Dr. J. Ravichandran, "Probability and Statistics for Engineers", 2011, Wiley-India Publishers, New Delhi.
5. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, "Probability and Statistics for Engineers and Scientists", 7/e, 2002, Pearson Education Asia, New Delhi.

REFERENCE WEBSITE:

1. https://www.youtube.com/watch?v=hizXlwJO1Ck
2. https://www.youtube.com/watch?v=5817fLmsTGE
3. https://www.youtube.com/watch?v=yv6i9plC9nk
4. https://www.youtube.com/watch?v=r1sLCDA-kNY&list=PL46B9EA2CFEB51241
5. https://www.youtube.com/watch?v=r1sLCDAkNY&list=PL46B9EA2CFEB51241&index=1
6. https://www.youtube.com/watch?v=HnvB8BCDQm0&list=PL46B9EA2CFEB51241&index=2

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	3	2	-	-	-	-	-	-	-	-	-
CO.5	3	3	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-

II B.Tech. - III Semester

20ESC231	FLUID MECHANICS AND MACHINERY (Common to Mechanical & EEE Branches)	L	T	P	C
		2	1	-	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the properties of fluids and concept of kinematic of flow.
2. To study the applications of the conservation laws to flow through pipes.
3. To understand the importance of dimensional analysis and basics of turbomachinery.
4. To understand the importance of various types of flow in turbines.
5. To understand the importance of various types of flow in pumps.

UNIT –1: PROPERTIES OF FLUIDS, BUOYANCY AND KINEMATICS OF FLOW (9)

Properties of Fluids: Fluid properties – Compressibility, surface tension and capillarity. **Pressure Measurements:** Variation of static pressure – Atmospheric, absolute, gauge and vacuum pressure – Pressure measurements – Piezometer, U-tube and differential manometers. **Buoyancy and Floatation:** Concepts of buoyancy, buoyancy force, center of buoyancy, meta center and meta centric height (theoretical concept only). **Kinematics of Flow:** Principles of fluid flow – Types of fluid flow – Rate of flow – Continuity equation.

UNIT –2: DYNAMICS OF FLUID FLOW AND FLOW THROUGH PIPES (9)

Dynamics of Fluid Flow: Equations of motion – Euler's equation – Bernoulli's equation for real fluid – Application of Bernoulli's equation in venturimeter, orifice meter and pitot tube. **Boundary Layer Theory:** Boundary layer characteristics – Boundary layer, displacement, momentum and energy thickness (Basics only). **Forces on Submerged bodies:** Expression for Drag and Lift – Drag on a sphere. **Flow Through Pipes:** Reynold's experiment – Loss of energy in pipes – Darcy's Weisbach equation and Chezy's formula – Minor energy losses – Pipes in series and parallel – Equivalent pipe.

UNIT –3: DIMENSION ALANALYSIS AND TURBOMACHINERY (9)

Dimensional Analysis: Dimensions – Dimensional homogeneity – Rayleigh method – Buckingham π-method – Selection of repeating variables – Model analysis – Similitude and similarities – Forces acting in moving fluid – Dimensionless numbers – Similarity laws – Model testing of partially submerged bodies – Distorted and undistorted models. **Basics of Turbo Machinery:** Force exerted by the jet on a stationary and moving of flat, inclined and curved – Jet on a hinged plate – Jet striking centrally and at tip of curved plate.

UNIT –4: HYDRAULIC TURBINES (9)

Hydraulic Turbines: Classification of hydraulic turbines – Heads and efficiencies – Working principles of Pelton wheel, Francis turbine and Kaplan turbine – Velocity triangle diagrams, work done, heads and efficiencies – Draft tube - Unit quantities and specific speed –Characteristics curves –Governing of turbines – Water hammer –Surge tank.

UNIT –5: HYDRAULIC PUMPS (9)

Centrifugal Pumps: Principles of working – Work done – Heads and efficiencies – Minimum starting speed – Multi stage centrifugal pump – Specific speed – Model testing – Priming – Characteristics curves – Cavitations – Suction height – NPSH. **Reciprocating Pumps:** Principles of working – Slip – Work saved by fitting air vessels.

Total Hours: 45

On successful completion of the course, students will be able to		POs
CO1	Apply mathematical knowledge to predict the properties and characteristics of a fluid, analysis.	**PO1, PO2, PO12**
CO2	Demonstrate knowledge and understanding the basic equations of fluid flows, compute drag and lift coefficients and solve problems in flow of fluids	**PO1, PO2, PO3, PO4, PO12**
CO3	Analyze the model and the prototype using dimensional analysis and force exerted in turbomachinery.	**PO1, PO2, PO3, PO4, PO12**
CO4	Design the working proportions of hydraulic turbines and analysis to improve the performances.	**PO1, PO2, PO3, PO4, PO12**
CO5	Analyze to improve the performance of pumps and ability to engage in independent.	**PO1, PO2, PO3, PO4, PO12**

TEXT BOOKS:

1. Hydraulics and Fluid Mechanics, "P.N. Modi and S.M. Seth", Standard Book House, Delhi, 18/e, 2011.
2. Fluid Mechanics, "Yunus A. Cengel and John Cimbala", McGraw Hill Education Private Ltd., 2017.

REFERENCE BOOKS:

1. Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, "Fundamentals of Fluid Mechanics", McGraw Hill, New York, 5/e, 2008.
2. S.K. Som and G. Biswas, "Introduction to Fluid Machines", Tata McGraw-Hill Education, Pvt. Ltd., Noida, 2/e, 2010.
3. R.K. Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd., 10/e, 2018.
4. A.K. Jain, "Fluid Mechanics", Khanna Publishers, New Delhi, 11/e, 2012.
5. R.K. Rajput, "Fluid Mechanics and Hydraulic Machinery", S. Chand & Company, Pvt. Ltd., New Delhi, 4/e, 2010.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/105/112105171/
2. https://nptel.ac.in/courses/112/105/112105287/
3. https://nptel.ac.in/courses/105/103/105103192/
4. https://nptel.ac.in/courses/112/105/112105183/
5. https://nptel.ac.in/courses/112/104/112104118/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	1
CO.2	3	2	1	1	-	-	-	-	-	-	-	1
CO.3	3	2	1	1	-	-	-	-	-	-	-	1
CO.4	3	2	1	1	-	-	-	-	-	-	-	1
CO.5	3	2	1	1	-	-	-	-	-	-	-	1
CO*	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. - III Semester

20MEC231	**ENGINEERING THERMODYNAMICS**	**L T P C**
		2 1 - 3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the basic principles of thermodynamics and to acquire knowledge on zeroth and first law of thermodynamics.
2. To acquire knowledge on second law of thermodynamics and its application to various systems.
3. To introduce the properties of pure substances and properties of gases and gas mixtures.
4. To understand thermodynamic equations, functions, relations, various specific heats and basics of psychometry.
5. To understand and to analyze air standard cycles applied for engines.

UNIT –1: BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS (9)

Basic Concepts: Concept of continuum - Microscopic and macroscopic approach - Point and path functions - Systems and their types - Property - State, path and process - Quasi static process - Work - Modes of work - Zeroth law of thermodynamics - Measurement of temperature - Thermodynamic temperature scales. **First Law of Thermodynamics:** Internal energy - Specific heat capacities - Enthalpy - Application of steady flow processes.

UNIT –2: SECOND LAW OF THERMODYNAMICS AND ENTROPY (9)

Second Law of Thermodynamics: Kelvin's Plank and Clausius statement and their equivalence - Reversibility and irreversibility - Carnot cycle - Reversed Carnot heat engine - Carnot theorem. **Entropy:** Concept of entropy - Clausius theorem - TS plot - Clausius inequality - Entropy change in irreversible process - Entropy principle and its applications - Entropy generation in a closed and open system.

UNIT –3: PROPERTIES OF PURE SUBSTANCES, GASES AND GAS MIXTURES (9)

Properties of Pure Substances: Formation of steam and its thermodynamic properties - Phase change of a pure substance - pv, pT, TS, hS diagrams for a pure substance - pvT surfaces - Dryness fraction - Steam tables - Measurement of steam quality. **Properties of Gases and Gas Mixtures:** Ideal gas - Avogadro's Law - Equation of state - Van der Waal's equation - Viral expansions - Compressibility chart - Dalton's law of partial pressure.

UNIT –4: THERMODYNAMIC RELATIONS AND PSYCHROMETRY (9)

Thermodynamic Relations: Exact differential - Helmholtz and Gibbs function - Maxwell's relations - Tds equations – Joule Thomson effect - Clausius Claperyon equation - Difference in heat capacities - Change in thermodynamic properties with variable specific heat - Isentropic expansion with variable specific heat. **Psychrometry:** Definition - Psychrometric properties - Psychrometric relations - Psychrometry charts - Psychrometric process.

UNIT –5: AIR STANDARD CYCLES (9)

Air Standard Cycles: Assumptions and working of Carnot cycle - Otto, Diesel and dual combustion cycle analysis – MEP - Comparison of air standard and actual cycles - Problems on thermal efficiency and work output in Otto and Diesel cycles - Stirling, Ericsson, Atkinson, Lenoir, Brayton cycles (basics only).

