



B.TECH. - REGULAR FOUR YEAR DEGREE PROGRAM
(For batches admitted from the academic year 2020-21)
&
B.TECH. - LATERAL ENTRY SCHEME
(For batches admitted from the academic year 2021-22)

PREAMBLE

Institution is gearing up for several initiatives towards academic excellence, quality improvement and administrative reforms. In view of this priority and in-keeping with the Institute Vision and Mission process was already initiated towards introduction of semester system, grading system and credit system.

The above initiatives acquired further strength with University Grants Commission (UGC) guidelines, informing all the Universities/ Autonomous Colleges regarding UGCs new initiatives, on speedy and substantive academic and administrative reforms regarding higher education. Given this background St.Peter's Engineering College has framed this REGULATION-2020 and in short, it will be referred to as SR20.

Academic Programmes of the Institute are governed by rules and regulations approved by the Governing Body. The academic rules and regulations are applicable to the students admitted into four year undergraduate programmes offered by the college leading to Bachelor of Technology (B.Tech) degree from the academic year 2020-21 onwards and lateral entry students admitted from the academic year 2021-2022 onwards.

INSTITUTE VISION

VISION: To promote quality education accessible to all sections of the Society without any discrimination of caste, creed, color, gender and religion and help students to discover their true potential.

INSTITUTE MISSION

IM1: To provide and equip stakeholders with knowledge and skills, social values and ethics, scientific attitude and orientations for lifelong learning.

IM2: To create an environment conducive to inhabiting their total involvement and participation

IM3: Provide infrastructure to arm the students with the competence to be at the forefront of cutting-edge technology and entrepreneurship in highly competitive global market.

INSTITUTE QUALITY POLICY: St. Peter's Engineering College strives to establish a system of quality assurance to continuously address, monitor and evaluate the quality of education offered to students, thus promoting effective teaching-learning processes for the benefits of our students and making our institution a centre of excellence for engineering and technological studies.

1. UNDER GRADUATE PROGRAMS OFFERED (E&T)

St. Peter's Engineering College, an autonomous college affiliated to JNTUH, offers 4 Year (8 Semesters) Bachelor of Technology (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2020 - 21 onwards, in the following Branches of Engineering:

- (i) B.Tech. - Civil Engineering
- (ii) B.Tech. - Electrical and Electronics Engineering
- (iii) B.Tech. - Mechanical Engineering
- (iv) B.Tech. - Electronics and Communication Engineering
- (v) B.Tech. - Computer Science and Engineering
- (vi) B.Tech. - Information Technology
- (vii) B.Tech. - Computer Science and Engineering [Artificial Intelligence & Machine Learning]

2. ADMISSION CRITERIA AND MEDIUM OF INSTRUCTION

2.1 Admission into first year of four year B.Tech. (Regular) Degree Programme:

2.1.1 Eligibility: A candidate seeking admission into the first year of four year B. Tech. Degree Programme should have:

- i) Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education,

Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination with Mathematics, Physics and Chemistry as optional subjects recognized by Board of Intermediate Education, Telangana.

- ii) Secured a rank in the TSEAMCET examination conducted by TSCHE for allotment of a seat by the Convener, TSEAMCET.

2.1.2 Admission Procedure: Admissions are made into the first year of four year B.Tech. Degree Programme as per the stipulations of the TSCHE.

- (i) Category A: 70% of the seats are filled through TSEAMCET counseling.
- (ii) Category B: 30% of the seats are filled by the Management.

2.2 Admission into the second year of four year B. Tech. (Regular) Degree Programme Under Lateral Entry Scheme.

2.2.1 Eligibility: A candidate seeking admission under Lateral Entry Scheme (LES) into the II year I Semester B. Tech. Regular Degree Programme should have passed the qualifying examination (B.Sc. Mathematics or Diploma in concerned course) and have secured a rank at Engineering Common Entrance Test TSECET (FDH). Admissions are made in accordance with the instructions received from the Convener, TSECET and Government of Telangana State.

2.2.2 Admission Procedure: Admissions are made into the II year of four year B.Tech. (Regular) Degree Programme through Convener, TSECET (FDH) against the sanctioned intake in each Programme of study as lateral entry student.

2.3 Branch Transfers: There shall be no Branch transfers after the completion of Admission Process.

2.4 Medium of Instruction: The Medium of Instruction and Examinations for the entire B.Tech. programme will be in English only.

3. B.Tech. PROGRAMME STRUCTURE

3.1 Admitted under Four year B. Tech. (Regular) degree Programme:

A student after securing admission shall complete the B.Tech. Programme in a minimum period of four academic years (8 semesters), and a maximum period of eight academic years (16 semesters) starting from the date of commencement of first year first semester, failing which the student shall forfeit their seat in B.Tech. course. Each student shall secure 160 credits (with SGPA ≥ 5 (each Semester) and CGPA ≥ 5) required for the completion of the under graduate programme and award of the B.Tech. Degree.

3.2 Admitted under Lateral Entry Scheme (LES) into B. Tech. degree Programme:

3.2.1 The LES students after securing admission shall pursue a course of study for not less than three academic years (6 Semesters) and not more than six academic years (12 Semesters), failing which the students shall forfeit their seat in B.Tech programme.

3.2.2 The student shall register for 122 credits and secure 122 credits with CGPA 5 from II year to IV year B.Tech. programme (LES) for the award of B.Tech. degree.

3.3 UGC / AICTE specified definitions / descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations / Norms, which are listed below:

3.3.1 Semester Scheme: Each B.Tech. (Regular) Programme is of 4 Academic Years (8 Semesters) and B.Tech. (LES) Programme is of 3 Academic Years (6 Semesters), with the academic year being divided into two semesters of 22 weeks (≥ 90 Instructional days per semester), each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)', Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and Curriculum / Course Structure as suggested by AICTE.

3.3.2 Credit Courses:

All Subjects / Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject / Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) Structure based on the following general pattern:

- (i) One Credit - for One hour /Week / Semester for Theory / Lecture (L) Courses; or Tutorials
- (ii) One Credit - for Two hours / Week / Semester for Laboratory / Practical (P) Courses

All Mandatory Courses, Industrial Visit, Guest Lecture, Tutorials, etc., will not carry any Credits.

- (iii) All Value Added Courses in each semester carry 1 credit for two hours/week/semester except in I & II Semester of I B.Tech.

Mandatory Courses

| Course Code | Course Name |
|-------------|-------------------------|
| AS20-00MC01 | Environmental sciences |
| AS20-00MC02 | Gender sensitization |
| AS20-00MC03 | Constitution of India |
| AS20-00MC04 | Professional ethics |
| AS20-00MC05 | Artificial intelligence |
| AS20-00MC06 | Cyber security |

3.3.3 Subject / Course Classification and Nomenclature:

SPEC has followed almost all the guidelines specified by AICTE / UGC / JNTUH for the classification of all subjects / courses offered at B.Tech. Programme and are mentioned below.

Department of Mechanical Engineering

| S. No. | Broad Course Classification | Course Group / Category | Course Description | Range of Credits |
|--|-----------------------------|-------------------------------------|---|------------------|
| 1 | Foundation Courses (FnC) | BS – Basic Sciences | Includes - Mathematics, Physics and Chemistry Subjects | 10% -15% |
| 2 | | ES – Engg. Sciences | Includes fundamental engineering subjects. | 15% -20% |
| 3 | | HS – Humanities And Social Sciences | Includes subjects related Humanities, Social Sciences and Management. | 5% -10% |
| 4 | Core Courses (CoC) | PC – Professional Core | Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg. | 30% -40% |
| 5 | Elective Courses (EIC) | PE – Professional Electives | Includes Elective subjects related to the Parent Discipline / Department /Branch of Engg. | 5% -15% |
| 6 | | OE – Open Electives | Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department /Branch of Engg. | 5% -10% |
| 7 | Core Courses | Project Work | B.Tech. Project or UG Project or UG Major Project. | 5% -15% |
| 8 | | Industrial Training / Mini- Project | Industrial Training/ Internship/ UG Mini-Project/ Mini-Project. | |
| 9 | | Value Added Courses | Technical Training based on core contents related to Parent Discipline/ Department/ Branch of Engg. | |
| 10 | Mandatory Courses (MC) | Mandatory Courses (MC) | Mandatory Courses (non-credit) | - |
| Total Credits for UGP (B. Tech.) Programme | | | | 160 (100%) |

4. COURSE REGISTRATION

- 4.1 A 'faculty advisor or counsellor' shall be assigned to a group of 15 students, who advises the student about the B.Tech. programme, its course structure and curriculum, choice / option for subjects / courses, based on his/her competence, progress, pre-requisites and interest.

The academic section of the college invites 'registration forms' from students before the beginning of the semester through online submission, ensuring 'date and time stamping'. The online registration requests for any 'current semester' shall be completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'.

- 4.2 A student can apply for online registration, only after obtaining the 'written approval' from his faculty advisor or counsellor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with Head of the Department, faculty advisor and the student.

- 4.3 Subject / course options exercised through online registration are final and cannot be changed or inter- changed; further, alternate choices will not be considered. However, if the subject / course that has already been listed for registration by Head of the Department in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice - either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by Head of the Department, with due notification and time-framed schedule, within the first week from the commencement of class-work for that semester.

- 4.4 **Open electives:** Students have to choose one open elective wherever offered from the list of open electives given for their stream. However, student cannot opt for an open elective subject offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

4.5 Professional electives: Students have to choose professional elective wherever offered from the list of professional electives given. However, students may opt for professional elective subjects offered in the related area.

4.6 Mandatory Courses (Non-Credit): All mandatory courses where ever offered require prior registration.

4.7 Value Added Courses: Students have to choose one value added course in each semester (2-1 to 3-2) wherever offered from the list of value added courses given for their stream. In 4-1 a value added course is common to all the departments and is mandatory.

5. SUBJECTS / COURSES TO BE OFFERED

A subject/course may be offered to the students, if only a minimum 1/3 of students register to the course.

- i) More than one faculty member may offer the same subject (lab / practical's may be included with the corresponding theory subject in the same semester) in any semester. However, selection choice for students will be based on 'first come first serve basis and CGPA criterion' (i.e. the first focus shall be on early on-line entry from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).
- ii) If more entries for registration of a subject come into picture, then the concerned Head of the Department shall take necessary decision, whether or not to offer such a subject / course for two (or multiple) sections.

6. ATTENDANCE REQUIREMENTS

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum 75% of attendance in aggregate (excluding the days of midterm examinations) for all the subjects / courses (excluding attendance in mandatory courses) in that semester.

6.2 Condoning of 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 on genuine and valid grounds, based on the student's representation with supporting evidence. A stipulated fee shall be payable towards condoning of shortage of attendance. Shortage of attendance below 65% in aggregate shall in no case be condoned.

- 6.3** Students whose shortage of attendance is not condoned in any semester are not eligible to take the end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case there are any professional electives and / or open electives, the same may also be re-registered, if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the same set of elective subjects offered under that category.
- 6.4** A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7. ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no. 6.

- 7.1** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course, if the student secures not less than 35% marks in the semester end examination (SEE), and a minimum of 40% of marks in the sum total of the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) taken together; in terms of letter grades, this implies securing C grade or above in that subject / course.
- 7.2** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to industry oriented mini-project, if the student secures not less than 40% of the total marks.

The student would be treated as failed, if student

- (i) If the student does not submit a report on his industry oriented mini-project before the evaluation committee as per the schedule,
- (ii) secures less than 40% of marks in industry oriented mini-project evaluations.

Student may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one re-appearance' evaluation also, student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules

7.3.1 Four year B.Tech. (Regular):

| Sl. No. | Promotions | Conditions to be fulfilled |
|---------|---|--|
| 1. | First year first semester to first year second semester | Regular course of study of first year first semester |
| 2. | First year second semester to second year first semester | (i) Regular course of study of first year second semester. (ii) Must have secured at least 19 credits out of 38 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3. | Second year first semester to second year second semester | Regular course of study of second year first semester. |
| 4. | Second year second semester to third year first semester | (i) Regular course of study of second year second semester. |

| Sl. No. | Promotions | Conditions to be fulfilled |
|---------|---|---|
| | | (ii) Must have secured at least 47 credits out of 79 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5. | Third year first semester to third year second semester | Regular course of study of third year first semester. |
| 6. | Third year second semester to fourth year first semester | (i) Regular course of study of third year second semester. |
| | | (ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 7. | Fourth year first semester to fourth year second semester | Regular course of study of fourth year first semester. |

7.3.2 Four year B.Tech. (LES):

| S. No. | Promotion | Conditions to be fulfilled |
|--------|---|---|
| 1. | Second year first semester to second year second semester | Regular course of study of second year first semester. |
| 2. | Second year second semester to third year first semester | (i) Regular course of study of second year second semester. |

| S. No. | Promotion | Conditions to be fulfilled |
|--------|---|---|
| | | (ii) Must have secured at least 25 credits out of 41 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3. | Third year first semester to third year second semester | Regular course of study of third year first semester. |
| 4. | Third year second semester to fourth year first semester | (i) Regular course of study of third year second semester. |
| | | (ii) Must have secured at least 49 credits out of 82 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5. | Fourth year first semester to fourth year second semester | Regular course of study of fourth year first semester. |

7.4 A student has to register for all subjects covering 160 credits (122 credits in case of LES) as specified and listed (with the relevant course / subject classifications as mentioned) in the course structure, fulfill all the attendance and academic requirements for 160 credits (122 credits in case of LES) securing a minimum of 'C' grade or above in each subject, and 'earn all 160 credits (122 credits in case of LES) securing $SGPA \geq 5.0$ (in each semester), and CGPA (at the end of each

successive semester) ≥ 5.0 , to successfully complete the under graduate programme.

- 7.5** A student eligible to appear in the semester end examination for any subject / course, but absent from it or failed (thereby failing to secure 'C' grade or above) may reappear for that subject / course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject / course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.
- 7.6** A student detained in a semester due to shortage of attendance may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements. The academic regulations under which the student has been readmitted shall be applicable. However, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which student has been detained.
- 7.7** A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits. The academic regulations under which the student has been readmitted shall be applicable.

8. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

- 8.1** The performance of a student in each semester shall be evaluated subject-wise / course-wise (irrespective of credits assigned) with a maximum of 100 marks. These evaluations shall be based on 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End Examination), and a letter grade corresponding to the percentage of marks obtained shall be given.

8.2 Evaluation of Theory Subjects / Courses

- A) Continuous Internal Evaluation:** For each theory subject, during the semester, there shall be 2 mid-term examinations of 30 marks each. Each mid-term examination consists of Descriptive paper for 25 marks and assignment for 5 marks

and the average of the two mid-term examinations marks shall be taken as the final marks.

- I. The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus. Each Internal Examination is conducted for 30 marks.
- II. The Descriptive paper shall be conducted for duration of 1 hour and 30 Minutes. Each descriptive paper consists of three compulsory questions (May contain Sub Questions carrying 2/3/5/10 marks) each with internal choice covering the prescribed syllabus.
 1. Unit 1(10 Marks)
 2. Unit 2(10 Marks)
 3. Unit 3(5 Marks)

Total = 25 Marks

- III. First assignment(One video from each(1,2,3)Units) should be submitted before the commencement of the first mid-term examinations, and the second assignment(One video from each(3,4,5)Units) should be submitted before the commencement of the second mid-term examinations. Five Marks for each Assignment.

Assignment 1(Videos Submission)

Unit 1 - 2 Marks, Unit 2 - 2 Marks, Unit 3 - 1 Mark.

Assignment 2(Videos Submission)

Unit 3 - 1 Mark, Unit 4 - 2 Marks, Unit 5 - 2 Marks.

The marks secured by the student in I and II Internal examinations are considered and the AVERAGE of the two Internal examinations shall be taken as the final marks secured by the student towards Continuous Internal Evaluation in the theory subject. If he/she is absent for any test, he/she will be awarded zero marks for that test.

B) Semester End Examinations:

The duration of SEE is 3 hours. The details of the question paper pattern are as follows:

- The end semester examinations will be conducted for 70 marks consisting of two parts viz.
 - i) Part- A for 20 marks, ii) Part - B for 50 marks.
- Part-A is compulsory question which consists of ten questions (two from each unit) carry 2 marks each.
- Part-B consists of five questions carrying 10 marks each. One question from each unit (may contain sub-questions) with internal choice.

8.3 Evaluation of Practical Subjects / Courses: In any semester, a student has to complete all the experiments / exercises in each laboratory course and get the record certified by the concerned Head of the Department to be eligible for Semester End Examination. For practical subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 internal marks and 70 marks for Semester End Examination (SEE). The semester end examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the Parent Institution.

C) Continuous Internal Evaluation (CIE): Out of the 30 marks, 15 marks are allocated for day- to-day work evaluation and 10 Marks for Lab Examination and 5 marks for Viva voce which will be conducted by the faculty (Subject Experts Nominated by HoD) for a duration of two hours and the best of the two mid-term examinations is taken into account.

ABSENCE IN LABORATORY INTERNAL EXAMINATIONS:

If any student is absent in both the laboratory internal examinations on health grounds for any valid reasons approved by the college academic committee, only one test shall be conducted on all experiments and the marks secured out of 30 marks shall be

divided by two, which shall be awarded against the said laboratory Internal Evaluation.

D) Semester End Examination (SEE): The SEE for practical subject / course shall be conducted at the end of the semester with a duration of 3 hours by one internal and one external examiner appointed by the Head of the Institution as per the recommendation of the concerned Head of the Department.

8.4 Evaluation of Design / Drawing Subjects / Courses: For the subjects such as Engineering Graphics, Machine Drawing and estimation, the distribution shall be 30 marks for CIE (15 marks for day-to-day work and 15 marks for internal examination) and 70 marks for SEE. There shall be two internal examinations in a semester and the average of the two shall be considered for the award of marks for internal examinations. For subjects like Engineering Graphics/Engineering Drawing, the SEE shall consist of five questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions. There shall be no Part - A, and Part - B system.

8.5 Evaluation of Major Project: Out of a total of 100 marks for the major project work, 30 marks shall be for Internal Evaluation and 70 marks for the End Semester evaluation. The End Semester evaluation (viva-voce) shall be conducted by committee. The committee consists of an external examiner, Head of the Department, the supervisor of project and a senior faculty member of the department. The topics for industry oriented mini project, and project work shall be different from each other. The evaluation of project work shall be conducted at the end of the IV year II Semester. The Departments have to evolve rubrics for evaluation of Project work. The marks may be distributed among various components like selection of topic, problem statement, literature review, methodology, oral and written presentation of the work done and performance in viva-voce examination.

8.6 Evaluation of Mandatory Non-Credit Courses: For Non Credit subjects the distribution shall be 100 marks for the Semester

End- Examination (SEE). The Semester End Examination will be conducted for 100 marks. The question paper consists of 8 questions where each question should contain a/b or a/b/c or a/b/c/d from different units. Out of 8 questions any 5 questions should be answered carrying 20 marks each. A Student must secure minimum 40 marks to pass.