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate knowledge and understanding the concept of conservation of mass, energy, work interaction, heat transfer and law of thermodynamics.	**PO1, PO2, PO4, PO12**
CO2	Identify closed and open systems and/or apply the concept of second law to analyze simple systems	**PO1, PO2, PO4, PO12**
CO3	Evaluate properties of pure substances and gas mixtures and use steam tables and Mollier chart in solving complex problems.	**PO1, PO2, PO4, PO12**
CO4	Understand the various thermodynamic equations, functions and relations and basics of various psychrometric relations and properties.	**PO1, PO2, PO12**
CO5	Understand the various air standard cycles applied in engines and identify methods to improve thermodynamic performance.	**PO1, PO2, PO4, PO12**

TEXT BOOKS:

1. P.K.Nag, "Engineering Thermodynamics", Tata McGraw-Hill Education Pvt. Ltd., 5/e, 2013.
2. Yunus Cengel and Boles, "Thermodynamics-An Engineering Approach", Tata McGraw-Hill Education Pvt. Ltd., 4/e, 2004.

REFERENCE BOOKS:

1. Howard N.Shapiro, Michael J.Moran, "Fundamentals of Engineering Thermodynamics", Wiley India Pvt, Ltd, 6/e, 2010.
2. J.B.Jones and R.E.Dugan, "Engineering Thermodynamics", Prentice-Hall of India Pvt. Ltd., 1/e, 2009.
3. A.Venkatesh, "Basic Engineering Thermodynamics", University Press (India) Private Ltd., 1/e, 2007.
4. Rayner Joel, "Basic Engineering Thermodynamics", Pearson Education, 5/e, 2008.
5. D.S.Kumar, "Engineering Thermodynamics", S.K.Kataria and Sons, 3/e, 2012.

NOTE:

Use of standard thermodynamic tables, Mollier diagram and psychometric charts are permitted.

REFERENCE WEBSITE:

1. https://swayam.gov.in/nd1_noc19_me56/preview
2. https://www.classcentral.com/course/nptel-engineering-thermodynamics-7904
3. https://www.edx.org/course/thermodynamics-2
4. https://www.courses.com/indian-institute-of-technology-kharagpur/basic-thermodynamics

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	1	-	-	-	-	-	-	-	1
CO.2	3	2	-	1	-	-	-	-	-	-	-	1
CO.3	3	2	-	1	-	-	-	-	-	-	-	1
CO.4	3	2	-	-	-	-	-	-	-	-	-	1
CO.5	3	2	-	1	-	-	-	-	-	-	-	1
CO*	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. - III Semester

20MEC232	MANUFACTURING TECHNOLOGY	L	T	P	C
		3	0	-	3

PRE-REQUISITES: Material Science and Metallurgy

COURSE EDUCATIONAL OBJECTIVES:

1. To apply the working principles of various metal casting processes.
2. To apply the working principles of various metal joining processes.
3. To apply the working principles of bulk deformation of metals.
4. To apply the working principles of sheet metal forming process.
5. To apply the working principles of plastics molding.

UNIT –1: METAL CASTING (9)

Fundamentals of Casting: Steps involved in foundry and casting – Types of patterns – Pattern materials – Pattern allowances – Molding sand types, properties and testing – Core molding – Molding machines – Concept of solidification of metals and alloys – Principles of gating – Methods of melting by crucible, blast and cupola furnaces – Defects in casting. **Special Casting:** Pressure die, centrifugal and investment casting – Shell, plaster and ceramic mould – Continuous and vacuum casting – CO2 process and stir casting.

UNIT –2: JOINING PROCESS (9)

Classification of welding –Types of welds, welded joints and electrodes. **Gas welding:** Flame characteristics – Oxy-acetylene, Oxy-hydrogen and air-acetylene welding. **Arc Welding:** Metal arc welding –TIG and MIG welding –Submerged arc welding – Electro slag and gas welding –Plasma arc welding. **Solid State Welding:** Friction and friction stir welding – Explosive welding. **Resistance Welding:** Spot and projection welding. **Modern Welding Process:** Thermit welding – Electron beam welding – Induction welding – Laser welding. **Welding Defects:** Causes and remedies. **Other Process:** Gas cutting –Brazing and soldering – Introduction of Nondestructive testing of welds.

UNIT –3: BULK FORMING (9)

Hot and Cold working: Introduction to the theory of plastic deformation – Strain hardening – Recovery, recrystallization and grain growth – Cold and hot working. **Rolling:** Theory of rolling – Types of rolling mills and products – Forces in rolling and power requirements – Rolling operations – Defects in rolled parts. **Extrusion of Metals:** Extrusion process and its characteristics – Hot and cold extrusion – Forward and backward extrusion – Impact and hydrostatic extrusion. **Drawing:** Types of drawing methods – Wire drawing and tube drawing – Design for manufacturing and economics of bulk forming.

UNIT –4: FORGING AND SHEET METAL FORMING (9)

Forging: Principles– Forging process – Tools and dies – Types: Smith, drop, roll and rotary forging – Forging hammers – Forging defects. **Sheet Metal Forming:** Characteristics – Formability of sheet metals – Test methods for formability – Shearing, bending and drawing– Stretch and hydro forming – Rubber and explosive forming – Magnetic pulse and peen forming – Super plastic and micro forming – Metal spinning – Design for manufacturing and economics of forging and sheet metal forming.

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UNIT –5: PROCESSING OF PLASTICS AND POWDER METALLURGY (9)

Processing Thermo Plastics: Characteristics – Bonding of thermoplastics – Molding of thermoplastics – Extrusion, injection, blow and rotational molding, calendaring, film and thermoforming, foaming. **Processing of Thermosets:** Compression, transfer, injection, jet, liquid and resin molding – Resin transfer molding, reaction injection molding and rotational molding. **Powder Metallurgy:** Powder production methods – Particle size characterization – Blending – Compacting – Sintering – Secondary and finishing operations – Advantages and applications of powder metallurgy.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Illustrate principles of foundry and recognize the different types of casting processes for manufacturing components and design the gating and riser system.	**PO1, PO2, PO12**
CO2	Demonstrate various types of joining processes and choose the appropriate one according to the application.	**PO1, PO2, PO12**
CO3	Explain the concept of rolling, extrusion and drawing operations.	**PO1, PO2, PO12**
CO4	Illustrate the various sheet metal forming processes for a specific application.	**PO1, PO2, PO12**
CO5	Acquire the knowledge of metal powder production methods and classify different molding process and select suitable manufacturing process for the typical components.	**PO1, PO2, PO12**

TEXT BOOKS:

1. Serope Kalpak jian and Steven R. Schmid, "Manufacturing Processing for Engineering Materials (SI Edition)", Pearson Education, New Delhi, 6/e, 2018.
2. P.N. Rao, "Manufacturing Technology - Foundry, Farming and Welding, Volume-I", Tata McGraw-Hill Education Pvt. Ltd., Noida, 5/e, 2018.

REFERENCE BOOKS:

1. Hajra Choudhury S.K and Nirjhar Roy, "Elements of Workshop Technology, Volume-I", Media Promoters and Publishers Pvt.Ltd, 15/e, 2010.
2. Roy A Lindberg, "Process and Materials of Manufacturing", Pearson Education, New Delhi, 4/e, 2015.
3. R.K. Jain, "Production Technology", Khanna publishers, New Delhi, 17/e, 2011.
4. R.K. Rajput, "A Textbook of Manufacturing Technology: Manufacturing Processes", Laxmi Publications (P) Ltd., New Delhi, 2/e, 2017.
5. "A Text book of Manufacturing Technology-I", P.C.Sharma, S.Chand& Company Pvt. Ltd., New Delhi, 1/e, 2011.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/104/112104301/
2. https://nptel.ac.in/courses/112/107/112107219/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	1
CO.2	3	2	-	-	-	-	-	-	-	-	-	1
CO.3	3	2	-	-	-	-	-	-	-	-	-	1
CO.4	3	2	-	-	-	-	-	-	-	-	-	1
CO.5	3	2	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. - III Semester

20MEC233	MECHANICS OF SOLIDS	L T P C
		2 1 - 3

PRE-REQUISITES: Engineering Mechanics

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the concepts of stress, strain, principal stresses and planes.
2. To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
3. To determine various stresses in the beam, and different sections.
4. To compute slopes and deflections in determinate beams by various methods.
5. To study the stresses and deformations induced in thin and thick shells.

UNIT –1: STRESS, STRAIN AND DEFORMATION OF SOLIDS (9)

Rigid bodies and deformable solids – Elasticity and plasticity – Types of stresses and strains – Hooke's law – Stress-strain diagram for mild steel – Working stress – Factor of safety – Lateral strain – Poisson's ratio – Elastic constants – Volumetric strains – Thermal stresses –Deformation of simple, compound and composite structure – Extension of tapering rods (rectangular and circular) – Analysis of stress – Strain energy – Resilience – Gradual, sudden, impact and shock loadings – Mohr's circle of stress.

UNIT –2: STRESSES IN BEAMS (9)

Bending Stresses: Theory of simple bending with assumptions – Neutral axis – Moment of resistance – Practical applications of bending equations in circular (solid and hollow), I, T, angle, channel and beam sections. **Shear Stresses:** Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T and angle sections.

UNIT –3: TRANSVERSE LOADING ON BEAMS (9)

Types of beams – Types of loads – Concept of shear force and bending moment – S.F and B.M diagrams for simply supported, cantilever and overhanging beams subjected to point loads, U.D.L, U.V.L and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT –4: DEFLECTION OF BEAMS (9)

Deflection of Beams: Bending into a circular arc – Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, U.V.L. – Mohr's theorems – Moment area method – Application to simple cases including overhanging beams.

UNIT –5: TORSION OF SHAFTS, COLUMNS, THIN AND THICK CYLINDERS (9)

Torsion: Theory of pure torsion – Assumptions – Torsional moment of resistance – Polar modulus – Torsion formulation – Deformation in solid and hollow shafts – Strength of a shaft – Composite shafts. **Columns:** Modes of failure – Euler's and Rankine's theory. **Thin Cylinders:** Thin seamless cylindrical shells – Riveted boiler shells – Thin spherical shells. **Thick Cylinders:** Lame's equation – Cylinders subjected to inside and outside pressures.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Apply the knowledge of basic theory of science and principles to attain engineering problems on deformation of materials.	**PO1, PO2, PO3, PO4, PO12**
CO2	Identify, formulate to perform the stress analysis of a beam under axial loading, torsion, transverse loading to provide valid conclusions.	**PO1, PO2, PO3, PO4, PO12**
CO3	Evaluate and interpreted the various stresses and deformation in circular and hollows shafts, sections to analyze complex engineering problems.	**PO1, PO2, PO3, PO4, PO12**
CO4	Analyze and understand the fundamental concepts of deflection of beam by various methods.	**PO1, PO2, PO3, PO4, PO12**
CO5	Apply reasoning in formed by the contextual knowledge to perform stress and strain deformations in thin, thick cylinders, spherical shells.	**PO1, PO2, PO3, PO4, PO12**

TEXT BOOKS:

1. S. Ramamrutham and R.Narayanan, "Strength of Materials", DhanpatRai Publishing Company (P) Ltd., New Delhi, 20/e, 2020.
2. Dr.B.C.Punmia, Dr.Arun Kumar Jain, Er.Ashok Kumar Jain, "Mechanics of Materials", Laxmi Publications (P) Ltd., New Delhi, 12/e, 2017.

REFERENCE BOOKS:

2. R.C.Hibbeler, "Mechanics of Materials", Pearson Education, New Delhi, 9/e, 2018.
3. Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf, David F. Mazurek, SanjeevSanghi, "Mechanics of Materials", McGraw-Hill Education Pvt. Ltd., Noida, 8/e, 2020.
4. Barry J Goodno and James M Gere, "Mechanics of Materials", Cengage Publication, 9/e, 2019.
5. Egor P Popov, "Mechanics of Materials", Pearson Education India, 2/e, 2015.
6. R.K Bansal, "A Textbook of Strength of Materials (Mechanics of Solids) In SI Units", Laxmi Publications (P) Ltd., New Delhi, 7/e, 2018.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/105/106/105106116/
2. https://nptel.ac.in/courses/105/102/105102090/
3. https://nptel.ac.in/courses/112/106/112106141/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	2	-	-	-	-	-	-	-	1
CO.2	3	2	2	2	-	-	-	-	-	-	-	1
CO.3	3	2	2	2	-	-	-	-	-	-	-	1
CO.4	3	2	2	2	-	-	-	-	-	-	-	1
CO.5	3	2	2	2	-	-	-	-	-	-	-	1
CO*	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. - III Semester

20MEC234	COMPUTER AIDED DESIGN	L	T	P	C
		2	-	-	2

PRE-REQUISITES: Computer Aided Drafting

COURSE EDUCATIONAL OBJECTIVES:

1. Applying the fundamental concepts of computer graphics and its tools in a generic framework.
2. To impart the parametric fundamentals to create and manipulate geometric models using curves, surfaces and solids.
3. To impart the parametric fundamentals to create and manipulate geometric models using NURBS and solids
4. Creating and adding geometric tolerances in assembly modeling.
5. Applying concept of CAD systems and standards for 3D modeling and visual realism.

UNIT –1: FUNDAMENTALS OF COMPUTER GRAPHICS (6)

Fundamentals of Computer Graphics: Product cycle and design process – Concepts of Computer Aided Design – Principles of computer graphics – Co-ordinate systems – 2D and 3D transformations – Homogeneous coordinates – Graphic primitives (point, line, circle drawing algorithms) – Clipping – Viewing transformation.

UNIT –2: CURVES AND SURFACES MODELLING (6)

Curves: Curve entities and representation – Analytic curves – Line, circle, ellipse, parabola, hyperbola and conics – Synthetic and Hermite cubic spline – Bezier and B-spline curve – Curve manipulations. **Surfaces Modeling:** Surface entities and representation – Surface analysis – Analytic surfaces – Plane and ruled surface – Surface revolution – Tabulated cylinder – Synthetic and Hermitebicubic surface – Bezier and B- spline surface – Coons, blending and offset surface – Triangular patches – Surface manipulators.

UNIT –3: NURBS AND SOLID MODELLING (6)

NURBS: Curves – Lines – Arcs – Circles – Bilinear and ruled surface. **Solid Modeling:** Geometry and topology – Solid entities and representation – Fundamentals of solid modeling – Half spaces – Boundary representations (B-rep) – Constructive Solid Geometry (CSG) – Sweeps – Solid manipulators. **Features:** Feature entities and representation – Three-dimensional sketching – Parametric relations – Constraints – Feature manipulations.

UNIT –4: ASSEMBLY MODELLING AND PRODUCT DATA EXCHANGE (6)

Mass Properties: Geometric and mass properties. **Assembly Modeling:** Assembly tree and planning – Mating conditions – Bottom up and top-down assembly – Testing matting – Assembly load – Managing assemblies and sub-assemblies – Inference of position and orientation. **Engineering Tolerances:** Conventional and geometric tolerances – Fits and limits – Surface quality – Datum's – Tolerance analysis by Monte Carlo simulation.

UNIT –5: VISUAL REALISM AND CAD STANDARDS (6)

Visualization: Model clean-up – Hidden line, surface and solid removal – Shading and colors. **Computer Animation:** Engineering animation – Types – Animation techniques – Key frame technique – Key frame technique – Simulation technique – **Product Data Exchange:** Types of translators – IGES – STEP – ACIS and DXF – Processors.

Total Hours: 30

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Understand fundamental concepts of computer graphics and its tools in a generic framework.	**PO1,PO2,PO3, PO4,PO5,PO12**
CO2	Impart the parametric fundamentals to create and manipulate geometric models using curves, surfaces and solids.	**PO1,PO2,PO3, PO4,PO5**
CO3	Impart the parametric fundamentals to create and manipulate geometric models using NURBS and solids.	**PO1,PO2,PO3, PO4,PO5**
CO4	Provide clear understanding of mass properties, engineering tolerances and assembly modeling.	**PO1,PO2,PO3, PO4,PO5**
CO5	Provide clear understanding of visual realism, computer animation and product data exchange.	**PO1,PO2,PO3, PO4,PO5**

TEXT BOOKS:

1. R Ibrahim Zeid, "Mastering CAD/CAM", McGraw Hill Education, India, 2018.
2. Rajesh K. Maurya, "Computer Graphics with Virtual Reality System", Wiley India Pvt. Ltd., 3/e, 2018.

REFERENCE BOOKS:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics", Prentice Hall, 2/e, 1992.
2. Michael E. Mortenson, "Geometric Modeling", Industrial Press, Inc. 3/e, 2006.
3. P.N.Rao, "CAD/CAM-Principles and Applications", Tata McGraw-Hill Education Pvt. Ltd., Noida, 3/e, 2010.
4. M.Ganesh, "Basics of Computer Aided Geometric Design: An Algorithmic Approach", Dreamtech Press, Wiley India, 3/e.
5. P. Radhakrishnan, S.Subramanyan and V.Raju, "CAD/CAM/CIM", New Age International Publishers, 1/e (Revised), 2018.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/104/112104031/
2. https://nptel.ac.in/courses/112/102/112102101/
3. https://nptel.ac.in/courses/112/102/112102102/
4. https://nptel.ac.in/courses/112/102/112102103/
5. https://nptel.ac.in/courses/112/105/112105211/
6. https://nptel.ac.in/courses/112/104/112104289/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	2	3	-	-	-	-	-	-	1
CO.2	3	2	2	2	3	-	-	-	-	-	-	1
CO.3	3	2	2	2	3	-	-	-	-	-	-	1
CO.4	3	2	2	2	3	-	-	-	-	-	-	1
CO.5	3	2	2	2	3	-	-	-	-	-	-	1
CO*	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. - III Semester

		L	T	P	C
20ESC232	**FLUID MECHANICS AND MACHINERY LAB (Common to Mechanical & EEE Branches)**	**-**	**-**	**3**	**1.5**

PRE-REQUISITES: A Course on Fluid Mechanics and Machinery

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the properties of fluid, types of fluid and types of flow.
2. To understand about flow measuring devices based on Bernoulli's principle.
3. To help the students acquire knowledge on fluids flow through pipes.
4. To perform characteristic study of turbines and pumps.