For non credit courses, 'Satisfactory' or "Not Satisfactory" is indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

8.7 Evaluation of Value Added Courses: Students have to submit a project by the end of the semester, which will be evaluated by the Project Review Committee consisting of Head of the Department, a Senior Faculty of the department and concerned faculty of that Course and the Project will be evaluated for 75 marks in which 50 marks are allotted by evaluating the submitted project and 25 marks is considered as internal review marks. Remaining 25 marks are obtained by conducting Quiz (Multiple Choice Questions) during the Internal I & II Examinations and the average is considered.

8.8 MOOCs/SWAYAM Courses: Meeting with the global requirements, to inculcate the habit of self learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The proposed MOOCs courses would be additional choices in all the elective groups subject to the availability during the respective semesters and respective departments will declare the list of the courses at the beginning of the semester. Course content for the selected MOOCs courses shall be drawn from respective MOOCs links or shall be supplied by the department. Evaluation of the Course shall be done by the provider. Student has to submit the certificate of MOOCs given from the provider.

If a student fails in the MOOCs Examination conducted by Provider then the student may be allowed to write Supplementary Examination in the subsequent semester wherein the evaluation and Assessment will be done by the Parent Institution.

There shall be one Mid Sessional Examination (30 marks) obtained from the Assignment of the NPTEL/SWAYAM Course ,semester end evaluation (Descriptive exam for 70 marks) shall be done along with the other regular courses by the parent Institution. Three credits will be awarded upon successful completion of each MOOCs course. Students who are interested to do MOOCs courses need to register at their department office by the start of the semester against the courses that are announced by the department.

9. GRADING PROCEDURE

9.1 Marks will be awarded to indicate the performance of each student in each theory subject, lab/practical's, design/drawing practice, industry oriented mini-project and major project. Based on the percentage of marks obtained in Continuous Internal Evaluation plus Semester End Examination, both taken together, as specified in item 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following letter grades (UGC Guidelines) and corresponding percentage of marks shall be followed

| % of Marks Secured (Class Intervals) | Letter Grade (UGC Guidelines) | Grade Points |
|--|-------------------------------|--------------|
| 90% and above (= 90% , = 100%) | O (Outstanding) | 10 |
| Below 90% but not less than 80% (= 80% , < 90%) | A+ (Excellent) | 9 |
| Below 80% but not less than 70% (= 70% , < 80%) | A (Very Good) | 8 |
| Below 70% but not less than 60% (= 60% , < 70%) | B+ (Good) | 7 |
| Below 60% but not less than 50% (= 50% , < 60%) | B (above Average) | 6 |
| Below 50% but not less than 40% (= 40% , < 50%) | C (Average) | 5 |
| Below 40% (< 40%) | F (Fail) | 0 |
| Absent | Ab | 0 |

9.3 A student obtaining 'F' grade in any subject shall be considered 'failed' and will be required to reappear as 'supplementary student' in the end semester examination (SEE), as and when offered. In such cases, his internal marks (CIE marks) in those subject(s) will remain same as those he obtained earlier.

9.4 A letter grade does not imply any specific % of marks. In general; a student shall not be permitted to repeat any subject/course (s) only for the sake of 'grade improvement' or 'SGPA/CGPA improvement'. However, he has to repeat all the subjects/courses pertaining to that semester if he is detained.

9.5 A student earns grade point (GP) in each subject/course, on the basis of the letter grade obtained by him in that subject/course (excluding mandatory non-credit courses). Then the corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/course.

$$\text{Credit Points (CP)} = \text{Grade Point (GP)} \times \text{Credits}$$

9.6 The student passes the subject/course only when he gets GP ≥ 5 (C grade or above).

9.7 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points ($>CP$) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

$$\text{SGPA} = \frac{\sum_{i=1}^N C_i G_i}{\sum_{i=1}^N C_i} \dots\dots\dots$$
 For each semester, where 'i' is the subject indicator index (takes into account all subjects in a semester), 'N' is the no. of subjects 'registered' for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to that ith Subject, and G_i represents the grade points (G_p) corresponding to the letter grade awarded for that i^{th} subject.

9.8 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered

courses in all Semesters, and the total number of credits registered in all the semesters. CGPA is rounded off to two decimal places. CGPA is thus computed from the 1 year second semester onwards, at the end of each semester, as per the formula.

CGPA = $\{ \sum_{j=1}^N C_j G_j \} / \{ \sum_{j=1}^N C_j \}$ for all S Semesters registered where 'N' is the total no. of subjects (as specifically required and listed under the course structure of the parent department) the student has 'registered' from the 1st semester onwards upto and inclusive of the semester S (obviously $M > N$), 'j' is the subject indicator index (takes into account all subjects from 1 to S semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of 1 year 1 semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

| Course/ Subject | Credits | Letter Grade | Grade Point | Credits Points |
|--------------------|---------|-----------------|----------------|----------------|
| Course 1 | 3 | A | 8 | 3 X 8 = 24 |
| Course 2 | 3 | B+ | 7 | 3 X 7 = 21 |
| Course 3 | 3 | B | 6 | 3 X 6 = 18 |
| Course 4 | 3 | A | 8 | 3 X 8 = 24 |
| Course 5 | 3.5 | C | 5 | 3.5 X 5 = 17.5 |
| Course 6 | 1.5 | A | 8 | 1.5 X 8 = 12 |
| Course 7 | 1.5 | O | 10 | 1.5 X 10 = 15 |
| Course 8 | 2 | O | 10 | 2 X 10 = 20 |
| | 20.5 | | | 154.5 |

$$SGPA = 154.5 / 20.5 = 7.53$$

Illustration of calculation of CGPA

| Semester | Credits | SGPA | Credits * SGPA |
|---------------|---------|---------------------|-----------------------|
| Semester 1 | 20.5 | 7.24 | 20.5 X 7.24 = 148.42 |
| Semester 2 | 17.5 | 6.48 | 17.5 X 6.48 = 113.4 |
| Semester 3 | 20.5 | 7.43 | 20.5 X 7.43 = 152.315 |
| Semester 4 | 20.5 | 8.21 | 20.5 X 8.21 = 168.305 |
| Semester 5 | 20.5 | 7.65 | 20.5 X 7.65 = 156.825 |
| Semester 6 | 20.5 | 6.42 | 20.5 X 6.42 = 131.61 |
| Semester 7 | 21 | 7.75 | 21 X 7.75 = 162.75 |
| Semester 8 | 19 | 8.25 | 19 X 8.25 = 156.75 |
| Total Credits | 160 | Total Credit Points | 1190.375 |

$$\text{CGPA} = 1190.375/160 = 7.43$$

9.9 For merit ranking or comparison purposes or any other listing, only the 'rounded off' values of the CGPAs will be used.

9.10 For calculations listed in Item 9.6-9.10, performance in failed subjects/courses (securing F grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations. However, mandatory courses will not be taken into consideration.

10 PASSING STANDARDS

10.1 A student shall be declared 'successful' or 'passed' in a semester, if the student secures a $GP \geq 5$ ('C' grade or above) in every subject/course in that semester (i.e. when student gets an $SGPA \geq 5.00$ at the end of that particular semester); and a student shall be declared 'successful' or 'passed' in the entire under graduate programme, only when he/she gets a $CGPA \geq 5.00$ for the award of the degree as required.

10.2 A Student shall be declared 'successful' or 'passed' in any non-credit subject/ course, if he secures a 'Certificate' for that mandatory course.

After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter

grades and credits earned. it will show the details of the courses registered (course code, title, no. of credits, grade earned etc.), credits earned, SGPA, and CGPA.

11 DECLARATION OF RESULTS

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6- 9.9.

11.2 For Final percentage of marks equivalent to the computed final CGPA, the following formula may be used:

$$\text{Percentage of Marks} = (\text{final CGPA} - 0.5) \times 10$$

12 AWARD OF DEGREE

12.1 After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. degree he shall be placed in one of the following four classes based on CGPA:

| Class Awarded | Grade to be Secured | Remarks |
|------------------------------|----------------------|--|
| First Class with Distinction | = 8 CGPA | From the aggregate marks secured from 160 Credits for Regular Students and 144 Credits for Lateral Entry Students. |
| First Class | = 6.5 to < 8 CGPA | |
| Second Class | = 5.5 to < 6.5 CGPA | |
| Pass Class | = 5.00 to < 5.5 CGPA | |
| FAIL | CGPA < 5 | |

12.2 First class with distinction will be awarded to those students who clear all the subjects in single attempt during his / her regular course of study by fulfilling the following conditions:

- (i) Should have passed all the subjects/courses in 'first appearance' within the first 4 academic years (or 8 sequential semesters) for B.Tech. (Regular) and first 3 academic years (or 6 sequential semesters) for B.Tech. (LES) from the date of commencement of first year first semester for B.Tech. (Regular) and II year I semester for B.Tech. (LES).
- (ii) Should have secured a CGPA 8.00, at the end of each of the 8 sequential semesters (6 sequential semesters for LES), starting

from I year I semester (starting from II year I semester for LES) onwards.

- (iii) Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in 'first class with distinction'.

12.3 Award of Medals: Students fulfilling the conditions listed under item 12.2 alone will be eligible for award of 'College Ranks' and 'Medals'.

12.4 Graduation Day: The College shall have its own Annual Graduation Day for the award of Degrees issued by the University.

12.5 Transcripts: After successful completion of prerequisite credits for the award of degree a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

13 WITH HOLDING OF RESULTS

If the student has not paid the fee to college at any stage, or has dues pending against his/her name due to any reason what so ever, or if any case of indiscipline is pending against him/her, the result of the student may be withheld, and he/she will not be allowed to go into the next higher semester.

14 SUPPLEMENTARY EXAMINATIONS

Supplementary examinations for odd semester subjects will be conducted along with even semester regular examinations and vice versa.

15. TRANSITORY REGULATIONS

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of R18 Regulations due to lack of attendance, shall be permitted to join I year I semester of SR20 Regulations and he is required to complete

the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student, who has been detained in any semester of II, III and IV years of R18 regulations for want of attendance, shall be permitted to join the corresponding semester of SR20 regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The SR20 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

A student of R18 Regulations, who has been detained due to lack of credits, shall be promoted to the next semester of SR20 Regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The SR20 Academic Regulations are applicable to a student from the year of readmission onwards.

See rule (C) for further Transitory Regulations.

C. For readmitted students in R18 Regulations:

1. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
2. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including SR20 Regulations. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≥ 206 , three subjects if total credits acquired are > 206 (see R16 Regulations for exemption details).
3. If a student readmitted to SR20 Regulations, has any subject with 80% of syllabus common with his/her previous

regulations, that particular subject in R18 Regulations will be substituted by another subject to be suggested by the SPEC Academic Council.

Note: If a student readmitted to SR20 Regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in SR20 Regulations, the Principal shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

D. Promotion Rule: Where the credits allotted to a semester/year under the regulations studied in are different from that under SR20 regulations for the corresponding semester/year, the promotion rules of SR20 vide section 7.3 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under SR20 regulations and revising the secured credits also in the same proportion.

16 STUDENT TRANSFERS

There shall be no transfers from other colleges / streams.

17 RULES OF DISCIPLINE

17.1 Any attempt by any student to influence the teachers, Examiners, faculty and staff of controller of Examination for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

17.2 When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.

17.3 When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).

17.4 When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Examiner is final.

18. MALPRACTICE

18.1 Malpractice Prevention Committee: A malpractice prevention committee shall be constituted to examine and punish the student who does malpractice / behaves indisciplinately in examinations.

The committee shall consist of:

- a) Controller of Examinations - Chairman
- b) Addl. Controller of Examinations.- Convener
- c) Subject Expert - Member
- d) Head of the Department of which the student belongs to - Member
- e) The Invigilator concerned - Member

The committee shall conduct the meeting after taking explanation of the student and punishment will be awarded by following the malpractice rules meticulously.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the staff who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations, in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and will be recommended for appropriate punishment after thorough enquiry and submit the report to Head of the Institution.

18.2 Malpractice Rules: Disciplinary Action for Improper Conduct in Examinations

| S. No. | Nature of Malpractices / Improper Conduct | Punishment |
|--------|--|--|
| 1(a) | Possesses or keeps accessible 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 or practical) in which he 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. |
| 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 in 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 will be handed over to the police and a case is registered against him. |
| 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 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 to appear for the remaining |

| S. No. | Nature of Malpractices / Improper Conduct | Punishment |
|--------|--|---|
| 2 | | examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Principal. |
| 3 | Impersonates any other candidate in connection with the examination. | The candidate who has impersonated shall be expelled from the examination hall. The candidate is also debarred 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 examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. |

| S. No. | Nature of Malpractices / Improper Conduct | Punishment |
|--------|---|---|
| 4 | Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | 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 examinations. The continuation of the course by the candidate is 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 Controller of examinations / 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 add. Controller of examinations | 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 |

| S. No. | Nature of Malpractices / Improper Conduct | Punishment |
|--------|--|---|
| | <p>or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the addl. Controller of examinations, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College 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.</p> | <p>the subjects of that semester/year. The candidates also are 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.</p> |
| 7 | <p>Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.</p> | <p>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</p> |

| S. No. | Nature of Malpractices / Improper Conduct | Punishment |
|--------|--|--|
| 7 | | remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 8 | Possess 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 | If the /a student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Student of the colleges 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 |

| S. No. | Nature of Malpractices / Improper Conduct | Punishment |
|--------|---|--|
| 9 | | 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 condition to 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. |
| 11 | Copying 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. |

| S. No. | Nature of Malpractices / Improper Conduct | Punishment |
|--------|--|------------|
| 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. | |

19. SCOPE

- i) The Academic Regulations should be read as a whole, for the purpose of any interpretation.
- ii) The above mentioned rules and regulations are applicable in general to both B.Tech. (Regular) and B.Tech. (LES), unless and otherwise specific.
- iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.

20. REVISION AND AMENDMENTS TO REGULATIONS

The Academic Council may revise or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the Academic Council.

DEPARTMENT OF MECHANICAL ENGINEERING VISION AND MISSION

VISION

Strives to be recognized globally for outstanding education, research leading to well-qualified engineers with innovative, entrepreneurial and societal problem solving skills.

MISSION

DM1: Provide a conducive environment, facilities for quality education to students to enhance the skills and produce globally competitive engineers.

DM2: Prepare graduates to pursue lifelong learning, serve the profession, meet intellectual, ethical and career challenges.

DM3: To train students to take up projects in automobile, design and inter-disciplinary areas.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO 1

Domain Knowledge: Graduates would have sounded grip on Mathematics, Physical Sciences fundamentals, capable to break down and synthesize any mechanical engineering problem.

PEO 2

Professional Employment: Graduates will be able to contribute to the growth of any core industry (Automobile, Aerospace & Manufacturing), Government Organizations and R&D establishments.

PEO 3

Higher Degrees: Graduates will pursue advanced degrees in CAD/CAM, Mechanical, Allied Engineering and management studies.

PEO 4

Engineering Citizenship: Graduates will be prepared to communicate, work effectively in team-based engineering projects and practice professional ethics consistent with a sense of social responsibility.

PEO 5

Lifelong Learning: Graduates will have continuous learning skills to become experts in the chosen domains and contribute to professional knowledge.

PROGRAM OUTCOMES (POS)

- 1. ENGINEERING KNOWLEDGE:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. PROBLEM ANALYSIS:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. DESIGN/DEVELOPMENT OF SOLUTIONS:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. MODERN TOOL USAGE:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. THE ENGINEER AND SOCIETY:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety,

legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **ENVIRONMENT AND SUSTAINABILITY:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **ETHICS:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **INDIVIDUAL AND TEAM WORK:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **COMMUNICATION:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions.
11. **PROJECT MANAGEMENT AND FINANCE:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **LIFE-LONG LEARNING:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOME'S (PSOS):

PSO1 ANALYSIS: To produce engineering professional capable of synthesizing and analyzing mechanical systems including allied engineering streams.

PSO2 INTEGRATE: An ability to adopt and integrate current technologies in the design and manufacturing domain to enhance efficiency.

GENERAL, COURSE STRUCTURE & THEME & SEMESTER-WISE CREDIT DISTRIBUTION SR 20

A. Definition of Credit:

| | |
|-----------------------------|-------------|
| 1 Hr. Lecture (L) per week | 1 credit |
| 1 Hr. Tutorial (T) per week | 1 credit |
| 1Hr. Practical (P) per week | 0.5 credits |
| 3Hours Practical (Lab)/week | 1.5 credit |

B. Range of credits - A total of 160 credits are required for a student to be eligible to get Under Graduate degree in Engineering.

C. Structure of Undergraduate Engineering program:

| S. No. | Category | Code | Break up of Credits |
|--------|--|------|---------------------|
| 1 | Humanities and Social Sciences including Management courses | HSMC | 13 |
| 2 | Basic Science courses | BSC | 17.5 |
| 3 | Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc | ESC | 32 |
| 4 | Professional core courses | PC | 55.5 |
| 5 | Professional Elective courses relevant to chosen specialization/branch | PE | 15 |
| 6 | Open subjects - Electives from other technical and /or emerging Subjects | OE | 12 |
| 7 | Project work, seminar, value added courses and internship in industry or elsewhere | PW | 15 |
| 8 | Mandatory Courses [Environmental Sciences, Gender Sensitization, Constitution of India, Professional Ethics, Artificial Intelligence, Cyber Security] | MC | (non-credit) |
| | Total | | 160 |

I. Semester-wise structure of curriculum

[L= Lecture, T = Tutorials, P = Practicals & C = Credits]

| I BTECH I SEM | | | | | | | | | |
|--------------------|---|-------------|------------|---|---|--------|----------------|----------------|-------------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit | Internal Marks | External Marks | Total Marks |
| | | | L | T | P | | | | |
| As20-00bs06 | Linear Algebra And Advanced Calculus | BSC | 3 | 1 | - | 3 | 30 | 70 | 100 |
| As20-00bs02 | Engineering Chemistry | BSC | 3 | 1 | - | 3 | 30 | 70 | 100 |
| As20-02es01 | Basic Electrical Engineering | ESC | 3 | 1 | - | 3 | 30 | 70 | 100 |
| As20-00hs01 | English | HSMC | 2 | - | - | 2 | 30 | 70 | 100 |
| As20-03es01 | Engineering Mechanics | ESC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| PRACTICAL COURSES | | | | | | | | | |
| AS20-02ES02 | Basic Electrical Engineering Lab | ESC | - | - | 2 | 1 | 30 | 70 | 100 |
| AS20-00HS02 | English Language And Communication Skills Lab | HSMC | - | - | 3 | 1.5 | 30 | 70 | 100 |
| AS20-00BS03 | Engineering Chemistry Lab | BSC | - | - | 2 | 1 | 30 | 70 | 100 |
| VALUE ADDED COURSE | | | | | | | | | |
| AS20-00HS03 | Soft Skills-I | HSMC | 3 | 0 | 0 | 0 | - | 100 | 100 |
| TOTAL | | | | | | 17.5 | | | |

| I BTECH II SEM | | | | | | | | | |
|--------------------|--|-------------|------------|---|---|--------|----------------|----------------|-------------|
| S.No | Course Title | Course Area | Hours/Week | | | Credit | Internal Marks | External marks | Total Marks |
| | | | L | T | P | | | | |
| AS20-00BS01 | Differential Equations And Vector Calculus | BSC | 3 | 1 | | 3 | 30 | 70 | 100 |
| AS20-00BS04 | Engineering Physics | BSC | 3 | 1 | | 3 | 30 | 70 | 100 |
| AS20-05ES01 | Programming For Problem Solving | ESC | 3 | 1 | | 3 | 30 | 70 | 100 |
| AS20-03ES02 | Engineering Graphics And Design | ESC | 2 | - | | 3.5 | 30 | 70 | 100 |
| AS20-03ES03 | Workshop Technology | ESC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| PRACTICAL COURSES | | | | | | | | | |
| AS20-00BS05 | Engineering Physics Lab | BSC | - | - | 3 | 1.5 | 30 | 70 | 100 |
| AS20-05ES02 | Programming For Problem Solving Lab | ESC | - | - | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03ES04 | Engineering Practices | ESC | - | - | 4 | 2 | 30 | 70 | 100 |
| VALUE ADDED COURSE | | | | | | | | | |
| AS20-00HS04 | Soft Skills -II | HSMC | 3 | 0 | 0 | 0 | | 100 | 100 |
| TOTAL | | | | | | 20.5 | | | |

Department of Mechanical Engineering

| II BTECH I SEM | | | | | | | | | |
|--------------------|---|-------------|------------|---|---|--------|----------------|----------------|-------------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit | Internal Marks | External Marks | Total Marks |
| | | | L | T | P | | | | |
| AS20-00HS07 | Universal Human Values-II | HSMC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC01 | Mechanics Of Solids | PC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC02 | Production Technology | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03ES05 | Material Science And Metallurgy | ES | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC03 | Thermodynamics | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| PRACTICAL COURSES | | | | | | | | | |
| AS20-03PC04 | Mechanics Of Solids Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03PC05 | Production Technology Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03ES06 | Material Science And Metallurgy Lab | ES | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| MANDATORY COURSE | | | | | | | | | |
| AS20-00MC01 | Environmental Sciences | MC | 3 | 0 | 0 | 0 | 30 | 70 | 100 |
| VALUE ADDED COURSE | | | | | | | | | |
| AS20-03PW01 | Creo For Beginners | PW | 0 | 0 | 2 | 1 | - | 100 | 100 |
| AS20-03PW02 | Catia For Beginners | PW | 0 | 0 | 2 | 1 | | 100 | 100 |
| AS20-03PW03 | Matlab For Beginners | PW | 2 | 0 | 0 | 1 | | 100 | 100 |
| AS20-05PW02 | Project Based Learning Using C++ | PW | 0 | 0 | 2 | 1 | | 100 | 100 |
| AS20-02PW09 | Hybrid & Electric Vehicle Design Training | PW | 0 | 0 | 2 | 1 | | 100 | 100 |
| TOTAL | | | | | | 20.5 | | | |

| II BTECH II SEM | | | | | | | | | |
|--------------------|--|-------------|------------|---|---|--------|----------------|----------------|-------------|
| S.No | Course Title | Course Area | Hours/Week | | | Credit | Internal Marks | External Marks | Total Marks |
| | | | L | T | P | | | | |
| AS20-00BS11 | Probability And Statistics & Complex Variables | BSC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC06 | Kinematics Of Machinery | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC07 | Thermal Engineering-I | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC08 | Fluid Mechanics & Hydraulic Machines | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03ES07 | Instrumentation And Control Systems | ES | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| PRACTICAL COURSES | | | | | | | | | |
| AS20-03PC09 | Thermal Engineering Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03PC10 | Fluid Mechanics & Hydraulic Machines Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03ES08 | Instrumentation And Control Systems Lab | ES | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| MANDATORY COURSE | | | | | | | | | |
| AS20-00MC02 | Gender Sensitization | MC | 3 | 0 | 0 | 0 | | 100 | 100 |
| VALUE ADDED COURSE | | | | | | | | | |
| AS20-03PW01 | Creo For Beginners | PW | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| AS20-03PW02 | Catia For Beginners | PW | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| AS20-03PW03 | Matlab For Beginners | PW | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| AS20-05PW02 | Project Based Learning Using C++ | PW | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| AS20-02PW09 | Hybrid & Electric Vehicle Design Training | PW | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| TOTAL | | | | | | | 20.5 | | |

| III BTECH I SEM | | | | | | | | | |
|--------------------|--|-------------|------------|---|---|--------|----------------|----------------|-------------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit | Internal Marks | External Marks | Total Marks |
| | | | L | T | P | | | | |
| AS20-03PC11 | Metrology And Machine Tools | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC12 | Thermal Engineering-II | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC13 | Dynamics Of Machinery | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PE1X | Professional Elective-I | PE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| AS20-03OE1X | Open Elective-I | OE | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| PRACTICAL COURSES | | | | | | | | | |
| AS20-03PC14 | Metrology And Machine Tools Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03ES09 | Machine Drawing Practice Through Autocad | ES | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03PC15 | Kinematics & Dynamics Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| MANDATORY COURSE | | | | | | | | | |
| AS20-00MC04 | Professional Ethics | MC | 3 | 0 | 0 | 0 | | 100 | 100 |
| AS20-00MC06 | Cyber Security | MC | 3 | 0 | 0 | 0 | | 100 | 100 |
| VALUE ADDED COURSE | | | | | | | | | |
| AS20-00HS10 | Aptitude Skills | HSMC | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| AS20-00HS11 | Start-Up Management | HSMC | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| AS20-00HS12 | ERP Tools | HSMC | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| TOTAL | | | | | | 20.5 | | | |

| III BTECH II SEM | | | | | | | | | |
|--------------------------|---|-------------|------------|---|---|---------|----------------|----------------|-------------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credits | Internal Marks | External Marks | Total Marks |
| | | | L | T | P | | | | |
| AS20-03PC16 | Refrigeration & Air Conditioning | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC17 | Heat Transfer | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC18 | Design Of Machine Members | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PE2X | Professional Elective-Ii | PE | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03OE2X | Open Elective-Ii | OE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| PRACTICAL COURSES | | | | | | | | | |
| AS20-03PC19 | Refrigeration & Air Conditioning Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03PC20 | Heat Transfer Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-00HS05 | Advanced English Communication Skills Lab | HSMC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| MANDATORY COURSE | | | | | | | | | |
| AS20-00MC03 | Constitution Of India | MC | 3 | 0 | 0 | 0 | | 100 | 100 |

| IV BTECH I SEM | | | | | | | | | |
|--------------------|---|-------------|------------|---|---|--------|----------------|----------------|-------------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit | Internal Marks | External Marks | Total Marks |
| | | | L | T | P | | | | |
| AS20-00HS06 | Business Economics & Financial Analysis | HSMC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC21 | CAD/Cam | PC | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PC22 | Operations Research | PC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| AS20-03OE3X | Open Elective -Iii | OE | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PE3X | Professional Elective -Iii | PE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| PRACTICAL COURSES | | | | | | | | | |
| AS20-03PC23 | CAD/CAM Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03ES10 | Production Drawing Practice | ES | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| AS20-03PW10 | Industry Oriented Mini Project | PW | 0 | 0 | 4 | 2 | 30 | 70 | 100 |
| VALUE ADDED COURSE | | | | | | | | | |
| AS20-00HS13 | Interview Skills | HSMC | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| TOTAL | | | | | | 21 | | | |

| IV BTECH II SEM | | | | | | | | | |
|-----------------|---------------------------|-------------|------------|---|---|--------|----------------|----------------|-------------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit | Internal Marks | External Marks | Total Marks |
| | | | L | T | P | | | | |
| AS20-03OE4X | Open Elective-Iv | OE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PE4X | Professional Elective -Iv | PE | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03PE5X | Professional Elective -V | PE | 3 | 1 | 0 | 3 | 30 | 70 | 100 |
| AS20-03OE4X | Open Elective-Iv | OE | 0 | 0 | 2 | 4 | 10 | 70 | 100 |
| TOTAL | | | | | | 19 | | | |

| Professional Elective-I | | | | | | |
|-------------------------|------------------------------------|-------------|------------|---|---|--------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit |
| | | | L | T | P | |
| AS20-03PE11 | Unconventional Machining Processes | PE | 3 | 0 | 0 | 3 |
| AS20-03PE12 | Tool Design | PE | 3 | 0 | 0 | 3 |
| AS20-03PE13 | Production Planning & Control | PE | 3 | 0 | 0 | 3 |
| AS20-03PE14 | Engineering Tribology | PE | 3 | 0 | 0 | 3 |
| TOTAL | | | | | | 3 |

| Professional Elective-II | | | | | | |
|--------------------------|------------------------------|-------------|------------|---|---|--------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit |
| | | | L | T | P | |
| AS20-03PE21 | IC Engines And Gas Turbines | PE | 3 | 0 | 0 | 3 |
| AS20-03PE22 | CNC Technology | PE | 3 | 0 | 0 | 3 |
| AS20-03PE23 | Composite Materials | PE | 3 | 0 | 0 | 3 |
| AS20-03PE24 | Computational Fluid Dynamics | PE | 3 | 0 | 0 | 3 |
| TOTAL | | | | | | 3 |

| Professional Elective-III | | | | | | |
|---------------------------|-----------------------------------|-------------|------------|---|---|--------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit |
| | | | L | T | P | |
| AS20-03PE31 | Advanced Mechanics Of Solids | PE | 3 | 0 | 0 | 3 |
| AS20-03PE32 | Mechanical Vibrations | PE | 3 | 0 | 0 | 3 |
| AS20-03PE33 | Additive Manufacturing Technology | PE | 3 | 0 | 0 | 3 |
| AS20-03PE34 | Power Plant Engineering | PE | 3 | 0 | 0 | 3 |
| TOTAL | | | | | | 3 |

| Professional Elective-IV | | | | | | |
|--------------------------|--------------------------------|-------------|------------|---|---|--------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit |
| | | | L | T | P | |
| AS20-03PE41 | Finite Element Methods | PE | 3 | 1 | 0 | 3 |
| AS20-03PE42 | Robotics | PE | 3 | 1 | 0 | 3 |
| AS20-03PE43 | Plant Layout Material Handling | PE | 3 | 1 | 0 | 3 |
| AS20-03PE44 | Automation In Manufacturing | PE | 3 | 1 | 0 | 3 |
| TOTAL | | | | | | 3 |

| Professional Elective-V | | | | | | |
|-------------------------|--------------------------|-------------|------------|---|---|--------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit |
| | | | L | T | P | |
| AS20-03PE51 | Automobile Engineering | PE | 3 | 1 | 0 | 3 |
| AS20-03PE52 | Mems | PE | 3 | 1 | 0 | 3 |
| AS20-03PE53 | Turbo Machines | PE | 3 | 1 | 0 | 3 |
| AS20-03PE54 | Renewable Energy Sources | PE | 3 | 1 | 0 | 3 |
| TOTAL | | | | | | 3 |

| Open Elective-I | | | | | | |
|---------------------------|--|-------------|------------|---|---|--------|
| Course Code | Course Title | Course Area | Hours/Week | | | Credit |
| | | | L | T | P | |
| AS20-03OE11 | Optimization Techniques | OE | 3 | 0 | 0 | 3 |
| AS20-03OE12 | Fundamentals Of Mechanical Engineering | OE | 3 | 0 | 0 | 3 |
| AS20-03OE13 | Introduction To Mechatronics | OE | 3 | 0 | 0 | 3 |
| AS20-03OE14 | Computer Graphics | OE | 3 | 0 | 0 | 3 |
| TOTAL | | | | | | 3 |
| Open Elective-II | | | | | | |
| Course Code | Course Title | Course Area | Hours/Week | | | Credit |
| | | | L | T | P | |
| AS20-03OE21 | World Class Manufacturing | OE | 3 | 0 | 0 | 3 |
| AS20-03OE22 | Fundamentals Of Robotics | OE | 3 | 0 | 0 | 3 |
| AS20-03OE23 | Fabrication Process | OE | 3 | 0 | 0 | 3 |
| AS20-03OE24 | Non Destructive Testing Methods | OE | 3 | 0 | 0 | 3 |
| TOTAL | | | | | | 3 |
| Open Elective-III (MOOCs) | | | | | | |
| Course Code | Course Title | Course Area | Hours/Week | | | Credit |
| | | | L | T | P | |
| AS20-03OE31 | Concepts Of Thermodynamics | OE | 3 | 0 | 0 | 3 |
| AS20-03OE32 | Basics Of Materials Engineering | OE | 3 | 0 | 0 | 3 |
| AS20-03OE33 | Introduction To Composites | OE | 3 | 0 | 0 | 3 |
| AS20-03OE34 | Robotics | OE | 3 | 0 | 0 | 3 |
| TOTAL | | | | | | 3 |

**B.TECH
FIRST YEAR
FIRST SEMESTER SYLLABUS**

LINEAR ALGEBRA AND ADVANCED CALCULUS

I B.TECH., I SEM

| | |
|--|--|
| Course Title: LINEAR ALGEBRA AND ADVANCED CALCULUS | Course Code: AS20-00BS06 |
| Teaching Scheme (L:T:P):3:1:0 | Credits:3 |
| Type of Course: Lecture +Tutorial | Total Contact Periods : 48Hrs : 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams -70 Marks |
| Prerequisites: 1.Basic definitions of Matrices 2.Knowledge of Calculus 3.Differentiation and Integration rules | |

Course Overview: Course include

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems .
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Objective To learn

- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations?

Department of Mechanical Engineering

- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative. Finding maxima and minima of function of two and three variables

Course Outcomes:

| CO# | Course Outcomes |
|--------|---|
| C111.1 | Convert the set of linear equations in to matrix notation and analyse its solution |
| C111.2 | Apply the concept of orthogonal transformation and reduce quadratic form to canonical form |
| C111.3 | Analyze the nature of series. |
| C111.4 | Describe the applications of the mean value theorems |
| C111.5 | Evaluate the improper integrals using Beta and Gamma functions. |
| C111.6 | Categorize the extreme values of functions of two variables with constraints and without constraints. |

COURSE CONTENT (SYLLABUS)

UNIT I: MATRICES

Matrices: Types of Matrices(only definitions);rank of a matrix by Echelon form and Normal form; Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations: solving system of Homogeneous and Non-Homogeneous equations- consistency, Gauss elimination method;Gauss Jacobi Iteration Method. Gauss Seidel Iteration Method.

UNIT-II: EIGEN VALUES AND EIGEN VECTORS

Eigen values and Eigenvectors and their properties; Cayley-Hamilton Theorem (without proof): finding inverse and power of a matrix by Cayley-Hamilton Theorem; Diagonalization; Quadratic

forms and Nature, Index and Signature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: SEQUENCES & SERIES

Sequence: Definition of a Sequence, Convergence of a sequence (definitions and examples only).

Series: Convergent, Divergent and Oscillatory Series; Series of positive terms: Comparison test, p-test, D-Alembert's ratio test; Raabe's test; logarithmic test; Integral test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

UNIT-IV: SINGLE VARIABLE CALCULUS

Mean value theorems(all the theorems without proof): Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-V: MULTIVARIABLE CALCULUS

Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence

& independence, Maxima and minima of functions of two variables and three variables with constraints; without constraints; method of Lagrange's Multipliers.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014.
2. R.K.Jain, S.R.K. Iyengar Advanced Engineering Mathematics, Narosa Publishing House Pvt.Ltd.,5 thEdition,2016

References Books:

1. 1.N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

2. B.V.Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://www.khanacademy.org/math/linear-algebra>
2. https://onlinecourses.nptel.ac.in/noc20_ma27
3. <https://www.mooc-list.com/course/calculus-two-sequences-and-series-coursera>

Web Reference/E-Books:

- 1 www.ee.ic.ac.uk
- 2 <http://en.m.wikipedia.org>
- 3 www.math.odu.edu

ENGINEERING CHEMISTRY

I B.TECH., I SEM

| | |
|---|--|
| Course Title: Engineering Chemistry | Course Code: AS20-00BS02 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits:4 |
| Type of Course: Lecture +Tutorial | Total Contact Periods: 48Hrs : 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Students must have studied two years of intermediate chemistry | |

Course Overview:

The primary objective of an Engineering Chemistry course is to introduce the students to the concepts and applications of chemistry in Engineering. It should cultivate in them an ability to identify chemistry in each piece of finely engineered products used in households and industry. This course aims to strengthen the fundamental concepts of chemistry and then builds an interface with their industrial applications. It deals with applied and industrially useful topics, such as Water Technology, Molecular Orbital Concepts, Electrode Potential, Electrodes, types of batteries and their industrial applications, Fuels, UV-VIS, IR and NMR concepts.

Course Objective

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To know the modern technology and interpret different problems involved in industrial utilization of water.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of Electrochemistry and Corrosion which are essential for engineers in Industry.

- Ability to impart the knowledge of fuels to apply the role of chemistry in energy production.

To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.

Course Outcomes (s)

| CO# | Course Outcomes |
|--------|--|
| C112.1 | Acquire the Scientific Attitude by means of distinguishing, analyzing and solving various Engineering problems. |
| C112.2 | To know the modern technology and interpret different problems involved in industrial utilization of water. |
| C112.3 | Interpret the knowledge of atomic, molecular and electronic changes, band theory related to conductivity. |
| C112.4 | Summarize the principles and concepts of electrochemistry, corrosion to predict the behavior of a system under different variables. |
| C112.5 | Define and classify the fuels, distinguishing the quality of fuels based on calorific values as well as understand the concepts of petroleum refining. |
| C112.6 | Apply the concepts on basic spectroscopy and application to medical and other fields. |

COURSE CONTENT (SYLLABUS)

Unit - I:

Water and its Treatment: Introduction - hardness of water - Causes of hardness - Types of hardness: temporary and permanent - expression and units of hardness, Numerical problems on Hardness of Water - Estimation of hardness of water by complexometric method. Boiler troubles: Scales and Sludge's and its treatment. Potable water and its specifications - Steps involved in treatment of Potable water - Disinfection of water by ozonization and chlorination - Breakpoint of Chlorination. Boiler feed water and its treatment - Internal Treatment of water: Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water - Ion exchange Process. Desalination of Brackish water - Reverse Osmosis.

Unit - II:

Molecular Structure and Theories of Bonding: Introduction - Atomic and Molecular Orbital's. Linear Combination of Atomic Orbital's (LCAO), Molecular orbital's of diatomic molecules, molecular orbital energy level diagrams of N₂, O₂ and F₂ molecules. ?- molecular orbital's of butadiene.

Crystal Field Theory (CFT): Salient Features of CFT - Crystal Field Splitting of transition metal ion d- orbital's in Tetrahedral, Octahedral and Square planar geometries. Band Structure of solids and effect of doping on conductance.