LIST OF EXPERIMENTS:

1. Calibration of venturi meter and orifice meter.
2. Determination of coefficient of discharge for small orifice by a constant head method.
3. Determination of coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted rectangular notch and triangular notch.
5. Determination of coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's theorem.
7. Impact of jet on vanes.
8. Turbine flow meter.
9. Study of hydraulic jump.
10. Performance test on Pelton wheel
11. Performance test on Francis turbine
12. Performance test on Kaplan turbine
13. Performance test on centrifugal pump
14. Performance test on Single stage centrifugal pump.
15. Performance test on Multi stage centrifugal pump.
16. Performance test on reciprocating pump.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Demonstrate the knowledge on properties of fluids and fluid flow characteristics of various hydraulic machines.	**PO1**
CO2	Measure and analyze the flow parameters using orifice, mouth	**PO2**
CO3	Determine and design the pipe flow by considering various loss of energy	**PO3**
CO4	Understand working, performance of hydraulic turbine by conduct investigation.	**PO4**
CO5	Follow the ethical principles while doing the experiments	**PO8**
CO6	Do the experiments effectively as an individual and as a team member in a group.	**PO9**
CO7	Communicate verbally and in written form pertaining to results of the experiments	**PO10**
CO8	Continue updating their skills related to fluid mechanics and hydraulic machines in future.	**PO12**

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	-	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.Tech. - III Semester

		L	T	P	C
20MEC235	**MATERIAL SCIENCE LAB AND MANUFACTURING TECHNOLOGY LAB**	**-**	**-**	**3**	**1.5**

PRE-REQUISITES: A course on Material Science and Manufacturing Technology

COURSE EDUCATIONAL OBJECTIVES:

1. To help students acquire knowledge about the behavior and properties of all engineering materials and basic manufacturing processes.

LIST OF EXPERIMENTS: MATERIAL SCIENCE LAB

1. a) Study of metallurgical microscope. b) Preparation of specimen.
2. a) Study of Fe-Fe_3C diagram. b) Study of the micro structures of cast irons.
3. Study of the microstructure of mild steels, low carbon and high carbon steels.
4. Study of the micro structures of Cu and brass.
5. Study of the micro structures of Al.
6. Hardenability of steels by Jominy end quench test.

LIST OF EXPERIMENTS: MANUFACTURING ENGINEERING LAB

1. Pattern design and molding a) Single pattern b) Split pattern
2. Melting and casting.
3. a) Lap and Butt joint, b) Single 'V' and Double 'V' butt joint c) T-corner joint
4. Spot welding.
5. Gas welding and Gas cutting.
6. Study of simple, compound and progressive press tool a) Blanking b) Piercing
7. Bending operations.
8. Injection molding.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Gain the knowledge on the microstructure with properties and principles of foundry, metal joining and forming processes.	**PO1**
CO2	Analyze the mechanical properties of materials by suitable testing and choose the appropriate metal joining processes.	**PO2**
CO3	Design and manufacturing components by adopting the concept of casting, forging, rolling and drawing operations.	**PO3**
CO4	Conduct investigation on the hardness of different materials	**PO4**
CO5	Evaluate the structure of the material by using modern microscope.	**PO5**
CO6	Follow the ethical principles while doing the experiments	**PO8**
CO7	Do the experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form pertaining to results of the experiments	**PO10**
CO9	Continue updating their skill related to materials and manufacturing in future.	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.Tech. - III Semester

20MEC236	**MECHANICS OF SOLIDS LAB**	**L**	**T**	**P**	**C**
		-	**-**	**3**	**1.5**

PRE-REQUISITES: A Course on Engineering Mechanics and Mechanics of Solids

COURSE EDUCATIONAL OBJECTIVES:

1. To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness.

LIST OF EXPERIMENTS:

1. Tension test on a mild steel rod under Universal Testing Machine
2. Compression test on wood / concrete under Universal Testing Machine
3. Shear test on Mild steel under Universal TestingMachine
4. Torsion test on mild steel rod
5. Charpy and Izod impact test on metal specimen
6. Brinnell hardness test on metal specimen
7. Rockwell hardness test on specimen
8. Compression and tension test on helical springs
9. Bending test on cantilever beam.
10. Bending test on simply supported beam.
11. Tension and compression test on metals / plastics / wood / timber / ceramics / rubber / fabric using Electronic Tensometer
12. Shear and bending test on metals / plastics / wood / timber / ceramics / rubber / fabric using Electronic Tensometer

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Demonstrate the knowledge on the strength of materials	**PO1**
CO2	Analyze the mechanical properties of materials by suitable testing.	**PO2**
CO3	Design the materials strength using various impact and deflection test.	**PO3**
CO4	Conduct investigation on the hardness of different materials	**PO4**
CO5	Evaluate the material properties by computerized machine.	**PO5**
CO6	Follow the ethical principles while doing the experiments	**PO8**
CO7	Do the experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form pertaining to results of the experiments	**PO10**
CO9	Continue updating their skill related to material science in future.	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.Tech. - IV Semester

20HSM241	PRINCIPLES OF MANAGEMENT	L	T	P	C
		3	-	-	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the concepts of total quality management, and Contributions of TQM
2. To learn TQM principles and impact of 5s, Kaizen, PDSA cycles in continuous process improvement.
3. To study the basic need of quality control and process control in an organization
4. To learn the traditional and modern TQM tools and techniques
5. To study the quality standard, requirements and elements in Quality management system

UNIT –1: INTRODUCTION TO MANAGEMENT (9)

Definition of management – Science or Art – Manager Vs Entrepreneur – Types of managers – Managerial roles and skills – Levels of management – Functions of management – Principles of management and Scientific Management and its approaches – Corporate Social Responsibilities – Organization culture and Environment.

UNIT –2: PLANNING AND DECISION MAKING (9)

Planning: Nature and purpose of planning – Planning process – Types of planning – Objectives – Setting objectives – Policies – Planning premises – Strategic Management – Planning Tools and Techniques **Decision Making**: Importance of decision making – – Decision making steps and process.

UNIT –3: ORGANIZING AND DIRECTING (9)

Organizing: Nature and purpose – Formal and informal organization – Organization chart and structure – Line and staff authority – Departmentalization – Delegation of authority – Centralization and decentralization – Job Design – HR planning, recruitment, selection, training and development, performance management, career planning and management. **Directing:** Principles of directing – Process of communication – Barrier in communication – Effective communication.

UNIT –4: CONTROLLING AND CO-ORDINATING (9)

System and process of controlling – Budgetary and non-budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.

UNIT –5: MODERN CONCEPTS OF MANAGEMENT (9)

Concept, features, merits and demerits of SWOT Analysis, Business Process Re-engineering, Supply Chain Management – Concepts, functions importance of marketing – Competitive analysis and advantages of E-marketing.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the concepts of management, roles to be adopted by manager, functions of manager and inculcating the social responsibility towards different stake holders.	**PO1, PO11**
CO2	Demonstrate knowledge with regard to planning, planning process and the process of making effective decisions.	**PO1, PO11**
CO3	Demonstrate knowledge about organizational environment, the process of staffing and the application of directive principles.	**PO1, PO11**
CO4	Demonstrate knowledge about controlling and Co-ordinating	**PO1, PO11**
CO5	Demonstrate knowledge about modern concepts in management.	**PO1, PO11**

TEXT BOOKS:

1. Total Quality Management, Besterfield Dale H, Besterfield Carol, Besterfield Glen H, Besterfield Mary, Urdhwareshe Hemant and Urdhwareshe Rashmi, 5/e, 2018, Pearson Education, New Delhi.
2. Principles of Management, "M. Govindarajan and S. Natarajan", Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Management, "Stephen P. Robbins and Mary Coulter", Prentice Hall of India, 8/e,
2. Principles of Management, "Charles W.L Hill, Steven L McShane", 2007, McGraw Hill
3. Education, Special Indian Edition.
4. Management-A Competency Based Approach, "Hellriegel, Slocum and Jackson", Thomson South Western, 10/e, 2007.
5. Management - A global and Entrepreneurial Perspective, "Harold Koontz, Heinz Weihrich and Mark V Cannice", Tata McGraw Hill, 12/e, 2007.
6. Essentials of Management, "Andrew J. Dubrin", Thomson South western. 7/e, 2007.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/110/105/110105146/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	2	-
CO.2	3	-	-	-	-	-	-	-	-	-	2	-
CO.3	3	-	-	-	-	-	-	-	-	-	2	-
CO.4	3	-	-	-	-	-	-	-	-	-	2	-
CO.5	3	-	-	-	-	-	-	-	-	-	2	-
CO*	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

II B.Tech. - IV Semester

20BSC243	OPERATIONS RESEARCH	L	T	P	C
		2	1	-	3

PRE-REQUISITES: A Course on Probability Theory.