Unit - III:

Electrochemistry and Corrosion: Electro chemical cells - electrode potential, standard electrode potential, Nernst equation, Types of electrodes - Calomel, Quinhydrone and Glass electrode. Determination of PH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries - Primary: Lithium cell, secondary batteries: Lead - Acid storage battery and Lithium ion battery.

Causes and effects of corrosion - theories of chemical and electrochemical corrosion - mechanism of electrochemical corrosion, Types of corrosion: Galvanic, Differential Aeration Corrosion - water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods - Cathodic protection - Sacrificial anode and impressed current cathodic methods. Surface coatings - metallic coatings - methods of application: Galvanizing , Tinning, Metal Cladding.

Unit - IV:

Fuels and Combustion: Introduction-Classification of Fuels - Calorific value, Characteristics of a good fuel - Solid fuels: coal - Classification of a coal by Rank - Analysis of coal - Proximate and Ultimate analysis and their significance. Liquid fuels - Petroleum and its refining, Cracking -types - Fixed bed Catalytic Cracking - Moving bed catalytic cracking. Synthetic Petrol - Fischer-Tropsch's process- Knocking - Octane and Cetane rating, Flash Point, Fire point, Cloud point & Pour Point; Gaseous fuels - Composition and uses of Natural Gas, LPG and CNG.

Combustion: Definition, Calorific value of fuel - HCV, LCV; Calculation of air quantity required for combustion of a fuel.

Unit-V

Spectroscopic Techniques and applications: Introduction, Principles of Electronic Spectroscopy: Beer-Lamberts law, Types of electronic transitions, applications of UV-Visible spectroscopy.

IR Spectroscopy: Introduction, Principle, Modes of Molecular vibrations, selection rules, Force Constant, Wave number regions of Some common organic functional groups (C-H, NH₂, OH, -COOH, C=O, C N, C=C, C C, C-O-C), Applications of IR Spectroscopy.

¹H-NMR Spectroscopy, Principles of NMR spectroscopy, Chemical shift - Shielding and Deshielding effects, Chemical shifts of some organic protons, Interpretation of NMR Spectra (Alkanes, Alcohol, carbonyl compounds, Alkyl halides) Applications of NMR: Introduction to Magnetic Resonance Imaging.

Text Books:

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell.
4. University Chemistry, by B.M. Mahan, Pearson IV Edition.
5. R.V. Gadag & A. Nityananda Shetty., "Engineering Chemistry", I K International Publishing House Private Ltd. New Delhi (2015- Edition).

References Books:

1. O.G. Palanna, "Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint (2015- Edition).
2. "Wiley Engineering Chemistry", Wiley India Pvt. Ltd. New Delhi. Second Edition 2013.
3. B.Jaiprakash, R. Venugopal, Sivakumaraiah and Pushpa Iyengar, Chemistry for Engineering Students, Subhash Publications, Bengaluru, (2015- Edition).

4. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/105/104/105104102/>
2. <https://nptel.ac.in/courses/105/106/105106119/>
3. <https://nptel.ac.in/courses/103/103/103103163/>
4. <https://nptel.ac.in/courses/104/106/104106096/>
5. <https://nptel.ac.in/courses/115/102/115102025/>
6. <https://nptel.ac.in/courses/103/108/103108162/>
7. <https://nptel.ac.in/courses/103/105/103105110/>
8. <https://nptel.ac.in/courses/104/102/104102113/>

Web Reference/E-Books:

| S. No. | Advanced concepts in syllabus | Website Referred |
|--------|----------------------------------|---|
| 1 | Water & Its Treatment | https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006/lecture-notes/ |
| 2 | Lithium Ion Batteries | https://www.youtube.com/watch?v=fo3dmxwd9ig |
| 3 | Fuel Cells | https://nptel.ac.in/content/storage2/courses/121106014/Week11/lecture34.pdf |
| 4 | IR Spectroscopy | www.chem.ucalgary.ca |
| 5 | Stereo chemistry | research.cm.utexas.edu |
| 6 | Synthesis of Aspirin | http://vlab.amrita.edu/?sub=2&brch=191&sim=849&cnt=1 |
| 7 | Defluoridation of fluoride water | www.csir.res.in |
| 8 | Engineering Chemistry IIT-MUMBAI | http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/TOC-mainM5.htm |
| 9 | NMR Spectroscopy | https://chem.libretexts.org/Textbook_Maps/Organic_Chemistry/Map%3A_Organic_Chemistry_(McMurry)/Chapter_13%3A_Structure_Determination_-_Nuclear_Magnetic_Resonance_Spectroscopy |

BASIC ELECTRICAL ENGINEERING
I B.TECH., I SEM

| | |
|--|------------------------------|
| Course Title: Basic Electrical Engineering | Course Code: AS20-02ES01 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits: 3 |
| Type of Course: Lecture +Tutorial | Total Contact Periods: 48Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Basics of Physics and Mathematics | |

Course Overview:

Electrical engineering principles are taught in this course. Topics include circuit theory, alternating current theory, DC Machines, induction, motors, Synchronous Machine, cabling, batteries and Switches.

Course Objective

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To impart the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C113.1 | Understand the basic concepts of Electrical Circuits. |
| C113.2 | Study various concepts in AC circuits |
| C113.3 | Discuss the concepts of transformer and Induction motor. |
| C113.4 | Discuss the concepts of DC Machines and synchronous machines. |
| C113.5 | Describe the operation of different types of cables, wires and batteries. |
| C113.6 | Understand the Performance of different protecting equipment's like MCB, FUSE. |

COURSE CONTENT (SYLLABUS)**UNIT-I: D.C. CIRCUITS**

Electrical circuit elements R, L and C, voltage and current sources, Kirchoff's laws, Network reduction techniques, Series - parallel, Y- Δ transformation, analysis of simple circuits with dc excitation. Superposition theorem, Thevenin's theorem and Norton's Theorem.

UNIT-II: A.C. CIRCUITS

Representation of sinusoidal waveform, phasor representation, peak and RMS values, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations, series resonance in series R-L-C circuit. Three-phase balanced circuits. Voltage and current relations in star and delta connections.

UNIT-III: TRANSFORMERS AND INDUCTION MOTORS

Transformers: Principle of operation of transformer, Equivalent circuit, losses and efficiency, voltage regulation. Auto-transformer. Three phase transformer connections.

Induction motors: Working principle and operation of three phase induction motor, Losses and efficiency-Brake test. Single-phase induction motor-working principle, operation and applications.

UNIT-IV: DC MACHINES AND SYNCHRONOUS MACHINES

DC machines: Constructional details and working of DC Generator, Methods of excitation, Applications of DC generators. DC Motor - principle of operation, speed control of separately excited DC motor. Applications of DC motors.

Synchronous machines: Construction and working of synchronous generator and its applications.

UNIT-V: ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption and battery backup.

Text Books:

1. "Basic Electrical Engineering", D.C. Kulshreshtha, McGraw Hill, 2019.
2. "Basic Electrical Engineering", A. Chakrabarti, S. Debnath, Tata McGraw Hill, 2012.
3. "Basic Electrical Engineering" - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
4. "Principle of Electrical Engineering", V.K Mehta, R. Mehta, S. Chand Limited, 2011.
5. "Basic Electrical Engineering", V. Mittle & Arvind Mittal, TMH, Second Edition.

References Books:

1. L.S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011
2. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. NPTEL Videos on Course "Basic Electrical Technology" Co-ordinated by IISc Bangalore
Link: <https://nptel.ac.in/courses/108/108/108108076/>
2. NPTEL Videos on Course "Basic Electrical Technology" Co-ordinated by IIT Kharagpur
Link: <https://nptel.ac.in/courses/108/105/108105053/>

Web Reference/E-Books:

1. Basic Electrical Engineering By U.A.Bakshi, V.U.Bakshi · 2009 Link: https://www.google.co.in/books/edition/Basic_Electrical_Engineering/Pp47n-yyVEYC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover
2. Basic Electrical Engineering By Chakrabarti · 2009 https://www.google.co.in/books/edition/Basic_Electrical_Engineering/KuJ44LVAAK4C?hl=en&gbp=1&dq=basic+electrical+engineering+books&printsec=frontcover
3. Basic Electrical Engineering By R. K. Rajput · 2009 https://www.google.co.in/books/edition/Basic_Electrical_Engineering/NamQz0aZMukC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover
4. Basic Electrical Engineering By SK Sahdev · 2015 https://www.google.co.in/books/edition/Basic_Electrical_Engineering/8xTLCgAAQBAJ?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover

ENGLISH
I B.TECH., CIVIL-I SEM

| | |
|---|--------------------------------|
| Course Title: English | Course Code: AS20-00HS01 |
| Teaching Scheme (L:T:P): 2:0:0 | Credits:2 |
| Type of Course: Lecture | Total Contact Periods: 32 |
| Continuous Internal Evaluation- 30 Marks | Semester End Exams -70Marks |
| Prerequisites: 1. Basic knowledge of English language 2. Must obtain Grammar, and basic reading skills 3. Able to communicate in English language with basic writing skills 4. Able to use different types of vocabulary in different types of situations | |

Course Overview:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.

Course Objective: The course will help to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills

- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.
- Train the students to use language appropriately for Interviews, Group discussions and Public speaking
- Enhance and empower the students in communication skills by concentrating on LSRW skills.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C114.1 | Apply English language effectively in spoken and written forms |
| C114.2 | Analyse the given texts and respond appropriately |
| C114.3 | Apply various grammatical structures in personal and academic fronts. |
| C114.4 | Develop appropriate vocabulary for professional communication |
| C114.5 | Improve competency in various forms of academic and professional writing. |
| C114.6 | Perceive the importance of language skill for the enhancement of employability opportunities. |

COURSE CONTENT (SYLLABUS)

UNIT I:

'Of Parents and Children' from the Essays of Francis Bacon

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences Importance of Proper Punctuation- Techniques for writing precisely - Paragraph writing - Types, Structures and Features of a Paragraph - Creating Coherence- Organizing Principles of Paragraphs in Documents.

UNIT II:

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: Homonyms, Homophones and Homographs

Grammar: Misplaced Modifiers

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Format of a Formal Letter- Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume.

UNIT III:

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Comprehension- Intensive Reading and Extensive Reading

Writing: Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events - Classifying- Providing Examples or Evidence

UNIT IV:

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations and Acronyms in English

Grammar: Sequence of Tenses

Reading: Improving Comprehension Skills - Techniques for Good Comprehension

Writing: Information Transfer- Flow Chart- Pie Chart- Essay Writing-Précis Writing.

UNIT V:

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Technical Vocabulary and their usage

Grammar: Collocations, Commonly Confused Words-Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction - Structure of Reports- Types of Reports - Manuscript Format.

Text Books:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.
2. The Essays of Frances Bacon, Edited, with introduction and notes by Mary Augusta Scott. Charles Scribner's Sons, New York, 1908,

References Books:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.

6. Exercises in Spoken English. Parts I -III. CIEFL, Hyderabad. Oxford University Press.
7. English Grammar Usage for Technical Students. DPS Publications, G Victor Emmanuel Raju, G Shailaja Reddy and M Sanjay Saahul.
1. Practice English Your Own-
<https://www.immigratemanitoba.com/alt/practise-english-on-your-own.pdf>
2. Longman English Grammar Practice- file:///C:/Users/user/Downloads/Longman _ English _ Grammar _ Practice _ intermediate_ Self_Study_ Edition % 20(learnenglishteam.com).pdf
3. English Grammar through stories by Alan Townend- file:///C:/Users/user/Downloads/English-Grammar-Through-Stories%20(learnenglishteam.com).pdf

ENGINEERING MECHANICS

I B.TECH., CIVIL-I SEM

| | |
|---|------------------------------|
| Course Title: ENGINEERING MECHANICS | Course Code: AS20-03ES01 |
| Teaching Scheme (L:T:P): 3:0:0 | Credits: 3 |
| Type of Course: Lecture | Total Contact Periods:48 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: None | |

Course Overview:

Engineering mechanics is the application of mechanics to solve problems involving common engineering elements. The goal of this Engineering Mechanics course is to expose students to problems in mechanics as applied to plausibly real-world scenarios. The course addresses the modeling and analysis of static equilibrium problems with an emphasis on real world engineering applications and problem solving.

Course Objective

The objectives of this course are to

- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium.
- Explain the resolution of a spatial system of forces using equations of equilibrium.
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections.
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
- Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations.

Course Outcomes(s)

At the end of the course, students will be able to

| CO# | Course Outcomes |
|--------|---|
| C115.1 | Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces. |
| C115.2 | Determine resultant of forces acting on a body subjected to a spatial of forces. |
| C115.3 | Solve problem of bodies subjected to friction. |
| C115.4 | Find the location of centroid and calculate moment of inertia of a given section. |
| C115.5 | Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion. |
| C115.6 | Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration. |

COURSE CONTENT (SYLLABUS)

UNIT I:

Introduction to Engineering Mechanics - Force Systems :Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space - Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

UNIT II:

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; Centroid and Centre of Gravity - Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. - Theorem of Pappus.

UNIT III:

Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem. Mass Moment of Inertia : Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia - Mass moment of inertia of composite bodies. Virtual Work: Theory of virtual work-Application.

UNIT IV:

Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT V:

Kinetics: Kinetics of a particle-D'Alemberts principle-Motion in a curved path - work, energy and power. Principle of conservation of energy- Kinetics of rigid body in translation, rotation-work done-Principle of work-energy-Impulse-momentum. Mechanical Vibrations: Definitions, Concepts-Simple Harmonic motion- free vibrations- Simple and compound pendulums.

Text Books:

1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy, J. Suresh Kumar/ BSP.
2. Engineering Mechanics/ Irving Shames, G. Krishna Mohan Rao / Prentice Hall.
3. Foundations and applications of Engineering Mechanics by HD Ram and AK Chouhan, Cambridge publications.
4. Tayal A.K., "Engineering Mechanics - Statics & Dynamics", Umesh Publications, 2011.
5. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.

References Books:

1. Timoshenko S.P and Young D.H., "Engineering Mechanics", McGraw Hill International Edition, 1983.
2. A Text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain/ Academic Publishing Company.
3. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/106/112106180/>
2. <https://nptel.ac.in/courses/112/106/112106286/>
3. <https://nptel.ac.in/courses/112/105/112105164/>
4. <https://nptel.ac.in/courses/112/103/112103109/>

Web Reference/E-Books:

1. [http://nptel.ac.in/courses/Webcourse contents/IITKANPUR/eng_mechanics/ui/Course_home_3.htm](http://nptel.ac.in/courses/Webcourse%20contents/IITKANPUR/eng_mechanics/ui/Course_home_3.htm).
2. <https://nptel.ac.in/courses/122/104/122104015/>
3. <https://freevideolectures.com/course/2264/engineering-mechanics>
4. <https://nptel.ac.in/courses/112/103/112103108/>
5. <https://nptel.ac.in/courses/115/104/115104094/>

BASIC ELECTRICAL ENGINEERING LAB

I B.TECH., CIVIL-I SEM

| | |
|--|-------------------------------|
| Course Title: Basic Electrical Engineering Lab | Course Code: AS20-02ES02 |
| Teaching Scheme (L:T:P): | Credits: 1 |
| Type of Course: Practical | Total Contact Periods: 32 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Basic Electrical Engineering | |

Course Overview:

Electrical engineering principles are taught practically in this Lab course. Topics include circuit theory, alternating current theory, Transformers, DC Machines, induction, motors and Synchronous Machine.

Course Objective

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C116.1 | Apply basic laws of electrical circuits. |
| C116.2 | Design simple Electrical Networks |
| C116.3 | Analyze the response of different types of electrical circuits to different Excitations. |
| C116.4 | Understand the measurement, calculation and relation between the basic electrical Parameters |
| C116.5 | Determine the characteristics of DC Machines |
| C116.6 | Determine characteristics of Transformer and AC Machines |

LIST OF EXPERIMENTS/DEMONSTRATIONS

Any ten of the following experiments

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

Text Books:

1. "Basic Electrical Engineering", D.C. Kulshreshtha, McGraw Hill, 2019.

2. "Basic Electrical Engineering", A. Chakrabarti, S. Debnath, Tata McGraw Hill, 2012.
3. "Basic Electrical Engineering" - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
4. "Principle of Electrical Engineering", V.K Mehta, R. Mehta, S. Chand Limited, 2011.
5. "Basic Electrical Engineering", V. Mittle & Arvind Mittal, TMH, Second Edition.

References Books:

1. L.S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011
2. "Electrical and Electronics Technology", E. Hughes, 10th Edition, Pearson, 2010
3. "Electrical Engineering Fundamentals", Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. NPTEL Videos on Course "Basic Electrical Technology" Co-ordinated by IISc Bangalore
Link: <https://nptel.ac.in/courses/108/108/108108076/>
2. NPTEL Videos on Course "Basic Electrical Technology" Co-ordinated by IIT Kharagpur
Link: <https://nptel.ac.in/courses/108/105/108105053/>

Web Reference/E-Books:

1. Basic Electrical Engineering By U.A. Bakshi, V.U. Bakshi 2009
Link: https://www.google.co.in/books/edition/Basic_Electrical_Engineering/Pp47n-yyVEYC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover
2. Basic Electrical Engineering By Chakrabarti · 2009 https://www.google.co.in/books/edition/Basic_Electrical_Engineering/KuJ44LVA4K4C?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover

3. Basic Electrical Engineering By R. K. Rajput · 2009 https://www.google.co.in/books/edition/Basic_Electrical_Engineering/NamQz0aZMukC?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover
4. Basic Electrical Engineering By SK Sahdev · 2015 https://www.google.co.in/books/edition/Basic_Electrical_Engineering/8xTLCgAAQBAJ?hl=en&gbpv=1&dq=basic+electrical+engineering+books&printsec=frontcover

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB I B.TECH., CIVIL -I SEM

| | |
|--|-------------------------------|
| Course Title: English Language Communication Skills Lab | Course Code: AS20-00HS02 |
| Teaching Scheme (L:T:P): 0:0:3 | Credits:1.5 |
| Type of Course : Practical | Total Contact Periods: 48 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70Marks |
| Prerequisites: 1. The students should have a basic knowledge of English language 2. Must obtain Grammar, and basic Speaking skills 3. Should able to communicate in English language 4. Able to use different types of vocabulary in different of situations | |

Course Overview:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English Language Communication Skills Lab has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In ELCS Lab the focus should be on the skills development in the areas of vocabulary, grammar, reading and speaking. For this, the teachers should use the prescribed Lab manual for detailed study. The students should be encouraged in improving communication skills in the lab. The time should be utilized for activity based learning. The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.