COURSE EDUCATIONAL OBJECTIVES:

1. To select the constraints on the availability of resources and developing a model for rendering an optimal solution.
2. To evaluate the challenges in the transportation and assignment problems and furnishing a rational solution to maximize the benefits.
3. To investigate the nature of the project/ failure and offering methodical assistance towards sequencing
4. To analyze the decision criteria and strategies in game theory.
5. To expand the basic knowledge on queuing theory.

UNIT –1: LINEAR PROGRAMMING MODELS (9)

Characteristics, phases and scope of operations research – Linear programming formulation – Graphical method of solution – Simplex method – Artificial variables – Big-M method – Two-phase method – Dual simplex method – Duality theorem – Principle of duality – Economic interpretation of the duality – Complementary slackness theorem – Revised simplex method.

UNIT –2: TRANSPORTATION AND ASSIGNMENT PROBLEMS (9)

Transportation Problem: Formulation – Feasible solutions – North west corner rule, least cost method and Vogel`s approximation method – Optimal solution by MODI method – Unbalanced transportation problem – Degeneracy – Maximization type. **Assignment Problem:** Formulation – Minimization and maximization problems – Unbalanced assignment problem – Traveling salesman problem.

UNIT –3: NETWORK AND SEQUENCING MODELS (9)

Network models – Minimal spanning tree algorithm – Shortest route problem – Maximal flow models – Minimum cost flow problem – Network simplex method – Project network – CPM and PERT – Critical path and float calculations – Determining minimum time required to complete the project. Sequencing: 'n' jobs through two machines – 'n' jobs through three machines – 'n' jobs through 'm' machines.

UNIT –4: DECISION THEORY AND GAME THEORY (9)

Decision Theory: Decision criteria and trees – Maximin and maximax – Hurwicz, laplace, savage and EOL criterion – Decision making under risk. **Game Theory:** Zero sum games – Games with and without saddle points – 2×2 games – Games with mixed strategies – Dominance principle and property – Graphical method.

UNIT –5: QUEUING THEORY (9)

Queuing Theory: Queuing models and networks – Pure birth and death models Poisson queuing model – Poisson queuing model – Balking, Reneging, Jockeying – Kendall notation – Single, multi and machine server model – Exponential distribution – Constant rate service – Infinite and finite population – Exponential service –Monte Carlo simulation technique.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Select the constraints on the availability of resources, develop a model and render an optimal solution during the given circumstances.	**PO1, PO2, PO4, PO12**
CO2	Appraise the challenges in the transportation and assignment problems and furnish a rational solution to maximize the benefits.	**PO1, PO2, PO4, PO12**
CO3	Construct the network diagram and estimate the time required to complete the project and determine optimum processing job order and investigate the nature of the project/ failure and offering methodical assistance towards sequencing.	**PO1, PO2, PO4, PO12**
CO4	Analyze the decision criteria's and strategies in game theory.	**PO1, PO2, PO4, PO12**
CO5	Expand the basic knowledge on queuing theory.	**PO1, PO2, PO4, PO12**

TEXT BOOKS:

1. P. Sankara Iyer, "Operations Research", McGraw Hill Education (India) Private Ltd. 1/e.
2. Hamdy A. Taha, "Operations Research an Introduction", Pearson Education Limited. 10/e, 2017.

REFERENCE BOOKS:

1. Frederick S. Hillier, Gerald J. Lieberman, Bodhibrata Nag and Preetam Basu, "Introduction to Operations Research", Tata McGraw Hill Education Pvt. Ltd. 10/e, 2017.
2. Wayne L Winston, "Operations Research: Applications and Algorithms", Cengage Learning, India. 4/e, 2020.
3. R. Panneerselvam, "Operations Research", PHI, Learning (P) Ltd. 2/e.
4. M. Sreenivasa Reddy, "Operations Research", Cengage Learning, India, 4/e, 2019.
5. N D Vohra, "Quantitative Techniques in Management", McGraw Hill Education (India) Private Ltd, 5/e, 2017.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/106/112106134/
2. https://nptel.ac.in/courses/112/106/112106131/
3. https://nptel.ac.in/courses/110/106/110106059/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	1	-	-	-	-	-	-	-	1
CO.2	3	2	-	1	-	-	-	-	-	-	-	1
CO.3	3	2	-	1	-	-	-	-	-	-	-	1
CO.4	3	2	-	1	-	-	-	-	-	-	-	1
CO.5	3	2	-	1	-	-	-	-	-	-	-	1
CO*	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

20MEC241 **KINEMATICS OF MACHINERY** **L T P C**

2 1 - 3

PRE-REQUISITES: A Course on Engineering Mechanics.

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the basic components and layout of linkages in the assembly of a system machine. To study the applications of the conservation laws to flow through pipes.
2. To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
3. To understand the motion resulting from a specified set of linkages, design few linkage mechanisms.
4. To understand the basic concepts cam mechanisms for specified output motions.
5. To understand the basic concepts of toothed gearing and kinematics of gear trains.

UNIT –1: BASICS OF MECHANISMS (9)

Basics of kinematics – Types of motions – Kinematic links – Kinematic pairs – Kinematic chain – Types of joints in chains – Degree's of freedom – Application of plane mechanism – Inversion of mechanism – Inversions of quadric, single and double slider. **Straight Line Motion Mechanisms:** Exact and approximate copiers and generated types – Peaucellier, Hart's and Scott-Russell's mechanism – Grasshopper mechanism – Watt's-modified Scott-Russell mechanism – T.Chebicheff's and Robert mechanism – Pantograph.

UNIT –2: KINEMATICS OF LINKAGE MECHANISMS (9)

Instantaneous Centre Method: Instantaneous center of rotation, centroids and axodes – Relative motion between two bodies – Three centers in-line theorem – Locating instantaneous centers for simple mechanisms and determination of angular velocity. **Relative Velocity Method:** Velocity and acceleration – Motion of link in machine – Determination of velocity and acceleration diagrams – Graphical method - Application of relative velocity method – Slider crank mechanism – Four bar mechanism. **Acceleration Method:** Acceleration diagrams for simple mechanisms, Coriolis acceleration and determination of Coriolis component of acceleration – Kleins construction – Analysis of slider crank mechanism for displacement, velocity and acceleration.

UNIT –3: STEERING MECHANISMS AND DRIVE SYSTEM (9)

Steering Mechanisms: Conditions for correct steering – Davis steering gear – Ackerman's steering gear – Velocity ratio – Hooke's joint – Single and double Hooke's joint. **Drive Systems:** Belt, Rope and chain drives – Selection of belt drive – Types of belt drives – Materials used for belts and ropes – Velocity ratio of belt drives, slip of belt, creep of belt, tension for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt. **Chains**: Length, angular speed ratio – Classification of chains (theory only).

UNIT –4: KINEMATICS OF CAM (9)

Classification of cams and followers – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing of cams.

UNIT –5: GEARS AND GEAR TRAINS (9)

Gearing: Law of toothed gearing – Involutes and cycloidal tooth profiles – Spur gear terminology – Gear tooth action – Contact ratio – Interference and undercutting – Helical, bevel, worm, rack and pinion gears. **Gear trains:** Gear trains – Speed ratio – Train value – Simple gear train – Compound and reverted gear train – Epicyclic gear trains.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Define link, pairs, mechanisms, inversion, structure and machines. Explain various terminologies associated with theory of machine. Draw inversions of different mechanisms.	**PO1, PO2, PO3, PO4, PO12**
CO2	Draw velocity and acceleration diagram for a given mechanism. Calculate velocity and acceleration from a given mechanism.	**PO1, PO2, PO3, PO4, PO12**
CO3	Explain steering geometry. Describe various steering mechanisms with its need and importance. Identify various linkages of steering mechanisms, steering gears.	**PO1, PO2, PO3, PO4, PO12**
CO4	Explain different types of cams and cam followers and its motions. Construct different types of CAM profile for a given data.	**PO1, PO2, PO3, PO4, PO12**
CO5	Develop a practical approach to optimizing gear trains with spur gears based on a selection matrix of optimal materials, gear ratios and shaft axes positions.	**PO1, PO2, PO3, PO4, PO12**

TEXT BOOKS:

1. S.S.Rattan, "Theory of Machines and Mechanisms", Tata McGraw-Hill Education Pvt.Ltd, Noida, 5/e, 2019.
2. Robert L Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill Education Pvt.Ltd, 1/e, 2009.

REFERENCE BOOKS:

1. John J. Uicker Jr, Gordon R. Pennock & Joseph E. Shigley, "Theory of Machines and Mechanisms", SI Edition, Oxford University Press, 3/e, 2009.
2. Thomas Bevan, "Theory of Machines", Pearson Education, New Delhi, 3/e, 2009.
3. Sadhu Singh, "Theory of Machines", Pearson Education, New Delhi, 3/e, 2011.
4. R.S Khurmi and J.K Gupta, "Theory of Machines", S.Chand & Company Pvt. Ltd. New Delhi, 14/e, 2013.
5. Amitabha Ghosh and Asok Kumar Mallik, "Theory of Mechanisms and Machines", East-West Press Pvt Ltd., 3/e, 2008.

REFERENCE WEBSITE:

1. http://nptel.ac.in/courses/112/104/112104121/
2. https://nptel.ac.in/courses/112/105/112105268/
3. https://nptel.ac.in/courses/112/106/112106270/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	1	1	-	-	-	-	-	-	-	1
CO.2	3	2	1	1	-	-	-	-	-	-	-	1
CO.3	3	2	1	1	-	-	-	-	-	-	-	1
CO.4	3	2	1	1	-	-	-	-	-	-	-	1
CO.5	3	2	1	1	-	-	-	-	-	-	-	1
CO*	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. - IV Semester

20MEC242	**METAL CUTTING AND MACHINE TOOLS**	**L T P C**
		2 1 - 3

PRE-REQUISITES: Manufacturing Engineering

COURSE EDUCATIONAL OBJECTIVES:

1. To apply the fundamental knowledge, and principles of metal cutting.
2. To apply the fundamental knowledge on lathe and automatic machine tools.
3. To apply the principles of shaper, slotter, planer and milling machines.
4. To understand the working principles of drilling, boring, jigs and fixtures.
5. To apply the principles of abrasive process and finishing process.

UNIT –1: THEORY OF METAL CUTTING (9)

Theory of Metal Cutting: Elements of cutting process – Geometry of single point tool and its angles – Mechanics of chip formation – Types of chips – Chip breakers – Orthogonal and oblique cutting – Cutting forces – Merchant's force diagram – Thermal aspects – Cutting speeds feed, depth of cut and surface finish – Tool life, tool wear and tool materials – Cutting fluids – Machinability – Economics of machining.

UNIT –2: LATHE (9)

Engine Lathe: Constructional features – Specification – Principle of working – Operations – Taper turning and thread cutting methods – Work holders and tool holders – Special attachments – Machining time and power estimation. **Capstan and Turret Lathes:** Constructional features – Collet chucks – Work and tool holding devices – Tool layout. **Automatic Lathes:** Principal features of semi-automatic and automatic lathes – Single spindle and multi-spindle automatic lathes – Swiss type and automatic screw type lathe.

UNIT –3: MILLING, SHAPER, SLOTTER, PLANNER AND BROACHING (9)

Milling Machine: Principles of working – Specifications – Classifications – Principal features of horizontal, vertical and universal milling machines – Milling operations – Geometry of milling cutters – Methods of indexing – Accessories to milling machines – Machining time calculations. **Shaping, Slotting, Planning and Broaching Machines:** Principles of working – Principal parts – Specification, classification, operations performed – Kinematic scheme of the shaping slotting and planning machines – Machining time calculations – Broach construction push, pull and continuous broaching machines.

UNIT –4: DRILLING, BORING, JIGS AND FIXTURES (9)

Drilling and Boring Machines: Principles of working, specifications, types, operations performed – Tool holding devices – Twist drill – Boring machines – Fine boring and jig boring machine – Deep hole drilling – Kinematics scheme of the drilling and boring machines. **Jigs and Fixtures:** Principles of design – Principles of location and clamping – Types of clamping and work holding devices – Typical examples of jigs and fixtures.

UNIT –5: ABRASIVE PROCESSES (9)

Grinding Machine: Theory of grinding – Classification – Cylindrical and surface grinding – Tool and cutter grinding – Special types of grinding. **Grinding wheel:** Types of abrasives, bonds, specification and selection of a grinding wheel. **Super Finishing:** Lapping – Honing – Gear and thread finishing – Comparison of grinding, lapping and honing.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the theory of metal cutting, tool life and geometry of single point cutting tool.	**PO1, PO2, PO12**
CO2	Understand the basic principle of lathe and identify various cutting tools used for different operations.	**PO1, PO2, PO12**
CO3	Select suitable reciprocating machines for typical component.	**PO1, PO2, PO12**
CO4	Design jigs for drilling and fixtures for turning, milling.	**PO1, PO2, PO12**
CO5	Identify various grinding machines used for different operations.	**PO1, PO2, PO12**

TEXT BOOKS:

1. Rao. P.N, "Manufacturing Technology - Metal Cutting and Machine Tools, Volume – II", Tata McGraw Hill, New Delhi, 4/e, 2018.
2. Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology (SI Edition)", Pearson Education, New Delhi, 7/e, 2018.

REFERENCE BOOKS:

2. Amitabha Ghosh and Ashok Kumar Mallik, "Manufacturing Science", East-West Press Pvt Ltd, 2/e, 2010.
3. R.K. Jain, "Production Technology - Machining Techniques and Automated Machine Tool Systems, Volume – II", Khanna Publishers, New Delhi, 19/e, 2018.
4. Geoffrey Boothroyd and Winston A. Knight, "Fundamentals of Metal Machining and Machine Tools", Routledge, CRC Press, Taylor and Francis Group, 3/e, 2005.
5. "Production Technology", Hindustan Machine Tools, Bangalore, India.
6. Hajra Choudhury S.K and Nirjhar Roy, "Elements of Workshop Technology- Machine Tools, Volume – II", Media Promoters and Publishers Pvt.Ltd. 15/e, 2010.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/105/112105306/
2. https://nptel.ac.in/courses/112/105/112105233/
3. https://nptel.ac.in/courses/112/105/112105211/
4. https://nptel.ac.in/courses/112/104/112104189/
5. https://nptel.ac.in/courses/112/104/112104204/
6. https://nptel.ac.in/courses/112/105/112105126/
7. https://nptel.ac.in/courses/112/105/112105127/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	1
CO.2	3	2	-	-	-	-	-	-	-	-	-	1
CO.3	3	2	-	-	-	-	-	-	-	-	-	1
CO.4	3	2	-	-	-	-	-	-	-	-	-	1
CO.5	3	2	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. - IV Semester

20MEC243	THERMAL ENGINEERING	L	T	P	C
		2	1	-	3

PRE-REQUISITES: A Course on Engineering Thermodynamics.

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the principal, construction, working in IC engines.
2. To analyze the stages of combustion and performance of IC engines.
3. To analyze the steam power cycles and study the boilers and draught.
4. To realize the concepts of steam flow through nozzle, understand the thermodynamic concepts for steam turbines and the condenser.
5. To gain basic knowledge about air compressor.

UNIT – 1: INTERNAL COMBUSTION ENGINES (9)

Introduction of IC Engines: Classification of IC engines - Components and their function - Valve timing diagram and port timing diagram - Comparison of two stroke and four stroke engines, S.I and C.I engines. **Fuel Systems:** S.I. Engine: Carburetor - Mechanical and electrical fuel pump - C.I. Engine: Fuel injection pump - Fuel injector - Types of fuel injector nozzles. **Cooling Systems:** Cooling requirements - Air cooling and water cooling (thermosyphon and forced circulation system). **Lubrication Systems:** Petroil, splash, pressurized and mist lubrication. **Ignition Systems:** Function of an ignition system - Battery coil, magneto coil and electronic coil ignition system.

UNIT – 2: COMBUSTIONS AND PERFORMANCE OF IC ENGINES (9)

Combustion S.I. Engine: Normal and abnormal combustion - Importance of flame speed and effect of engine variables - Stages of combustions - Knocking - Fuel rating - Antiknock additives - Combustion chambers. **Combustion C.I. Engine:** Stages of combustion - Effect of engine variables - Diesel knock - Combustion chambers – Fuel rating. **Performance of IC Engines:** Performance parameters - Indicated power - Brake power - Morse test - Efficiencies of an I.C. engines - Air consumption - Heat balance sheet.

UNIT – 3: STEAM POWER CYCLE, BOILERS AND DRAUGHT (9)

Steam Power Cycle: Rankine cycle – Schematic layout - Thermodynamic analysis - Concept of mean temperature of heat addition - Methods to improve cycle performance: Reheat cycle - Regenerative cycle - Binary vapour cycle. **Boilers:** Classification of steam boilers - Boiler mountings and accessories - Equivalent evaporation - Boiler efficiency - Heat balance sheet. **Draught:** Classification – Natural draught: Chimney height and diameter - Condition for maximum discharge through a chimney - Artificial draught: Forced draught, induced draught and balanced draught (basics only).

UNIT – 4: STEAM NOZZLES, TURBINES AND CONDENSERS (9)

Steam Nozzles: Introduction - Steam flow through nozzles – Nozzle efficiency - Supersaturated flow in a nozzle – Problems in steam nozzles. **Steam Turbines:** Classifications – Compounding – Problems on velocity diagrams for impulse and reaction turbines - Governing and control. **Steam Condensers:** Requirements of steam condensing plant – Classification of condensers – Sources of air in condensers – Effects of air leakage in a condenser.

UNIT – 5: AIR COMPRESSOR (9)

Classification of air compressors – Reciprocating compressor – Workdone by single stage reciprocating air compressor with and without clearance volume – Efficiencies of reciprocating compressors - Multistage air compressor and inter cooling – Rotary air compressors (basics only).