Course Objective:

The course will help to

To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning

Department of Mechanical Engineering

To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm

To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking

To train students to use language appropriately for public speaking and interviews

To improve the fluency of students in spoken English and neutralize their mother tongue influence

Course Outcome:

| CO# | Course Outcomes |
|--------|--|
| C117.1 | Learn how to pronounce words using phonetic transcription |
| C117.2 | Improves collaborative skills and maximizes speaking skills |
| C117.3 | Develops Neutralization of accent for intelligibility |
| C117.4 | Develops better understanding of nuances of English language through audio-visual experience |
| C117.5 | Improves language skills according in the different situations, discussions and interviews |
| C117.6 | Develops linguistic, communicative and critical thinking |

COURSE CONTENT (SYLLABUS)

Listening Skills Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

- Computer Assisted Language Learning (CALL) Lab
- Interactive Communication Skills (ICS) Lab

Exercise - I :

- **CALL Lab:** Introduction to Pronunciation - Speech Sounds - Vowels and Consonants.
- **ICS Lab:** Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Greetings - Introducing Oneself and Others -Taking Leave - JAM Session- Situational Dialogues.

Exercise - II :

- **CALL Lab:** Understand: Structure of Syllables - Word Stress .
- Practice: Basic Rules of Word Accent.
- ICS Lab: Understand: Features of Good Conversation - Non-verbal Communication.

Practice: Role Play- Expressions in Various Situations -Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III

- **CALL Lab:** Understand: Intonation- Rhythm-The Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation - Differences in British and American Pronunciation.

- ICS Lab: Oral Presentations-Introduction to Formal Presentations
- Practice: Formal Presentations- Poster Presentations and PPT's.

Exercise - IV

CALL Lab: Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

ICS Lab: Public Speaking - Exposure to Structured Talks-Group Discussion

Practice: Group Discussion.

Exercise - V

CALL Lab: Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests.

- ICS Lab: Interview Skills - concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews.

Practice: Mock Interviews

References

1. ELCS LAB MANUAL
2. Practice English Your Own- <https://www.immigratemanitoba.com/alt/practise-english-on-your-own.pdf>
3. Longman English Grammar Practice- file:///C:/Users/user/Downloads/Longman _ English _ Grammar _ Practice _ intermediate_ Self_ Study_ Edition% 20 (learnenglishteam.com) .pdf
4. English Grammar through stories by Alan Townend- file:///C:/Users/user/Downloads/English-Grammar-Through-Stories%20(learnenglishteam.com).pdf

ENGINEERING CHEMISTRY LAB

I B.TECH., I SEM

| | |
|---|------------------------------|
| Course Title: Engineering Chemistry Lab | Course Code: AS20-00BS03 |
| Teaching Scheme (L:T:P): 0:0:3 | Credits:1.5 |
| Type of Course: Practical | Total Contact Periods:48 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Basics of chemistry | |

Course Overview:

The course emphasizes active resolution of experimental problems involving volumetric, analytical and instrumental usage; their design and optimization. Analytical, oral presentation, written report, and cooperative problem-solving skills are stressed in the context of chemical sciences practices. Safety awareness is integrated throughout the course.

Course Objectives

The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

1. Estimation of hardness in water to check its suitability for drinking purpose.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thinlayer chromatographic (TLC) technique.

Course Outcomes (s)

| CO# | Course Outcomes |
|--------|--|
| C118.1 | Analyze the need, design and perform a set of experiments. |
| C118.2 | Differentiate hard and soft water; solve the related numerical problems on water purification and its significance in industry and daily life. |
| C118.3 | Understand the kinetics of a reaction from a change in concentration of reactants or products as a function of time. |
| C118.4 | Employ the basic techniques used in chemistry laboratory for analysis such as Thin Layer Chromatography, volumetric titrations, Conductometric Measurements, Ostwald's viscometer and stalagmometer. |
| C118.5 | To demonstrate the technique of thin Layer Chromatography (TLC) and synthesize drug molecules widely used in industry. |
| C118.6 | Learn safety rules in the practice of laboratory investigations. |

**COURSE CONTENT (SYLLABUS)
LIST OF EXPERIMENTS**

1. Determination of total hardness of water by Complexometric method using EDTA
2. Estimation of Iron using Standard KMnO_4 .
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of Fe^{2+} by Dichrometry
7. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate
8. Determination of acid value of coconut oil

9. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
10. Determination of surface tension of a give liquid using Stalagmometer
11. Synthesis of Aspirin and Paracetamol
12. Thin layer chromatography calculation of Rf values. eg ortho and para nitro phenols

Reference Books:

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand &Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5TH edition
4. Text book on Experiments and calculations in Engineering chemistry - S.S. Dara.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

- 1 http://www.cdeep.iitb.ac.in/webpage_data/nptel/Core%20Science/Engineering%20Chemistry%201/Course_home_Lec38.html
2. <http://vlabs.iitb.ac.in/vlab/labscs.html>
3. <https://www.vlab.co.in/broad-area-chemical-engineering>

SOFT SKILLS 1 I B.TECH., CIVIL-I SEM

| | |
|------------------------------------|--------------------------------|
| Course Title: Soft Skills 1 | Course Code: AS20-00HS03 |
| Teaching Scheme (L:T:P): 2:0:0 | Credits: Nil |
| Type of Course: Lecture | Total Contact Periods:32 Hrs |
| Continuous Internal Evaluation: No | Semester End Exams : 100 Marks |
| Prerequisites: | |

Course Overview:

The students will enhance their communication skills. The course will enable them to become responsible towards their lives and will be able to face challenges, the course will also enable to develop work culture, orientation and will enable them with problem solving abilities.

Course Objective

1. To develop Communicative Methodology.
2. To lead the life with utmost responsibility.
3. To accept challenges.
4. To develop work orientation in the mindset of the students.
5. To have problem solving ability.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C119.1 | Facilitates better interaction among students. |
| C119.2 | Enhance and improve documentation. |
| C119.3 | Demonstrate leadership qualities. |
| C119.4 | Demonstrate effective presentation skills. |
| C119.5 | Express benevolence. |
| C119.6 | Enhance their communication skills |

COURSE CONTENT (SYLLABUS)

UNIT I: Importance of Soft Skills

Successful Career - Communication - Body Language - Written Communication - Presentation

Team Work - Professionalism - Interpersonal Skills - Time and Stress Management - Leadership Qualities

UNIT II: Self Introduction

Introductory Speech - General Speech - Academic Speech - Evaluation of Speech - Steps of Self Introduction - Basic Questions and Answers - Deliver Self Introduction - Tips of Self Introduction - Body Gestures- Good Eye Contact - Never be Nervous - Do's and Don'ts' of Self Introduction- Examples on Self Introduction

UNIT III: Body Language

Introduction - Communicating Body - Studying of body language - 17 concepts of learning body language.

UNIT IV: Communication Skills

Sounds of English - English as a World Language - Speech formation - Pronunciation - Oral Communication - Written Communication - Face to Face Communication Effective Communication - Presentation - Information Transfer.

UNIT V: Positive Attitude and Positive Thinking

Introduction - Possible Reactions - Dual Attitude - Indifference Attitude - Negative Attitude - Think Positively - Depend on Positive Thinking - Know - What we are - Benefits of Behaviour - Myths of negative thinking - Tips to become a positive thinker - Moving towards success

Text Books:

1. Body Language in the work place - Allan and Barbara Pease 2011.
2. Students Handbook: Skill Genie - Higher education department, Government of Andhra Pradesh.
3. Soft Skills - Odhisha State Open University.

Web References:

1. Extraordinary Communication Skills - By Sandeep Maheshwari | Hindi & English Speaking Practice Tips <https://www.youtube.com/watch?v=VczVqHJW0gg>
2. Effective Communication Skills Training Video in Hindi <https://www.youtube.com/watch?v=kxAXOh5RmwU>
3. A guide to effective communication <https://www.youtube.com/watch?v=JwjAAgGi-90>
4. A Failure to Communicate <https://www.youtube.com/watch?v=8Ox5LhIJSBE>
5. Non Verbal Communication <https://www.youtube.com/watch?v=SKhsavlvuao>

**B.TECH
FIRST YEAR
SECOND SEMESTER SYLLABUS**

**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
I B.TECH., CIVIL - II SEM**

| | |
|--|-------------------------------------|
| Course Title: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS | Course Code: AS20-00BS01 |
| Teaching Scheme (L:T:P):3:1:0 | Credits:3 |
| Type of Course: Lecture +Tutorial | Total Contact Periods:48Hrs+ 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams -70 Marks |
| Prerequisites: 1. knowledge on Derivatives 2. knowledge on Integrations 3. knowledge on Functions | |

Course Overview:

- Students will able to identify Exact and Non-Exact D.E. and find the solutions by using different methods.
- Students will able to identify Homogeneous and Non-Homogeneous D.E. and find the solutions by using different methods.
- Students will learn and evaluate Double and Triple Integrals.
- Students will learn Gradient, Divergent, Curl and Vector Identities.
- Students will learn and evaluate Line, Surface and Volume Integrals and Vector Integral Theorems.

Course Objective:

- Methods of solving the differential equations of first order.
- Methods of solving the differential equations of higher order.
- Evaluation of multiple integrals and their applications.
- The physical quantities involved in engineering field related to vector valued functions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C121.1 | Acquires various skills pertaining to differential and vector calculus and apply them in different fields of Engineering |
| C121.2 | Determine whether the given differential equation of first order is exact or not. |
| C121.3 | Apply the concept of higher order ODE to real world problems. |
| C121.4 | Analyze and apply the concept of multiple integrals to find areas, volumes. |
| C121.5 | Define Directional Derivative and Scalar Potential Function |
| C121.6 | Evaluate the line, surface and volume integrals and convert them from one to another. |

COURSE CONTENT (SYLLABUS)**UNIT I: FIRST ORDER ODE**

Exact equations; Non-Exact equations; Linear equations; Bernoulli's equations; Newton's Law of Cooling; Law of Natural Growth and Decay; Orthogonal Trajectories.

UNIT II: HIGHER ORDER LDE

Higher Order Linear Differential Equations with Constant Coefficients; Non-Homogeneous Differential Equations with RHS of the type: e^{ax} , $\sin ax$, $\cos ax$, xk , $e^{ax}v$, xv , Method of Variation of Parameters.

UNIT III: MULTIPLE INTEGRALS

Evaluation of Double Integrals (Cartesian and Polar); Change of Variables (Cartesian to Polar); Change of Order of Integration (Cartesian form); Areas and Volumes by Double Integrals. Triple Integrals (Cartesian form).

UNIT IV: VECTOR DIFFERENTIATION

Vector Point Function; Scalar Point function; Gradient; Divergent; Solenoidal; Curl; Irrotational; Directional Derivative; Scalar Potential Function; Vector Identities.

UNIT V: VECTOR INTEGRATION

Line Integral; Surface Integral; Volume Integral; Green's Theorem in a plane; Gauss's Divergence Theorem; Stoke's Theorem (without proofs) and Applications.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2010.
2. S.R.K. Iyengar and R.K. Jain, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition, 2016.

References Books:

1. Dr. M.D. Rai Singhaniania ,Ordinary and Partial Differential Equations, S.Chand and Company Ltd., 18 th Edition, 2008.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3. Murray R.Spiegel, Seymour Lipschutz, Dennis Spellman, Vector Analysis: Schaum's Outlines Series, Tata McGrawHill, 2 nd Edition, 2009.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://www.coursera.org/learn/ordinary-differential-equations>
2. https://onlinecourses.nptel.ac.in/noc20_ma15/preview

Web Reference/E-Books:

1. Engineering Mathematics-II By Dr.M.Suryanarayana Reddy
2. Mathematics-I By P. Shivaramakrishna Das, C. Vijaya Kumari
3. Ordinary And Partial Differential Equations By Dr.M.D.Raisinghaniania

ENGINEERING PHYSICS I B.TECH., CIVIL-II SEM

| | |
|--|---------------------------------|
| Course Title: ENGINEERING PHYSICS | Course Code: AS20-00BS04 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits: 3 |
| Type of Course: Lecture + Tutorial | Total Contact Periods: |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| <p>Prerequisites:</p> <ol style="list-style-type: none"> 1. The student must have basic knowledge of units and dimension of physical quantities, principles of mechanics and laws of optics. 2. The student must be aware of basics of waves and oscillations, fundamental principles of electromagnetic theory. 3. The student must have fundamental knowledge of mathematical concepts like vector algebra, integration and differentiation | |

Course Overview:

This course deals with the study of harmonic Oscillators which explore in understanding complex mechanical systems. It deals with wave optics which help to understand the behavior of wave propagation in different medium. It deals with the fundamental properties of dielectric, magnetic and nanomaterials and explore their application in all engineering streams.

Course Objective

1. Student explores different types of harmonic oscillations.
2. Student identifies different properties of physical optics like interference and diffraction
3. Student distinguishes the distribution of particles in solids using different statistical concepts.
4. Student understand the concept of effective mass of electron and Differentiate between the type of semiconductor.

5. Student classifies different dielectric and magnetic properties of solids using basic principles of physics
6. Student interprets the characteristics of lasers and applications of lasers, and characteristics of nanomaterials and their applications

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C122.1 | Analyse the impedances in Mechanical and Electrical Oscillators |
| C122.2 | Interpret the phase difference of coherent light sources using interference and diffraction |
| C122.3 | Summarize the distribution of particles in solids using Maxwell-Boltzmann, Bose-Einstein statistics and Fermi-Dirac statistics |
| C122.4 | Identify the different type of semiconductors using Hall Effect and their applications |
| C122.5 | Explores the different types of Dielectric and Magnetic materials and their applications in different fields. |
| C122.6 | Analyse the different properties of laser, along with the Significance of nanomaterials and their application in Science and Technology. |

COURSE CONTENT (SYLLABUS)

UNIT I: HARMONIC OSCILLATIONS

Introduction to Mechanical and electrical simple harmonic oscillators, Complex number notation and phasor representation of simple harmonic motion, Damped harmonic oscillator: wave equation, Analysis of under, over damped, critically damped, Energy in a damped harmonic oscillator, Quality factor, forced vibration: equation of motion(Qualitatively) and solution.

UNIT II: WAVE OPTICS

Interference: Superposition of waves, Interference by transmitted and reflected light, Formation of Newton's ring, experimental method for calculation of wavelength, determination of refractive index of a liquid by newton's ring

Diffraction: Types of Diffraction, Fraunhofer diffraction at a single slit - Intensity distribution in diffraction pattern, Fraunhofer diffraction due to double slit - expression for resultant intensity, Diffraction grating - resolving power of a plane transmission grating(qualitative)

UNIT III: INTRODUCTION TO SOLIDS

Limitation of Classical statistics, Density of Energy states(qualitative), Fermi distribution function

Electrons in a periodic potential - Bloch theorem, Kronig - Penny Model(qualitative), Brillouin Zones (E-K curve).

Concept effective mass of electron, Energy band formation in solids, classification of solids into Metals, Semiconductors and insulators, types of semiconductors(qualitative), Hall effect.

UNIT IV: DIELECTRICS AND MAGNETIC PROPERTIES OF MATERIALS

Dielectric properties: Introduction, Types of polarizations (Electronic and Ionic) and calculation of their polarizabilities, Internal fields in solids: (Lorentz Method), Clausius-Mossotti relation, Piezoelectricity, Ferroelectricity, Pyro-electricity and their applications

Magnetic Properties: Introduction, Bohr magneton, classification of magnetic materials on the basis of magnetic moment, Properties of anti-ferro and Ferri magnetic materials, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Superconductors- Type - I and Type - II Superconductors, Applications of Superconductors

UNIT V: LASERS AND NANO MATERIALS

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO₂) laser, He-Ne laser, Applications of lasers in science and technology.

Nanomaterials: Introduction, Significance of nanoscience: Surface to volume ratio, Quantum Confinement, Synthesis of Nano materials: Ball Milling Method, Sol-Gel Method, Applications of Nanomaterials in medical and defense

Text Books:

1. Engineering Physics - B K pandey, S. Chturvedi
2. A Text Book of Engineering Physics- Dr.P.G. Kshirsagar, Dr.M.N. Avadhanulu
3. Engineering Physics - P.K.Palaniswamy
4. Engineering Physics, Malik and Singh, Tata Mc Graw Hill

References Books:

1. Vibrations of waves & Physics, 3rd edition, I. G. Main.
2. Introduction to Solid State Physics - Charles Kittel

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. https://onlinecourses.nptel.ac.in/noc20_ph24/preview
2. <https://nptel.ac.in/courses/122/107/122107035/#>
3. <https://www.coursera.org/learn/nanotechnology>

Web Reference/E-Books:

1. Physics for Engineers by N. K. Verma
2. Wave Optics by R.K Verma

PROGRAMMING FOR PROBLEM SOLVING I B.TECH., II SEM

| | |
|---|-------------------------------------|
| Course Title: PROGRAMMING FOR PROBLEM SOLVING | Course Code: AS20-05ES01 |
| Teaching Scheme (L:T:P):3:1:0 | Credits:4 |
| Type of Course: Lecture +Tutorial | Total Contact Periods: 48Hrs+ 16Hrs |
| Continuous Internal Evaluation- 30 Marks | Semester End Exams- 70 Marks |
| Prerequisites: Mathematics knowledge, Analytical and Logical skills | |

Course Overview:

It introduces students to the field of computer science as a discipline for solving problems through computation and provides the foundation for more advanced courses on programming and software development.

Course Objective

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C123.1 | Designs algorithms and draws flowcharts for solving problems. |
| C123.2 | Converts the algorithms/flowcharts to C programs. |
| C123.3 | Develops the code and tests a given logic in C programming language. |
| C123.4 | Dissects a problem into functions and develops modular reusable code. |
| C123.5 | Demonstrates arrays, pointers, strings and structures in C. |
| C123.6 | Explains Searching and sorting problems. |

COURSE CONTENT (SYLLABUS)

UNIT - I

Problem Solving Using Computers :Computer Overview, Introduction to components of a computer system, Algorithms ,Flowchart, Pseudo code with examples, Number systems(Decimal & Binary Conversion).

Overview of C :History of C, Basic structure of C- program, Creating and Running C-Program, Input and output statements.

UNIT - II

Fundamentals of C: C-Tokens, Data types, Operators, Expressions, Type conversions, Types of Errors , Input and output statements.

Control Statements in C

Decision making and branching, Decision making and Looping statements.

UNIT - III

Structured Programming :Functions: Syntax, Steps ,Types and Category of Functions, parameter passing mechanism. Recursion and Storage Classes

Dynamic memory allocation: malloc(), calloc(), realloc(), free() with example

UNIT - IV

Arrays & Strings: Declaration , Initialization and Accessing Elements, String handling functions, Array of Strings.

Structures and Unions: Defining structures, initializing structures, unions, Array of structures, self referential structures.