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the basic knowledge on IC engines and its various systems.	**PO1, PO2, PO12**
CO2	Analyze the stages of combustion and performance of IC engines.	**PO1, PO2, PO12**
CO3	Analyze the steam power cycles and knowledge based on different types of boilers and draughts.	**PO1, PO2, PO12**
CO4	Analyze the performance of steam nozzle, steam turbines through velocity triangles and steam condenser.	**PO1, PO2, PO4, PO12**
CO5	Understand the various types of compressors and its performance.	**PO1, PO2, PO12**

TEXT BOOKS:

1. P.K. Nag, "Basic and Applied Thermodynamics", Tata McGraw-Hill Education Pvt. Ltd., 2/e, 2009.
2. R.K Rajput, "Thermal Engineering", Laxmi Publications (P) Ltd, New Delhi, 8/e, 2010.

REFERENCE BOOKS:

1. V. Ganesan, "Internal Combustion Engines", Tata McGraw-Hill Education Pvt. Ltd., 4/e, 2012.
2. Mathur and Sharma, "IC Engines", Dhanpat Rai Publishing Company (P) Ltd., 1/e, 2010.
3. Ballaney. P.L., "Thermal Engineering", Khanna publishers, 25/e, 2017.
4. Heywood, "I .C. Engines", Tata McGraw-Hill Education Pvt.Ltd., Noida, 1/e, 1998.
5. Kothandaraman, C.P., Domkundwar .S and Domkundwar A.V., "A Course in Thermal Engineering", Dhanpat Rai & Sons, 6/e, 2011.

NOTE: Use of standard thermodynamic tables and Mollier diagram are permitted.

REFERENCE WEBSITE:

2. https://nptel.ac.in/courses/112106133/2
3. http://en.wikipedia.org/wiki/Applied_Thermal_Engineering
3. https://nptel.ac.in/courses/112/103/112103307/
4. https://nptel.ac.in/courses/112/103/112103275/
5. https://nptel.ac.in/courses/112/105/112105266/
6. https://nptel.ac.in/courses/112/106/112106133/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	1
CO.2	3	2	-	-	-	-	-	-	-	-	-	1
CO.3	3	2	-	-	-	-	-	-	-	-	-	1
CO.4	3	2	1	-	-	-	-	-	-	-	-	1
CO.5	3	2	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. - IV Semester

20MEC244	**AUTOMOTIVE SYSTEMS**	**L T P C**
		2 - - 2

PRE-REQUISITES: A Course on Thermal engineering.

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the construction and working principle of vehicle structure.
2. To acquire knowledge on power transmission systems in automobiles.
3. To understand the construction and working principle of steering system and functioning of suspension and braking system.
4. To understand the principle detecting the emission from automobile, standards and electrical systems
5. To understand the basic principle of hybrid and electrical vehicle systems.

UNIT –1: VEHICLE STRUCTURE AND ENGINES (6)

Vehicle Structure: Basic structure of an automobile – Power unit – Chassis, frames and body – Resistance to vehicle motion – Power transmission – Rear wheel drive, Front wheel drive and four-wheel drive. **Automobile Engines:** Types - Construction – Components – Functions and materials – Turbo charging and super charging – Oil filters air filters – Fuel filters. **Wheels and Tyers:** Types of wheels and tyer with properties.

UNIT –2: TRANSMISSION SYSTEM (6)

Clutches: Types – Friction clutches – Dry friction and wet clutches – Clutch operations – Principles of fluid fly wheel – Trouble shooting. **Gear Box:** Function of transmission – Principles of sliding mesh, constant mesh, synchromesh, epi-cyclic gear box and torque converter – Over drive – Automated manual transmissions – Trouble shooting. **Drive Line:** Propeller shaft, universal joint, final drive, rear axles and rear axle drives.

UNIT –3: STEERING, SUSPENSION AND BRAKING SYSTEM (6)

Steering: Front axle – Wheel alignment and its factors – Factors pertaining to wheels – Steering geometry – Center point steering – Steering mechanisms – Vehicle handling – Steering linkages – Steering gears – Power steering – Four-wheel steering – Trouble shooting. **Suspension:** Rigid axle suspension system – Torsion bar – Shock absorber – Independent suspension system – Air suspension system. **Braking System:** Drum and disc brake system, mechanical, hydraulic, pneumatic and vacuum brake systems – Antilock braking system, electronic brake force distribution and traction control.

UNIT –4: EMISSION AND ELECTRICAL SYSTEM (6)

Emission: Emission from automobiles – Pollution standards – Pollution control and techniques – Multipoint fuel injection for SI engines – Common rail diesel injection, emissions from alternative energies – Hydrogen, biomass, alcohols, LPG, CNG. **Electrical System:** Charging circuit, generator, current-voltage regulator – Starting system, Bendix drive – Mechanism of solenoid, lighting, horn, wiper, fuel gauge, oil pressure and engine temperature indicator – Engine management system – Intelligent lighting system.

UNIT –5: INTRODUCTION OF HYBRID AND ELECTRICAL VEHICLE SYSTEMS (6)

Environmental Impact: Air pollution, global warming, petroleum resources and different transportation development strategies – History of EVs, HEVs and Fuel Cell Vehicles. **Energy Sources:** Battery basics, parameters, power and characteristics – Electrochemical batteries – Ultracapacitors – Ultra-high-speed flywheels – Hybridization of energy storages. **Electric Vehicles:** Configurations and performance of EVs – Tractive effort – Energy consumption. **Hybrid Electric Vehicles:** Concept and architectures of hybrid electric drivetrains.

Total Hours: 30

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Acquired knowledge on vehicle components and basic construction.	**PO1, PO2, PO12**
CO2	Understand the principles of power transmission system in automobiles.	**PO1, PO2, PO12**
CO3	Understand the working principle of steering system and steering geometry.	**PO1, PO2, PO12**
CO4	Understand the functioning of suspension and braking system.	**PO1, PO2, PO12**
CO5	Understand the emissions from automobile and engine electrical systems.	**PO1, PO2, PO12**

TEXT BOOKS:

1. Kirpal Singh, "Automobile Engineering-Vol.I and II", Standard Book House, New Delhi, 12/e, 2011.
2. William Crouse, "Automotive Mechanics", Tata McGraw-Hill Education Pvt. Ltd., Noida, 10/e, 2006.

REFERENCE BOOKS:

1. V.Ganesan, "Internal Combustion Engines", Tata McGraw-Hill Education Pvt. Ltd., Noida, 4/e, 2012.
2. R.K.Rajput, "Automobile Engineering", Laxmi Publications (P) Ltd., New Delhi, 1/e, 2007.
3. P.S.Gill, "Automobile Engineering: Vol-I", S.K.Kataria and Sons Publications, New Delhi, 2011.
4. Mehrdad Ehsani, Yimin Gao, Stefano Longo, and Kambiz M. Ebrahimi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: 3/e, 2018, CRC Press, Taylor & Francis Group, LLC.
5. Husain Iqbal "Electric and Hybrid Vehicles: Design Fundamentals", , 2/e, 2016, CRC Press, Taylor & Francis Group, LLC.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/107/106/107106088/
2. https://nptel.ac.in/courses/108/106/108106182/
3. https://nptel.ac.in/courses/108/106/108106170/
4. https://nptel.ac.in/courses/108/102/108102121/
5. https://nptel.ac.in/courses/108/103/108103009/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	1	-	-	-	-	-	-	-	-	-	1
CO.2	3	1	-	-	-	-	-	-	-	-	-	1
CO.3	3	1	-	-	-	-	-	-	-	-	-	1
CO.4	3	1	-	-	-	-	-	-	-	-	-	1
CO.5	3	1	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

II B.Tech. – IV Semester

20MEC245	**COMPUTER AIDED MACHINE DRAWING LAB**	**L**	**T**	**P**	**C**
		-	**-**	**3**	**1.5**

PRE-REQUISITES: A Course on Computer Aided Drafting Lab and Computer Aided Design.

COURSE EDUCATIONAL OBJECTIVES:

1. To make the students understand and interpret drawings of machine components.
2. To prepare assembly drawings using standard CAD packages.
3. To familiarize the students with Indian Standards on drawing practices and standard components.
4. To gain practical experience in handling 2D drafting and 3D modeling software systems.

LIST OF EXERCISES:

The following exercises are to be done by 2D software package

1. **Detachable Joints:** Drawing of thread profiles, hexagonal and square-headed bolts and nuts, bolted joint with washer and locknut, stud joint, screw joint and foundation bolts.
2. **Riveted Joints:** Drawing of rivet, lap joint, butt joint with single strap, single riveted, double riveted double strap joints.
3. **Welded Joints:** Lap joint and T joint with fillet, butt joint with conventions (Any Two).
4. **Keys:** Taper key, sunk taper key, round key, saddle key, feather key, woodruff key.
5. **Couplings:** Rigid – Muff, flange; flexible – bushed pin-type flange coupling, universal coupling, Oldhams' coupling.