Pointers: Types of Pointers Use of Pointers, Dereferencing operations, Examples

UNIT - V

Numerical methods: Roots, Integration and Differentiation Methods, Examples

Linked List: Definition, Types, Implementation Using Self referential Structures:

Files: (only if time is available, otherwise should be done as part of the lab)

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).
3. Ashok N. Kamthane, Programming in C, 2/e, Pearson Education.
4. Programming with C, by K.R. Venugopal, Tata Mcgraw Hill Publishing Co Ltd

References Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://www.coursera.org/learn/computational-thinking-problem-solving>
2. nptel.ac.in/courses/106105085/4
3. nptel.ac.in/courses/106105085/2

Web Reference/E-Books:

1. https://onlinecourses.nptel.ac.in/noc18_cs33/preview
2. <http://www.thenewboston.com/>
3. <https://www.codesdope.com/>

ENGINEERING GRAPHICS AND DESIGN
I B. TECH., II SEM

| | |
|---|----------------------------------|
| Course Title: ENGINEERING GRAPHICS AND DESIGN | Course Code: AS20-03ES02 |
| Teaching Scheme (L:T:P): 2:0:3 | Credits: 3.5 |
| Type of Course: Lecture + Practical | Total Contact Periods: 32Hrs+ 48 |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: None | |

Course Overview:

Engineering graphics & Design has a well-defined set of standards by which technical drawings are produced. This course teaches the language of engineering graphics from basic sketching through 3-D solid modeling using computer aided design (CAD) software AutoCAD.

Course Objective

The objectives of this course are to

- To know the conventions used in Engineering Drawing and comprehend the tools to be used in AutoCAD software.
- To understand the importance of engineering curves.
- To learn to use the orthographic projections for points, lines, planes and solids in different positions.
- To make the students draw the projections of the planes.
- To understand the isometric projections.
- To create simple solid models of various domain applications.

Course Outcomes(s)

At the end of the course, students will be able to

| CO# | Course Outcomes |
|--------|--|
| C124.1 | Apply the concepts of engineering curves in construction using AutoCAD. |
| C124.2 | Solve the problem of projections of points and lines, in different positions using AutoCAD. |
| C124.3 | Solve the problem of projections of planes and solids in different positions using AutoCAD. |
| C124.4 | Solve the problems of Projections of solids and its positions using AutoCAD. |
| C124.5 | Solve the problems on Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions using AutoCAD. |
| C124.6 | Solve the problems on Orthographic Projections and its conversions using AutoCAD. |

COURSE CONTENT (SYLLABUS)

Introduction to AutoCAD Software: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

UNIT I:

Introduction to Engineering Drawing: Principles of Engineering drawing and their significance, Conventions, Drawing Instruments. Engineering Curves: Construction of Ellipse, Parabola and Hyperbola - General and Special methods; Cycloidal curves- Epicycloids and Hypocycloids.

UNIT II:

Orthographic Projections, Projections of Points & Straight Lines: Principles of Orthographic Projections - Conventions; Projections of Points in all positions; Projections of lines inclined to both the planes.

Projections of Planes: Projections of Planes- Surface Inclined to both the Planes.

UNIT III:

Projections of Regular Solids: Projections of Regular Solids inclined to both the Planes - Prisms, Pyramids, Cylinder and Cone.

Sections and Sectional Views: Right regular solids - prism, cylinder, pyramid, cone - use of Auxiliary views.

UNIT IV:

Isometric Projections: Principles of Isometric projection - Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and Compound Solids.

UNIT V:

Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

Introduction to Solid Modelling: Creation of simple solid models relevant to the domain.

Text Books:

1. Engineering Drawing, N. D. Bhatt, 53rd Edition, Charotar Publishing House, 2016.
2. Textbook on Engineering Drawing, K. L. Narayana & P. Kannaiah, SciTech Publishers, 2010.
3. Engineering Drawing and Computer Graphics, M. B. Shah & B. C. Rana, Pearson Education, 2010.
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
5. Engineering graphics and design, Pradeep Jain, A.P Gautam and Ankitha Maheshwari.

REFERENCES BOOKS:

1. Mastering AutoCAD 2019 and AutoCAD LT 2019, George Omura and Brian C. Benton (Auto CAD 2019), 1st Edition, John Wiley & Sons, Indianapolis, Indiana.

2. AutoCAD Software Theory and User Manuals.
3. Engineering Design, George E. Dieter, Linda C. Schmidt/third edition.
4. Engineering Drawing and design, Cencell Jonson, Jay D.Helsel, Dennis R.Short.
5. Engineering Drawing, Jolhe/fourth edition.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/103/112103019/>
2. <https://nptel.ac.in/courses/112/104/112104172/>

Web Reference/E-Books:

1. <http://nptel.ac.in/courses/112103019>
2. <http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html>
3. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_scienc_e_students/engineeringdrawing.pdf

Software Required: AUTOCADD

WORKSHOP TECHNOLOGY
I B.TECH., MECH - II SEM

| | |
|---|---------------------------------------|
| Course Title: WORKSHOP TECHNOLOGY | Course Code: AS20-03ES03 |
| Teaching Scheme (L: T:P): 3:1:0 | Credits: 3 |
| Type of Course: Lecture + Tutorial | Total Contact Periods:48 Hrs + 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: None | |

Course Overview:

Workshop technology which is grassroots knowledge of any manufacturing industries. this course designed in such a way that students able to understand and perform of basics of workshop technology such as foundry, carpentry, fitting, forging, welding, metal forming, processing of plastics etc.

Course Objective:

Student will be able to

- Use basic workshop tools and its operations.
- Understand the process of drilling, foundry, mechanical working of metals.
- Explain the various welding processes applicable in the manufacturing industries.
- Describe the sheet metal work operations.
- describe the fitting, forging, rolling fundamentals
- Describe the various types of extrusion and Processing of Plastics.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C125.1 | Use basic workshop tools and its operations. |
| C125.2 | Explain the drilling, foundry, mechanical working of metals. |
| C125.3 | Distinguish the various welding processes applicable in the manufacturing industries. |
| C125.4 | Explain the sheet metal work operations. |
| C125.5 | Explain the fitting, forging, rolling fundamentals |
| C125.6 | Explain the various types of extrusion and Processing of Plastics. |

COURSE CONTENT (SYLLABUS)**UNIT - I**

Carpentry: Marking & measuring tools, cutting tools: saws, chisels, planes, boring tools, striking tools, holding devices, Miscellaneous tools, Carpentry Processes, carpentry joints, Wood working machines

Fitting: Cutting tools: chisels, files, scrapers, saws, drill bits, reamer, taps, dies and sockets. Striking Tools, Holding Devices, Marking Tools, Miscellaneous Tools, Checking and measuring instruments, Fitting Operations.

Forging: Hand forging tools, Equipment, Smith Operations, Machine Forging, Forging defects.

UNIT - II

Sheet Metal Work: Sheet metal hand tools: Measuring tools, stakes, Sheet Metal Operations: shearing, bending, drawing, squeezing, Sheet Metal Joints: Hem joints, Fastening Methods.

Drilling: Type of drilling machines, Drill bits, Operations.

UNIT - III

Foundry: Introduction, Foundry equipment: Hand moulding tools, sands, types of moulding sand, pattern making, cores.

Welding: Classification - Types of welds, welded joints, their characteristics and Design of welded joints; Welding Positions.

Cutting of Metals: Oxy Acetylene gas cutting, Plasma cutting.

UNIT - IV

Mechanical working of metals: introduction, hot working process, cold working process.

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion- Forward extrusion and backward extrusion - Impact extrusion - Extruding equipment - Tube extrusion, Hydrostatic extrusion. Forces in extrusion

UNIT - V

Rolling fundamentals: theory of rolling, types of Rolling mills and products. Drawing and its types - wire drawing and Tube drawing -Types of presses and press tools.

Processing of Plastics: Types of Plastics, Properties, applications, their processing methods and equipment (blow and injection moulding)

Text Books:

1. Workshop Technology Vol I & II by Raghuvanshi
2. Manufacturing Technology (Vol I) by P N Rao (Mc Graw Hill)
3. Workshop Technology, R.S. Khurmi/Second edition
4. Workshop Technology, Pakirappa
5. Workshop Technology, Hazra Chowdhary/Sixth edition (Media Promoters)

References Books:

1. Elementary Workshop Technology by HazraChowdary& Bhattacharya (Media Promoters)
2. Production Technology by Jain & Gupta (Khanna Publishers)
3. Production Technology /Sarma P C /S. Chand
4. Workshop Technology and practice, Segun R. Bello
5. Workshop Technology, Bello R.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/104/112104195/>
2. <https://www.coursera.org/learn/advanced-manufacturing-process-analysis>
3. <https://www.classcentral.com/course/swayam-manufacturing-process-technology-i-ii-5289>

ENGINEERING PHYSICS LAB
I B.TECH., II SEM

| | |
|--|------------------------------|
| Course Title: ENGINEERING PHYSICS LAB | Course Code: AS20-00BS05 |
| Teaching Scheme (L:T:P): (0:0:3) | Credits: 1.5 |
| Type of Course: Practical | Total Contact Periods: 48Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: 1. The student must know the usage of basic tools for measurement of physical quantities. 2. The students must have knowledge of error analyses, types of errors, principles of optics, mechanics, waves and Oscillations | |

Course Overview:

The course deals with experiments in various fields of physics such as Wave Optics, Wave mechanics, Electronics, Electricity and Magnetism.

Course Objective

1. The student understands the different types of harmonic oscillators.
2. The student understands the electromagnetic modes of energy transmission.
3. The student understands the geometrical and physics properties of light using mercury vapor lamp
4. The student explores the interference and diffraction of light.
5. The student classifies the P-type and n-type semiconductors.
6. The student estimates the quality factor of electrical resonance.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C126.1 | Evaluate the rigidity modulus and spring constant using torsional pendulum and coupled oscillator |
| C126.2 | Explore the different electromagnetic modes of energy transmission using Melde's and Stewart and Gees experiments |
| C126.3 | Identify the difference between interference, diffraction and dispersion of light |
| C126.4 | Explore the interference of light using newtons rings and diffraction of light using diffraction gratings. |
| C126.5 | Classify the p-type and n-type semiconductors using Hall effect. |
| C126.6 | Estimate the quality factor of the resonance using different LCR values |

COURSE CONTENT (SYLLABUS)

The students have to perform any eight of the following experiments

1. Torsional pendulum -Rigidity modulus of given wire.
2. Coupled Oscillator - Determine the spring constant.
3. Melde's experiment -Transverse and Longitudinal modes.
4. Stewart and Gee's method-Magnetic field along the axis of current carrying coil.
5. Spectrometer-Dispersive power of the material of a prism.
6. Diffraction grating - Determination of wavelengths spectral lines of Mercury spectrum by minimum deviation method.
7. Diffraction grating -Wavelength of laser light.
8. Newton's Rings -Radius of curvature of Plano convex lens.
9. Hall effect- Determination of Hall Voltage and Hall Coefficient.
10. LCR Circuit -Determination of quality factor and resonant frequency of LCR circuit.

References Books:

1. Practical physics by Dr. Aparna, V.G.S.publications.
2. Physics practical lab manual -SPEC

Online Resources :

1. <https://www.futurelearn.com/courses/teaching-practical-science-physics>
2. <https://www.vlab.co.in/broad-area-physical-sciences>

PROGRAMMING FOR PROBLEM SOLVING LAB I B.TECH., II SEM

| | |
|---|------------------------------|
| Course Title: PROGRAMMING FOR PROBLEM SOLVING LAB | Course Code: AS20-05ES02 |
| Teaching Scheme (L:T:P)0:0:3 | Credits:1.5 |
| Type of Course: Practical | Total Contact Periods: |
| Continuous Internal Evaluation- 30 Marks | Semester End Exams- 70 Marks |
| Prerequisites: - Mathematics knowledge, Analytical and Logical skills | |

Course Overview:

This course provides the fundamental concepts of programming using C language, apply the control structures, iterations statements, arrays, functions, strings, pointers, structures, unions and files. This course also explains the concepts of searching and sorting techniques in C language.

Course Objective

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C127.1 | Develops algorithms for simple problems. |
| C127.2 | Translate given algorithms to a working and correct program. |
| C127.3 | Identifies and correct syntax errors as reported by the compilers. |
| C127.4 | Identifies and correct logical errors encountered during execution. |
| C127.5 | Demonstrates data operations using arrays, strings, structures and pointers of different types. |
| C127.6 | Creates, reads and writes to and from simple text and binary files. |

COURSE CONTENT (SYLLABUS)

Practice Sessions:

Week1:

Tutorial 1: Problem solving using computers(Creating, Compiling & Running Steps , Basic Structure of C Program)-:

Lab1: Familiarization with programming environment

Week2:

Tutorial 2: Variable types and Rules, Formatted I/O statements

Lab 2: Reading and Displaying Different Values Using scanf() & Printf()

Week3:

Tutorial 3: Types of Operators

Lab 3: Simple Computational problems using operators

Week4:

Tutorial 4: Branching and logical expressions:

Lab 4: Problems involving if-then-else structures

Week5:

Tutorial 5: Loops, while, do-while and for loops:

Lab 5: Iterative problems e.g., sum of series, sum of n- natural numbers

Week6:

Tutorial 6: 1D Arrays: searching, sorting:

Lab 6: 1D Array manipulation : insertion, selection and bubble sort

Week7:

Tutorial 7: 2D arrays and Strings

Lab 7: Matrix problems, String operations, string sorting , palindrome string

Week8:

Tutorial 8: Functions, call by value:

Lab 8: Simple functions: factorial ,sum of individual digits, Fibonacci series etc.,

Week9:

Tutorial 9: Recursion, structure of recursive calls

Lab 9: Recursive functions: factorial, Fibonacci, GCD and towers of Hanoi

Week10:

Tutorial 10: Pointers, structures and dynamic memory allocation

Lab 10: Problem solving using Pointers and structures

Week11:

Tutorial 11: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 11: Programming for solving Numerical methods problems

Week12

Tutorial 12: Single Linked List using self referential structures

Lab 12: Implementation of Single linked list using self referential structures

Week13:

Tutorial 13: File data type , File pointer, modes of operations, file handling functions

Lab 13: Programs using file handling functions: File copy, Merging of Files

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

References Books:

1. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
2. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
3. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <http://nptel.ac.in/courses/106105085/>
2. <http://nptel.ac.in/courses/106106127/>

Web Reference/E-Books:

1. www.leetcode.com
2. www.thenewboston.com
3. www.codesdope.com

ENGINEERING PRACTICES

I B.TECH. II SEM

| | |
|---|----------------------------------|
| Course Title: ENGINEERING PRACTICES | Course Code: AS20-03 ES02 |
| Teaching Scheme (L:T:P): 0:0:4 | Credits: 2 |
| Type of Course: Practical | Total Contact Periods: 64 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams- 70 Marks |
| Prerequisites: None | |

Course Overview:

Mechanical Engineering Practices is a place where students acquire knowledge on the operation of various processes involved in manufacturing and production. The Workshop Practice course makes students competent in handling practical work in engineering environment.

Course Objective

The objectives of this course are to

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.

- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C128.1 | Apply the concepts of engineering workshop practice on machine tools and their operations. |
| C128.2 | Expertise on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding. |
| C128.3 | Recognize the tools and apply different trades of Engineering practices on drilling, material removing, measuring, chiseling etc. |
| C128.4 | Apply basic knowledge on electrical engineering for house wiring practice. |
| C128.5 | Manufacture the given material to desired product in a particular pattern by tin smithy. |
| C128.6 | Mould the component of different size and shape by black smithy in on Furnace |

COURSE CONTENT (SYLLABUS)

1. **TRADES FOR EXERCISES:**At least two exercises from each trade:
 - I. Carpentry - (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint).
 - II. Fitting - (V-Fit, Dovetail Fit & Semi-circular fit).
 - III. Tin-Smithy - (Square Tin, Rectangular Tray & Conical Funnel).
 - IV. Foundry - (Preparation of Green Sand Mould using Single Piece and Split Pattern).
 - V. Welding Practice - (Arc Welding & Gas Welding).
 - VI. House-wiring - (Parallel & Series, Two-way Switch and Tube Light).
 - VII. Black Smithy - (Round to Square, Fan Hook and S-Hook).

2. TRADES FOR DEMONSTRATION & EXPOSURE:Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working.

Text Books:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

References Books:

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/107/112107145/>
2. <https://nptel.ac.in/courses/112/107/112107144/>

Web Reference/E-Books:

1. https://books.google.co.in/books/about/MECHANICAL_WORKSHOP_PRACTICE.html?id=rHhJlb-_ye4C
2. <https://www.youtube.com/watch?reload=9&v=4gpjof5ESKQ>

SOFT SKILLS -II
I B.TECH. CIVIL-II SEM

| | |
|-------------------------------------|-------------------------------|
| Course Title: Soft Skills -II | Course Code: AS20-00HS04 |
| Teaching Scheme (L:T:P):2:0:0 | Credits: Nil |
| Type of Course: Lecture | Total Contact Periods: 32 Hrs |
| Continuous Internal Evaluation: Nil | Semester End Exams: 100 Marks |
| Prerequisites: Softskills-I | |

Course Objective:-

1. To develop Optimistic Nature.
2. To enhance the skills related to Group Discussion.
3. To make the students to have commitment.
4. To have dedication as well determination.
5. To develop confidence.

Course Outcomes:

| CO# | Course Outcomes |
|--------|---|
| C129.1 | Analyze excellent behavioral attitude. |
| C129.2 | Apply amicable solutions to problematic issues in life. |
| C129.3 | Understand the importance of functional and practical work. |
| C129.4 | Create goal oriented personality. |
| C129.5 | Understand soft skills and life skills. |
| C129.6 | Remember to be committed and determined. |

COURSE CONTENT (SYLLABUS)

UNIT I: Linguistic Ability

Writing Skills - Reading Skills - Listening Skills - Speaking Skills - Just a Minute Program - JAM - Improving Vocabulary.

UNIT II: Effective Communication

Introduction - Communicative Methodology - Way to Communicate perfectly - Communicative series - Descriptive

Communication - Process of Communication - Barriers of Communication - Essentials of Communication - Improving existing Communication - Strategies to improve Communication - Corporate Communication - Assess the Communication - How to be a successful Communicator.

UNIT III: Ethical Values

Meaning of Ethics- Importance of Education - Moral Values - Eradication of problems - Influence of the society - Developing self-motivational skills - Source of Ethics - Develop Ethics - Ethics related to Life.

UNIT IV: Confidence

Self Confidence - Self Esteem - Importance of Confidence - Right decision Making - Turn towards Productivity - Things can be had with Confidence - Self Identity - Building good career - Self Reliance - Quotes of Confidence.

UNIT V: Introduction

Initiation - Verbal Oriented - Purpose of Group Discussion - Importance of Group Discussion - Involvement in Group Discussion - Learning Attitude - Skill Development Platform - Primary Level Topics and Discussion - Able Participation - Practice Group Discussion.

Text Books:

1. Body Language in the work place - Allan and Barbara Pease 2011.
2. Students Handbook: Skill Genie - Higher education department, Government of Andhra Pradesh.
3. Soft Skills - Odhisha State Open University.