The following exercises are to be done by 3D software package (Any Six)

1. Assembly drawing of (a) sleeve and cotter joint (b) socket and spigot joint.
2. Assembly drawing of knuckle joint
3. Assembly drawing of universal joint.
4. Assembly drawing of screw jack.
5. Assembly drawing of plummer block.
6. Assembly drawing of stuffing box.
7. Assembly drawing of piston and connecting rod.
8. Assembly drawing of tailstock.
9. Assembly drawing of eccentrics.
10. Assembly drawing of pipe vice.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Develop knowledge on design procedure for specific machine components.	**PO1**
CO2	Analysis of various types of force and its influences on machine components.	**PO2**
CO3	Design the assembly models.	**PO3**
CO4	Investigate the results of analyzing tool with theoretical calculation.	**PO4**
CO5	Create models and analyze using CATIA V6 and solid works.	**PO5**
CO6	Follow ethical principle in conduction of exercise.	**PO8**
CO7	Perform individually and also in a team to complete the process	**PO9**
CO8	Communicate in verbally or in written form, their understanding about the exercise.	**PO10**
CO9	Continue updating their knowledge on various analysing tools for model designs and drawing.	**PO12**

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.Tech. - IV Semester

20MEC246	MACHINE TOOLS TECHNOLOGY LAB	L	T	P	C
		-	-	3	1.5

PRE-REQUISITES: A course of Metal Cutting and Machine Tools

COURSE EDUCATIONAL OBJECTIVES:

1. To study and acquire knowledge on various basic machining operations and special purpose machines and their applications.

LIST OF EXPERIMENTS:

1. Demonstration of construction and operations of general-purpose machines: Lathe, drilling machine, milling machine, shaper, slotting machine, cylindrical grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on given work piece using lathe machine.
3. Thread cutting and knurling on given work piece using lathe machine.
4. Eccentric turning on lathe machine on given work piece using.
5. External and internal thread cutting on given work piece using lathe machine.
6. Drilling and reaming operation on given work piece.
7. Contour milling on given work piece using milling machine.
8. Gear cutting on given work piece using milling machine.
9. Shaping operation on given work piece using shaping machine.
10. Slotting operation on given work piece using slotting machine.
11. Grinding operation on surface grinding machine.
12. Grinding operation on cylindrical grinding machine.
13. Grinding operation on tool cutter grinding machine.
14. Study on abrasive jet machining (AJM).

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Knowledge in general purpose machines: Lathe, drilling machine, milling machine, shaper, planning machine, slotting machine, cylindrical grinder, surface grinder and tool and cutter grinder.	PO1
CO2	Analyze problems and offer a qualitative assessment on problem.	PO2
CO3	Design the model and develop the parts.	PO3
CO4	Identify different manufacturing techniques to produce complex shapes.	PO4
CO5	Manufacture simple parts using lathe/milling drilling/shaper and alignment are verified by standard metrology instruments	PO5
CO6	Follow the ethical principles in conducting the experiments	PO8
CO7	Perform experiments individually and also a team to complete the work	PO9
CO8	Communicate in verbally or in written form their understanding about the experiments.	PO10
CO9	Continue updating their skill related to machine tools for various applications during their life time.	PO12

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.Tech. - IV Semester

20MEC247	THERMAL ENGINEERING LAB AND AUTOMOTIVE SYSTEMS LAB	L	T	P	C
		-	-	3	1.5

PRE-REQUISITES: A course on Thermal Engineering

COURSE EDUCATIONAL OBJECTIVES:

1. To develop the basic knowledge of timing diagram and to analyze the performance of IC engines.
2. To introduce the methods to study the heat distribution and improve the performance of IC engines.
3. To analyze the performance of air compressor and refrigeration system.

LIST OF EXPERIMENTS (THERMAL ENGINEERING LAB):

1. Valve timing diagram and port timing diagram of an IC engine.
2. Performance test on four stroke single cylinder diesel engine.
3. Retardation test on four stroke single cylinder diesel engine.
4. Performance test on four stroke single multi cylinder petrol engine.
5. Evaluation of engine friction by conducting Morse test on four stroke multi cylinder petrol engine.
6. Heat balance sheet of an IC engine.
7. Performance test on two stroke single cylinder petrol engine.
8. Performance test on two stage reciprocating air compressor.
9. Determination of flash and fire points of various fuels / lubricants.
10. Determination of COP of a vapour compression refrigeration system.
11. Study of variable compression ratio four stroke petrol engines.
12. Study on steam boilers, steam turbines and steam condensers.

LIST OF EXPERIMENTS (AUTOMOTIVE SYSTEMS LAB):

1. Study, dismantling and assembling of four stroke engines.
2. Study, dismantling and assembling of two stroke engines.
3. (a) Study of petrol engine fuel system (b) Study of diesel engine fuel system
4. (a) Study, dismantling and assembling of multi cylinder petrol/diesel engine.
   (b) Study, dismantling and assembling of front and rear axles.
5. (a) Study, dismantling and assembling of clutch
   (b) Study, dismantling and assembling of gear box.
   (c) Study, dismantling and assembling of differential.
6. (a) Study, dismantling and assembling of differential.
   (b) Study of braking system.
7. (a) Study of emission characteristics in diesel engine using isobutanol–diesel fuel blends.
   (b) Study of gasoline – ethanol blends in spark-ignition engines.
8. Study the design concepts of hybrid and electric vehicles.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate the knowledge on automobile system, engines, air compressor, refrigeration systems and boilers.	**PO1**
CO2	Identify and analyze various performance parameters of engines and compressors.	**PO2**
CO3	Develop systems to identify the performance parameters of engines and compressors and dismantle and assemble the various parts of transmission systems in automobiles.	**PO3**
CO4	Conduct investigation on performance of various engines, air compressors and provide valid conclusion about its efficiency, heat balance, engine friction, speed and retardations.	**PO4**
CO5	Follow ethical principle in conduction of experiments.	**PO8**
CO6	Perform individually and also in a team to complete the process.	**PO9**
CO7	Communicate in verbally or in written form, their understanding about the experiments.	**PO10**
CO8	Continue updating their knowledge on various testing methods evolve in future for the identification of performance of engines and compressors.	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

20MAC231 **ENVIRONMENTAL SCIENCE (Common To All Branches)** **L T P C**

2 - - -

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To recognize nature of environmental studies and various renewable and nonrenewable resources.
2. To understand flow and bio-geo- chemical cycles and ecological pyramids.
3. To identify various causes of pollution and solid waste management and related preventive measures.
4. To evaluate and interpret the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
5. To understand the causes of population explosion, value education and welfare programmes.

UNIT - I: INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES (6)

Multidisciplinary nature of environmental studies: Definition, scope and importance. Need for public awareness.

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy resources.

UNIT – II: CONCEPT OF ECOSYSTEM AND BIODIVERSITY (6)

Structure and function of an ecosystem: Producers, consumers and decomposers-Energy flow in the ecosystem- Ecological succession- Food chains, food webs and ecological pyramids- Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: Introduction – Definition: genetic, species and ecosystem diversity-Biogeographical classification of India-Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels- India as a mega-diversity nation-Hot-sports of biodiversity-Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. -Endangered and endemic species of India -Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

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UNIT – III: ENVIRONMENTAL POLLUTION AND WASTE MANAGEMENT (6)

Environmental Pollution: Definition - Cause, effects and control measures of: - a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes-Role of an individual in prevention of pollution. Pollution case studies-Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV: SOCIAL ISSUES AND THE ENVIRONMENT (6)

From Unsustainable to Sustainable development: Urban problems related to energy Water conservation, rain water harvesting, watershed management-Resettlement and rehabilitation of people; its problems and concerns. -Environment Protection Act-Air (Prevention and Control of Pollution) Act-Water (Prevention and control of Pollution) Act-Wildlife Protection Act- Forest Conservation Act -Issues involved in enforcement of environmental legislation- Public awareness**.**

UNIT – V: HUMAN POPULATION AND THE ENVIRONMENT (6)

Population growth: variation among nations-Population explosion – Family Welfare Programme-Environment and human health-Human Rights-Value Education-HIV/AIDS. Women and Child Welfare-Role of Information Technology in Environment and human Case Studies.

Total hours: 30

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs mapped with COs
CO1	Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO2	Understand flow and bio-geo- chemical cycles and ecological pyramids.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO4	Understand concept of rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**
CO5	Causes of population explosion, value education and welfare programmes.	**PO1, PO2, PO3 PO4, PO5, PO6,PO7**

TEXT BOOKS:

1. R. Rajagopalan," Environmental Studies", Oxford University Press.
2. Gilbert M. Masters and Wendell P. Ela.,"Environmental Engineering and science" PHI Learning Pvt. Ltd, 2008

REFERENCE BOOKS:

1. ErachBharucha "Textbook of Environmental Studies for Undergraduate Courses", University grants commission, 2/e,2013.
2. C.P.Kaushik and Anubhakaushik "Text book of environmental studies", New age International publishers, 4/e,2006.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/127/105/127105018/
2. https://nptel.ac.in/courses/113/104/113104061/
3. https://nptel.ac.in/courses/120/108/120108005/
4. https://nptel.ac.in/courses/120/108/120108002/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	1	2	2	2	3	-	-	-	-	-
CO.2	3	2	1	2	2	2	3	-	-	-	-	-
CO.3	3	2	1	2	2	2	3	-	-	-	-	-
CO.4	3	2	1	2	2	2	3	-	-	-	-	-
CO.5	3	2	1	2	2	2	3	-	-	-	-	-
CO*	**3**	**2**	**1**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**