Web References:

1. Extraordinary Communication Skills - By Sandeep Maheshwari | Hindi & English Speaking Practice Tips <https://www.youtube.com/watch?v=VczVqHJW0gg>
2. Effective Communication Skills Training Video in Hindi <https://www.youtube.com/watch?v=kxAXOh5RmwU>

3. A guide to effective communication <https://w.youtube.com/watch?v=JwjAAgGi-90>
4. A Failure to Communicate <https://www.youtube.com/watch?v=8Ox5LhIJSBE>
5. Non Verbal Communication <https://www.youtube.com/watch?v=SKhsavlvuao>

**B.TECH
SECOND YEAR
FIRST SEMESTER SYLLABUS**

UNIVERSAL HUMAN VALUES II
II B.TECH I SEM

| | |
|--|-------------------------------------|
| Course Title: UNIVERSAL HUMAN VALUES | Course Code: AS20 – 00HS07 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits: 3 |
| Type of Course: Lecture +Tutorial | Total Contact Periods: 48Hrs+ 16Hrs |
| Continuous Internal Evaluation- 30 Marks | Semester End Exams-70 Marks |

Prerequisites:

1. The student must have basic knowledge of Need, Basic Guidelines, Content and Process for Value Education
2. Understanding Harmony in the Human Being - Harmony in Myself
3. The student must have fundamental knowledge Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship
4. The student can able to Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Course Overview:

This course is designed for transferring the right understanding and definite human conduct in the students. The conduct of every human differs from human to human. Through this course an attempt is being made to introduce the definite human conduct in students. The conduct of a human being can be definite only if knowledge of right understanding and right human conduct is taught to them.

Course Objective

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration aboutthemselves (human being),family, society and nature/ existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcome(s)

| CO# | Course Outcomes |
|--------|---|
| C211.1 | Basic guideline of human values universally. |
| C211.2 | Understanding the harmony in the human being |
| C211.3 | Learn the rights and responsibilities as an employee, team member and a global citizen |
| C211.4 | To know about society – Harmony @ human relation |
| C211.5 | The student can study the professional ethics and values. |
| C211.6 | Understand the importance of Values and Ethics in their personal lives and Professional careers |

COURSE CONTENT (SYLLABUS)**UNIT - I****Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

Purpose and motivation for the course, recapitulation from Universal Human Values-I- Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels. (Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking)

UNIT - II**Understanding Harmony in the Human Being - Harmony in Myself!**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body' . Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as

an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT- III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT - IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and selfregulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic

perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT - V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly, and eco-friendly production systems, c. Ability to identify and develop appropriate, technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Sum up, Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Books

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

E-RESOURCES:

1. <https://www.yourmorals.org/schwartz.2006.basic%20human%20values.pdf>
2. https://web.archive.org/web/20080311200942/https://kroc.nd.edu/ocpapers/op_16_1.pdf
3. https://kroc.nd.edu/ocpapers/op_16_1.pdf
4. https://www.google.com/search?sa=X&biw=1366&bih=657&sxsr=ALeKk032tvNCeLhiX_fL4ciefThZdeN_vQ:1607766793377&q
5. https://www.researchgate.net/publication/270388493_Variations_in_Value_Orientation

WEB REFERENCES:

1. <https://furhhd.org/our-programmes/education-and-ethics/universal-human-values-ethics/>
2. https://www.google.com/search?sa=X&biw=1366&bih=657&sxsr=ALeKk032tvNCeLhiX_fL4ciefThZdeN_vQ:607766793377&q=WEBRESOURCES
3. <https://www.un.org/press/en/2003/sgsm9076.doc.htm>
<https://www.kobo.com/ebook/the-psychology-of-conservatism-routledge-revivals>

MECHANICS OF SOLIDS

II B.TECH., MECH. -I SEM

| | |
|---|--------------------------------------|
| Course Title: MECHANICS OF SOLIDS | Course Code: AS20-03PC01 |
| Teaching Scheme (L:T:P): 3:0:0 | Credits:3 |
| Type of Course: Lecture + Tutorial | Total Contact Periods:48 Hrs+ 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Engineering Mechanics | |

Course Overview: Student will learn Properties and strength of material.

Course Objective

- Student is exposed to the concept of different types of loads, stresses, strains and analysis of members for axial loads.
- Student will acquire knowledge in drawing bending and shear force diagrams of beams of various loads and configurations.
- Student becomes familiar with methods of evaluation of deflection of beams of various configurations and stresses that arise due to simple bending.
- Student is exposed to the concept of shear stresses in beams, principal stresses, strains and phenomenon of torsion.
- Student will acquire knowledge in estimating stresses for thin, thick cylindrical shells and buckling of columns.

Course Outcomes (s)

| CO# | Course Outcomes |
|--------|--|
| C212.1 | Determine stresses and strains in members subjected to axial loads and temperature changes. |
| C212.2 | Draw shear force, bending moment diagrams for different types of beams and calculate stresses and strains due to simple bending. |
| C212.3 | Determine slope and deflection for various configurations of beams using different methods. Analyze stress, strain and deflection due to torsion in circular members |
| C212.4 | Analyze shear stress distribution in different sections of beams and find out principal stresses and strains. |
| C212.5 | Find out stresses and strains in thin, thick cylindrical shells and also able to calculate critical buckling loads in columns and struts |
| C212.6 | Design cylinders and torsions to support a given load. |

COURSE CONTENT (SYLLABUS)

UNIT-I:

Stresses and Strains: Definitions, types of stresses and strains, elasticity and plasticity. Hooke's law, stress strain diagrams for engineering materials, modulus of elasticity. Poisson's ratio, relationship between elastic constants, linear and volumetric strains, bars of uniform strength, temperature stresses, compound bars.

UNIT-II:

Beams: Definition of bending moment and shear force; relationship between intensity of loading, shear force and bending moment; bending moment and shear force diagrams for cantilever, simply supported and overhanging beams; simple theory of bending, moment of resistance, modulus of section.

UNIT-III:

Slopes and Deflections: Slope and deflection calculations of cantilever, simply supported beams subjected to point loads and uniformly distributed loads with Macaulay's and double integration methods.

Torsion: Derivation of torsion formula for circular sections, power transmission, effect of combined bending and torsion.

UNIT-IV:

Shear Stresses in beams: Distribution of shear stresses in rectangular, I-section, T-section, solid and hollow circular sections.

Compound stresses: Principal stresses and strains. Mohr's circle of stress.

UNIT-V:

Cylinders: Stresses in thin and thick cylinders with internal and external pressures. Stresses in compound cylinders.

Columns and struts: Euler's and Rankine's formulae for axial load applications. Secant and Perry formulae for eccentrically loaded columns.

Text Books

1. S.S.Rattan, "Strength of Materials", 3/e, Tata Mc-Graw Hill, 2016.
2. S. Ramamrutham, "Strength of Materials", Dhanpatrai and Sons, 1993.
3. G.H.Ryder, "Strength of Materials", 3/e, Macmillan India Limited, Delhi 2002.
4. Strength of materials - R.S. Kurmi and Gupta.
5. Solid Mechanics, by Popov.

References:

1. S.S. Bhavakatti, "Strength of Materials", Vikas Publication, 2003.
2. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd.
3. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.
4. James M Gere, "Mechanics of materials", 8/e, Cengage learning, 2013.

5. R.C. Hibbeler, "Mechanics of Materials", 9/e, Pearson, 2018.
6. Mechanics of Structures Vol -I by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.

E-Resources:

1. <https://nptel.ac.in/courses/105/104/105104160/>
2. <https://nptel.ac.in/courses/112/102/112102284/>
3. <https://nptel.ac.in/courses/112/107/112107146/>
4. <https://nptel.ac.in/courses/112/107/112107147/>
5. <https://nptel.ac.in/courses/112/106/112106141/>
6. <https://nptel.ac.in/courses/105/105/105105108/>

PRODUCTION TECHNOLOGY

II B.TECH., MECH - I SEM

| | |
|--|--|
| Course Title: PRODUCTION TECHNOLOGY | Course Code: AS20-03PC02 |
| Teaching Scheme (L: T:P): 3:1:0 | Credits: 3 |
| Type of Course: Lecture + Tutorial | Total Contact Periods: 48 Hrs + 16 Hrs |
| Continuous Internal Evaluation- 30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Workshop Technology | |

Course Overview:

Manufacturing which is grassroots knowledge of any manufacturing industries. this course designed in such a way that students able to understand and perform of basics of manufacturing process such as casting, welding, metal forming, processing of plastics etc.

Course Objective

Student will able to

- Describe the Casting Process and terminology used in casting
- Describe the various types of patterns, gating systems and solidification of pure and alloy metals
- Identify various welding processes used in Manufacturing industry
- Explain the advanced welding processes.
- Explain the different deformation processes
- Explain the various extrusion, forging process and Processing of Plastics

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C213.1 | Classify the types, materials, allowances and defects in casting |
| C213.2 | Explain different types of patterns used in casting, design of gating systems and solidification. |
| C213.3 | Distinguish the various welding processes applicable in the manufacturing industries. |
| C213.4 | Explain the advanced welding processes, defects and testing of welds |
| C213.5 | Develop process-maps for metal forming processes using plasticity principles. |
| C213.6 | Explain the various types of extrusion, forging processes and Processing of Plastics. |

COURSE CONTENT (SYLLABUS)

UNIT I:

Casting: Steps involved in making a casting -Advantage of casting and its applications; Patterns -Pattern making, Types, Materials used for patterns, pattern allowances; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation - Defects in castings; Principles of Gating- Requirements - Types of gates, Gating Ratio, Design of gating systems - Riser - Function, types of Riser and Riser design. Casting processes - Types - Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Solidification of casting - Solidification of pure metal, Directional Solidification.

Melting furnaces used in metal casting: Crucible furnace, Cupola furnace, Electric furnace, induction furnace, open hearth furnace

UNIT II:

Welding: Classification - Types of welds, welded joints, their characteristics and Design of welded joints; Welding Positions - Gas welding - Types, Gas welding, Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding and Plasma welding.

Cutting of Metals: Oxy Acetylene gas cutting, Plasma cutting. Standard time and cost calculations.

UNIT III:

Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, Friction Stir Welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding.

Welding defects - causes and remedies; destructive and non-destructive testing of welds.

UNIT IV:

Hot and cold working: strain hardening, recovery, recrystallisation and grain growth. Comparison of properties of cold and hot worked parts.

Sheet metal Operations: Stamping, Blanking and piercing, Coining, Strip layout, Hot and cold spinning - Bending and deep drawing.

Rolling fundamentals: theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements. Drawing and its types - wire drawing and Tube drawing -. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT V:

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion- Forward extrusion and backward extrusion - Impact extrusion - Extruding equipment - Tube extrusion, Hydrostatic extrusion. Forces in extrusion

Forging Processes: Forging operations and principles - Tools - Forging methods - Smith forging, Drop Forging - Roll forging - Forging hammers: Rotary forging - forging defects - cold forging.

Processing of Plastics: Types of Plastics, Properties, applications, their processing methods and equipment (blow and injection moulding)

Text Books:

1. Manufacturing Technology / P.N. Rao Vol.1 & 2 / Mc Graw Hill
2. Manufacturing Engineering & Technology / SeropeKalpakjian / Steven R. Schmid / Pearson
3. Production Technology /Sarma P C /S. Chand
4. Production Technology / R.K. Jain/Khanna Publishers
5. Industrial Management and Production Management, Martand T.Telsang/S.Chand Publications

References Books:

1. Metal Casting / T.V Ramana Rao / New Age
2. Production Technology / G. Thirupathi Reddy / Scitech
3. Manufacturing Processes/ J.P. Kaushish / PHI Publications

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://www.coursera.org/learn/advanced-manufacturing-process-analysis>
2. <https://www.classcentral.com/course/swayam-manufacturing-process-technology-i-ii-5289>

MATERIAL SCIENCE AND METALLURGY

II B.TECH., MECH. -I SEM

| | |
|---|--|
| Course Title: MATERIAL SCIENCE AND METALLURGY | Course Code: AS20-03ES04 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits:3 |
| Type of Course: Lecture + Assignment | Total Contact Periods: 48 Hrs + 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Engineering Chemistry | |

Course Overview: Materials Science and metallurgy is concerned with the generation and application of knowledge relating the composition, structure and processing of materials to their uses. The field encompasses the spectrum of materials that covers metals, ceramics, polymers, semiconductors, and combinations of materials or composites. Metallurgical engineering is a broad field that studies the physical and chemical behaviour of metallic elements, inter metallic compounds and their alloys. Extractive metallurgy involves extracting metal from ore. Chemical metallurgy deals with chemical properties of metals including uniting of different metals with one another to form alloys.

Course Objective: The subject deals with the materials and their properties, commonly used for the manufacturing various components in industry. It also focuses on study of various phase diagrams of alloy materials. The ferrous materials and Non Ferrous materials, their properties and applications in the industries are incorporated. The importance of polymers, ceramics and composite materials are included.

Course Outcomes(s)

| CO | Course Outcomes |
|--------|--|
| C214.1 | Explain basic concepts of crystal structure such as unit cells, crystal systems of metals etc. |
| C214.2 | Demonstrate the concept of alloying and formation of different types of phases in alloys. |
| C214.3 | Differentiate ferrous and non-ferrous alloys. |
| C214.4 | Explain various heat treatment processes. |
| C214.5 | Classify and explain polymers, ceramics and composites. |
| C214.6 | Explain Properties of Nano materials |

COURSE CONTENT (SYLLABUS)

UNIT I: CRYSTAL STRUCTURE Unit cells, crystal systems of metals, crystal planes and directions, slip systems, Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms, determination of grain size, effect of grain size on the properties of alloys and Hall - Petch equation.

UNIT II: ALLOYS & PHASE DIAGRAMS Alloys- substitutional and interstitial solid solutions. Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstructure of ledeburite, austenite, ferrite and cementite.

UNIT III: FERROUS AND NON FERROUS ALLOYS Alloying of steel, properties of stainless steel and tool steels, maraging steels; cast irons-grey, white, malleable and spheroidal cast irons; copper and copper alloys- brass, bronze and cupro-nickel; Aluminium and Aluminium alloys.

UNIT IV: HEAT TREATMENT OF STEEL Annealing, tempering, normalizing and spheroidising, austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening. Isothermal transformation diagrams for Fe-C alloys and

microstructure development, Continuous cooling curves and interpretation of final microstructures and properties.

UNIT V: POLYMERS, CERAMICS AND COMPOSITES

Classification, properties and applications of polymers, ceramics, composites and nano materials.

Text Books:

1. V. Raghavan, 'Material Science and Engineering', Prentice Hall of India Private Limited, 1999.
2. U. C. Jindal, 'Engineering Materials and Metallurgy', Pearson, 2011.
3. Sidney H. Avener (2007,) Introduction to Physical Metallurgy, 2nd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
4. Material Science and Engineering, Hugh Schercliff
5. Material Science and Engineering, David G. Rethwisch and William Callister

References Books:

1. W. D. Callister, 2006, 'Materials Science and Engineering-An Introduction', 6th Edition, Wiley India.
2. Kenneth G. Budinski and Michael K. Budinski, 'Engineering Materials', Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.
3. V. D. Kodgire (2006), Material Science and Metallurgy for engineers, 1st Edition, Everest, Pune, India. Web
4. An introduction to materials, Hector L. Mancini
5. The science and engineering materials, Donald Askeland, third S.I edition

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://ocw.mit.edu/courses/materials-science-and-engineering/>
2. <https://www.mooc-list.com/tags/materials-science>

THERMODYNAMICS

II B.TECH., MECH. -I SEM

| | |
|---|--|
| Course Title: THERMODYNAMICS | Course Code: AS20-03PC03 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits:03 |
| Type of Course: Lecture + Tutorial | Total Contact Periods:48 Hrs + 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Engineering Chemistry, Engineering Physics | |

Course Overview:

Develops understanding of mass, energy, heat, work, efficiency, ideal and real thermodynamic cycles and processes. Covers first and second laws of thermodynamics, perfect gas law, properties of real gases, and the general energy equation for closed and open systems.

Course Objective:

To be able to state the First Law and to define heat, work, thermal efficiency and the difference between various forms of energy.

To be able to identify and describe energy exchange processes (in terms of various forms of energy, heat and work) in aerospace systems.

Course Outcome(s):

| CO# | Course Outcomes |
|--------|---|
| C215.1 | Understand the after completing this course various thermodynamic systems and processes |
| C215.2 | Understand the after completing this course basic laws of thermodynamics |
| C215.3 | Evaluate the performance of energy conversion devices. |
| C215.4 | Understand property values during any process by using concepts of a mixture of gasses |
| C215.5 | Analyze the thermodynamic cycles and evaluate performance parameters |
| C215.6 | Estimate the analysis of Air standard cycles with air water – vapour mixtures. |

COURSE CONTENT (SYLLABUS)**Unit - I**

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle - Reversibility - Quasi - static Process, Irreversible Process, Causes of Irreversibility - Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics - Concept of Temperature - Principles of Thermometry - Reference Points - Const. Volume gas Thermometer - Scales of Temperature, Ideal Gas Scale.

Unit - II

PMM I - Joule's Experiments - First law of Thermodynamics - Corollaries - First law applied to a Process - applied to a flow system - Steady Flow Energy Equation.

Limitations of the First Law - Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase - Energy Equation, Availability and Irreversibility - Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations - Elementary Treatment of the Third Law of Thermodynamics

Unit - III

Pure Substances, p-V-T-surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations - Triple point at critical state properties during change of phase, Dryness Fraction - Clausius - Clapeyron Equation Property tables. Mollier charts - Various Thermodynamic processes and energy Transfer - Steam Calorimetry.

Perfect Gas Laws - Equation of State, specific and Universal Gas constants - various Non- flow processes, properties, end states,

Heat and Work Transfer, changes in Internal Energy - Throttling and Free Expansion Processes - Flow processes

Unit - IV

Deviations from perfect Gas Model - Vander Waals Equation of State - Compressibility charts - Mixtures of perfect Gases - Mole Fraction, Mass fraction Gravimetric and volumetric Analysis - Dalton's Law of partial pressure, Avogadro's Laws of additive volumes - Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties - Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation - Adiabatic Saturation, Carrier's Equation - Psychrometric chart.

Unit - V

Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle - Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis - comparison of Cycles.

Text Books:

1. Engineering Thermodynamics, P.K. Nag, TMH, 3rd Edition.
2. Thermodynamics, C.P. Arora.
3. Thermodynamics, S.C. Gupta/pearson education india
4. Engineering Thermodynamics, R.K. Rajput/Third edition
5. Thermal physics, Kittel/second edition

References Books:

1. Thermodynamics, An Engineering Approach - Yunus Cengel & Boles, TMH
2. Thermodynamics, J.P. Holman, TMH.
3. Engineering Thermodynamics - Jones & Dugan.

4. An introduction to Thermodynamics, YVC Rao, NewAge.
5. Heat and Thermodynamics, Zemansky and Dittman/Seventh edition/intermediate textbook

Web Reference/E-Books:

| | |
|----|---|
| W1 | http://scienze-como.uninsubria.it/mella/chimfissbac/thermodynamics.pdf |
| W2 | https://www.saylor.org/site/wp-content/uploads/2013/08/BolesLectureNotesThermodynamicsChapter10.pdf |

Video References

| | |
|-----|---|
| V1 | https://www.youtube.com/watch?v=wSxh54XqV74 |
| V2. | https://www3.nd.edu/~powers/ame.20231/planckdover.pdf |
| V3. | nptel.ac.in/courses/102106026 |

MECHANICS OF SOLIDS LAB II B.TECH., MECH. -I SEM

| | |
|---|------------------------------|
| Course Title: MECHANICS OF SOLIDS LAB | Course Code: AS20-03PC04 |
| Teaching Scheme (L:T:P): 0:0:3 | Credits:1.5 |
| Type of Course: Practical | Total Contact Periods:48 |
| Continuous Internal Evaluation-30 Marks | Semester End Exams- 70 Marks |
| Prerequisites: Engineering Mechanics, Mechanics of Solids | |

Course Overview: Student will learn Properties and Strength of Materials.

Course Objective: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C216.1 | Calculate modulus of Elasticity for given material from the Tension test, deflection test on simply supported, cantilever and continuous beams. To verify Maxwell's reciprocal theorem on given beam. |
| C216.2 | Calculate direct stress (normal and shear) from Compression and Shear tests on given specimen. |
| C216.3 | Calculate modulus of rigidity of given material from Torsion test on circular shaft and spring test. |
| C216.4 | Calculate Impact strength and hardness of given material from Charpy /Izod impact tests and Brinell / Rockwell hardness tests. |
| C216.5 | Calculate strain in given cantilever beam using electrical resistance strain gauge. |
| C216.6 | Design cylinders and torsions to support a given load. |

COURSE CONTENT (SYLLABUS)

Perform any 10 out of the 12 Exercises.

List of Experiments:

1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam - deflection test.

Web References & E Resources:

1. <https://www.alljntuworld.in/download/strength-materials-lab-manual/>
2. <https://nptel.ac.in/courses/112/107/112107146/>
3. [https://home.iitm.ac.in/kramesh/Strength% 20of %20Materials% 20Laboratory% 20Manual.pdf](https://home.iitm.ac.in/kramesh/Strength%20of%20Materials%20Laboratory%20Manual.pdf)
4. <https://www.youtube.com/watch?v=QyJHs5v-JKc>
5. <https://www.youtube.com/watch?v=AV5VXW4CaUU>
6. https://www.youtube.com/watch?v=jpogdcw_Uh0
7. <https://www.youtube.com/watch?v=T3tc33pd3hQ>

**PRODUCTION TECHNOLOGY LAB
II B.TECH., MECH -I SEM**

| | |
|--|--------------------------------|
| Course Title: PRODUCTION TECHNOLOGY LAB | Course Code: AS20-03PC05 |
| Teaching Scheme (L: T:P): 0:0:3 | Credits:1.5 |
| Type of Course: Practical. | Total Contact Periods:48 Hours |
| Continuous Internal Evaluation- 30 Marks | Semester End Exams- 70 Marks |
| Prerequisites: - | |

Course Overview:

manufacturing which is grassroots knowledge of any manufacturing industries. this course designed in such a way that students able to understand and perform of basics of manufacturing process such as casting, welding, metal forming, processing of plastics etc.

Course Objective

Students will able to

- Explain the process of pattern making (Understanding)
- Explain the properties of moulding sand and steps in Moulding, Melting and Casting (Understanding)
- Explain the Fabrication of joints using gas welding and arc welding (Understanding)
- Explain the Process of Blanking & Piercing operation and study of simple, compound and progressive press tool. (Understanding)
- Explain the process of deep drawing, bending and extrusion process (Understanding)
- State the process of injection moulding and blow moulding (Remembering)

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C217.1 | Execute the pattern making by considering suitable allowances |
| C217.2 | Execute casting process and sand properties testing for a given material. |
| C217.3 | Execute Fabricated joints using gas welding and arc welding |
| C217.4 | Execute blank and pierce on a given component by using blanking and piercing operation |
| C217.5 | Execute deep drawing, bending and extrusion process for a given Component. |
| C217.6 | Execute the injection moulding and blow moulding for a given component. |

COURSE CONTENT (SYLLABUS)**I. Metal Casting Lab:**

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability - 1
3. Moulding Melting and Casting - 1 Exercise

II. Welding Lab:

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises
(Water Plasma Device)

III. Mechanical Press Working:

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending and other operations

IV. Processing of Plastics

1. Injection Moulding
2. Blow Moulding

References Books:

1. Dictionary of Mechanical Engineering - G.H.F. Naylor, Jaico Publishing House.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/104/112104195/>
2. <https://www.coursera.org/learn/advanced-manufacturing-process-analysis>
3. <https://www.classcentral.com/course/swayam-manufacturing-process-technology-i-ii-5289>

MATERIAL SCIENCE AND METALLURGY LAB II B.TECH., MECH -I SEM

| | |
|---|---------------------------------|
| Course Title: MATERIAL SCIENCE AND METALLURGY LAB | Course Code: AS20-03ES05 |
| Teaching Scheme (L: T:P): 0:0:3 | Credits: 1.5 |
| Type of Course: Practical. | Total Contact Periods: 48 Hours |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: -Engineering Chemistry Lab | |

Course Overview:

Provides an overview of Materials Science and Engineering as a basis for understanding how structure/property/processing relationships are developed and used for different types of materials. Illustrates the role of materials in modern society by case studies of advances in new materials and processes. Laboratory/discussion periods will be devoted to demonstrations and experiments that illustrate the lectures.

Course Objective

The purpose of this course is to make the students learn the concepts of Metallurgy and Material Science role in all manufacturing processes, which convert raw materials into useful products adapted to human needs.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C218.1 | Preparation and study of the microstructure of pure metals like iron, copper and Aluminum |
| C218.2 | Study and execute of the microstructures of Cast Irons |
| C218.3 | Study of the microstructures of non-ferrous alloys |
| C218.4 | Study and execute of microstructure in Heat Affected Zone (HAZ) of welded joint |
| C218.5 | To strengthen a given Al - 4.5% Cu alloy by Age-hardening process. |
| C218.6 | To find out the hardness of various treated and un treated steels |

COURSE CONTENT (SYLLABUS)

Perform any 10 experiments out of 12 experiments

1. Preparation and study of crystal structures
2. Preparation and study of the microstructure of pure metals like iron, copper and Aluminum
3. Preparation and study of the microstructure of Mild steels, low carbon steels, High carbon steels
4. Study of the microstructures of Cast Irons
5. Study of the microstructures of non-ferrous alloys
6. Study of the microstructures of heat treated steels
7. Hardenability of steels by Jomney end quench test
8. To find out the hardness of various treated and un treated steels
9. Study of microstructure in Heat Affected Zone (HAZ) of welded joint
10. Study of Hardness variation across Heat Affected Zone (HAZ) of welded joint.
11. To study the effect of Tempering on hardened steel specimens and to observe the microstructure.
12. To strengthen a given Al - 4.5% Cu alloy by Age-hardening process.

References Books:

1. W. D. Callister, 2006, ?Materials Science and Engineering-An Introduction?, 6th Edition, Wiley India.
2. Kenneth G. Budinski and Michael K. Budinski, ?Engineering Materials?, Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://ocw.mit.edu/courses/materials-science-and-engineering/>
2. <https://www.mooc-list.com/tags/materials-science>

ENVIRONMENTAL SCIENCES

II B. TECH I SEM

| | |
|--------------------------------------|---------------------------------|
| Course Title: Environmental Sciences | Course Code: AS20-00MC01 |
| Teaching Scheme (L:T:P): 3:0:0 | Credits:0 |
| Type of Course: Lecture | Total Contact Periods: 48 Hours |
| Continuous Internal Evaluation- Nil | Semester End Exams-70 Marks |
| Prerequisites: | |

Course Objective:

To learn

- The importance of ecological balance for sustainable development.
- The impacts of developmental activities and mitigation measures.
- The environmental policies and regulations.
- New developmental projects for sustainable development of nations.

Course Outcomes (s)

| CO# | Course Outcomes |
|--------|--|
| C122.1 | Understand the importance of ecological balance and principles |
| C122.2 | Evaluates the impact of developmental activities on ecological balance |
| C122.3 | Understand various environmental acts and policies |
| C122.4 | Gain knowledge about effect of Environment on Human health |
| C122.5 | Understands the importance of environmental regulations helping in sustainable development |
| C122.6 | Develop technologies for the sustainable development based on ecological principles |

COURSE CONTENT (SYLLABUS)

UNIT-I

Ecosystem: Definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food web, Ecological Pyramids, Flow of energy, biochemical cycles, bio accumulation, bio magnification, Carrying capacity, ecosystem value services.

UNIT-II

Natural resources: Water resources: use and over utilization of surface and ground water, floods and droughts, measures taken to mitigate the intensity of floods and droughts. Dams: benefits and problems. Mineral resources: Use and exploitation, Environmental effects of extracting mineral resources, Land resources: Forest resources, uses of forests, causes of Deforestation. Energy resources: Growing energy needs, Renewable and non-renewable energy sources. Use of alternative energy sources and case studies. Projects of renewable energy resources in different states of India.

UNIT-III

Biodiversity and Biotic resources: Introduction, definition, genetic, species and ecosystem diversity. Value of biodiversity, Consumptive use, productive use, social, ethical, aesthetic and optional values. India as a megadiversity nation. Hot spots of biodiversity. Threats to biodiversity, conservation of biodiversity: in-situ and ex-situ conservation and national biodiversity act.

UNIT-IV

Environmental pollution and control technologies:
Environmental pollution: classification of pollution, Air pollution: primary and secondary pollutants, Automobile and Industrial pollution, ambient air quality standards. Water pollution: sources and types of pollution, drinking water quality standards. Soil pollution: sources and types, impacts of modern agriculture, Degradation of soil. Noise pollution: sources and health hazards, standards. Solid waste: characterization and management. e-waste and its management. Pollution control technologies: Wastewater

treatment methods: primary, secondary and tertiary. Overview of air pollution control technologies. Global environmental problems and global efforts: Climate change and impacts on human environment. Ozone depletion and ozone depleting substances (ODS). International conventions/protocols: Earth summit, Kyoto protocol and Montreal protocol.

UNIT-V

Environmental policy, legislation and EIA: Environmental protection act, legal aspects, Air act-1981, Water act, Forest act, Wild life act, Municipal solid waste management and handling rules, biomedical waste management and handling rule, Hazardous waste management and handling rule. EIA: EIA structure, methods of base line data acquisition, overview on impacts of air, water, biological and socio-economical aspects, strategies for risk assessment, concepts of environmental management plan (EMP). Towards sustainable future: concept of sustainable development, population and its explosion, crazy consumerism, Rain water harvesting, Environmental education, Urban sprawl, Human health, Environmental ethics, Concept of green building, Life cycle assessment(LCA).

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.
2. Textbook of Environmental Science and Technology- Dr. M. Anji Reddy, BS Publications.
3. Environmental Studies by Anubha Kaushik, New Age International Publishers.

Reference Books:

1. Environmental Studies by R. Rajagopalan, Oxford University press.
2. Introduction to Environmental Science by Y. Anjaneyulu, BS Publications.
3. Environmental Science: Towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd, NewDelhi.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/120/108/120108002/>
2. https://onlinecourses.nptel.ac.in/noc20_ge16/preview
3. <https://nptel.ac.in/courses/121/106/121106014/>
4. <https://nptel.ac.in/courses/120/108/120108004/>

**B.TECH
SECOND YEAR
SECOND SEMESTER SYLLABUS**

**PROBABILITY, STATISTICS & COMPLEX VARIABLES
II B.TECH., MECH -II SEM**

| | |
|--|--------------------------------------|
| Course Title: PROBABILITY, STATISTICS & COMPLEX VARIABLES | Course Code: AS20-00BS12 |
| Teaching Scheme (L:T:P):3:1:0 | Credits:3 |
| Type of Course: Lecture + Tutorial | Total Contact Periods:48Hrs + 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams -70 Marks |
| Prerequisites: 1.Fundamental Concepts of Probability 2.Knowledge of Basic Statistics 3.Awareness of Complex Number System | |

Course Overview:Course include

- Basics of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basics of statistics including measures of central tendency
- The study of statistical methods for data samples.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.
- Understanding of Mobius transformation

Course Objective To learn

- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples.
- Differentiation and integration of complex valued functions.

- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

Course Outcomes

| CO# | Course Outcomes |
|--------|--|
| C221.1 | Formulate and solve problems involving random variables and Apply Statistical methods for analyzing experimental data. |
| C221.2 | Evaluate the statistical parameters of Probability distributions |
| C221.3 | Test the Hypothesis and Make important decisions for large and small samples |
| C221.4 | Analyze the complex functions with reference to their analyticity Using C-R equations and Harmonic functions |
| C221.5 | Evaluation of integrals by Cauchy integral and find the Taylor's and Laurent's series expansion of complex functions |
| C221.6 | Evaluation of integrals using Residue theorem and bilinear transformation |

COURSE CONTENT (SYLLABUS)

UNIT - I:RANDOM VARIABLES

Introduction to Basic Probability; Random variables: Discrete random variables and continuous random variables, Expectation of Random Variables: Moments, Variance of random variables.

UNIT - II: PROBABILITY DISTRIBUTIONS

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution. Continuous random variables and their properties, parameters for these distributions.

UNIT - III: TESTING OF HYPOTHESIS

Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, types of errors, level of significance, critical region. Large sample test for single proportion, difference of

proportions, single mean, difference of means; small sample tests: Test for single mean, difference of means and test for ratio of variances.

UNIT - IV: ANALYTIC FUNCTIONS

Introduction to Complex functions; Analyticity, Cauchy-Riemann equations (without proof), Finding harmonic conjugate.

UNIT - V: COMPLEX INTEGRATION

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions,

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2014.
2. R.K. Jain, S.R.K. Iyengar Advanced Engineering Mathematics, Narosa Publishing House Pvt. Ltd. 5th Edition, 2016.
3. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Khanna Publications

References:

1. Sheldon. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
2. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications Reprint, 2010.
3. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://www.mooc-list.com/course/probability-basic-concepts-discrete-random-variables-edx>
2. <https://study.sagepub.com/landers2e/student-resources/data-skill-challenges/chapter-5-sampling-distributions>
3. <https://www.mooc-list.com/course/calculus-two-sequences-and-series-coursera>

KINEMATICS OF MACHINES

II B.TECH., MECH. -II SEM

| | |
|---|---------------------------------------|
| Course Title: KINEMATICS OF MACHINES | Course Code: AS20-03PC01 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits:3 |
| Type of Course: Lecture + Tutorial | Total Contact Periods:48 Hrs + 16 Hrs |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Engineering Mechanics | |

Course Overview:

Student will learn the relative motion between the parts of machines.

Course Objective

1. Understand the basic principles of kinematics and the related terminology of machines.
2. Discriminate mobility; enumerate links and joints in the mechanisms.
3. Formulate the concept of analysis of different mechanisms.
4. Understand the working of various straight line mechanisms, gears, gear trains, steering gear mechanisms, cams and a Hooke's joint.
5. Analyze a mechanism for displacement, velocity and acceleration of links in a machine.

Course Outcomes (s)

| CO# | Course Outcomes |
|--------|---|
| C222.1 | Ability to describe the principles of kinematic pairs, chains and their classification. |
| C222.2 | Ability to explain the Degrees Of Freedom, inversions, equivalent chains and planar mechanisms. |
| C222.3 | Analyze the planar mechanisms for position, velocity and acceleration |
| C222.4 | Ability to draw the profiles of cams and followers for specified motions. |
| C222.5 | Evaluate gear tooth geometry and select appropriate gears for the required applications |
| C222.6 | Construct planar four bar and slider crank mechanisms for specified kinematic conditions. |

COURSE CONTENT (SYLLABUS)

UNIT-I

Mechanisms : Elements or Links , Classification, Rigid Link, flexible and fluid link, Types of kinematic pairs , sliding, turning, rolling, screw and spherical pairs lower and higher pairs, closed and open pairs, constrained motion, completely, partially or successfully constrained and incompletely constrained .

Machines: Mechanism and machines, classification of machines, kinematic chain , inversion of mechanism, inversion of mechanism , inversions of quadric cycle, chain , single and double slider crank chains.

UNIT-II

Straight Line Motion Mechanisms: Exact and approximate copiers and generated types Peaucellier, Hart and Scott Russell Grasshopper Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

Steering Mechanisms: Conditions for correct steering Davis Steering gear, Ackermann's steering gear velocity ratio.

Hooke's Joint: Single and double Hookes joint Universals coupling application problems.

UNIT-III

Kinematics: Velocity and acceleration - Motion of link in machine - Determination of Velocity and acceleration diagrams - Graphical method - Application of relative velocity method four bar chain.

Plane motion of body: Instantaneous center of rotation, centroids and axodes - relative motion between two bodies - Three centres in line theorem - Graphical determination of instantaneous center, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT-IV

Cams: Definitions of cam and followers their uses Types of followers and cams Terminology Types of follower motion - Uniform velocity Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers: Roller follower circular cam with straight, concave and convex flanks.

UNIT-V

Gears: Higher pairs, friction wheels and toothed gears types law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding phenomena of interferences. Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact - Introduction to Helical, Bevel and worm gearing.

Gear Trains: Introduction - Train value - Types - Simple and reverted wheel train

Epicycle gear Train. Methods of finding train value or velocity ratio - Epicycle gear trains. Selection of gear box-Differential gear for an automobile.

Text Books:

1. S. S. Rattan [2009], Theory of Machines, TMH Publishers, New Delhi.

2. Sadhu Singh [2012], Theory of Machines, Pearson Education, New Delhi.
3. C.S. Sharma and K. Purohit [2010], Theory of Mechanisms and Machines , PHI publishers, New Delhi.
4. Theory of machines ,R.S Khurmi,Fourth edition
5. Theory of Mechanisms& machines,Ghosh,third edition

Reference Books:

1. Ballaney [2005], Theory of Machines, Khanna Publishers, New Delhi.
2. Thomas Bevan [2005], Theory of Machines, CBS Publishers, New Delhi.
3. J.S. Rao and R.V. Dukkupati [2008], Mechanisms and Machine Theory, NAI Publishers, New Delhi.
4. J.E. Shigley [2010], Theory of Machines and Mechanisms, McGraw Hill Publishers, New York.
5. Theory of Machines and Mechanisms,Gordon R pennock& J Uicker,Oxford Higher education, Fourth edition

Web References:

1. <http://www.umt.fme.vutbr.cz/~ruja/vyuka/kinematics/LectureNotes.pdf>
2. <http://nptel.ac.in/courses/112104121>
3. <https://www.iitg.ernet.in/mech/files/courses/ME224.pdf>
4. <http://www.amu.ac.in/newdata/depttmom/8758.pdf>

E- Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

THERMAL ENGINEERING - I

II B.TECH., MECH -II SEM

| | |
|---|---------------------------------------|
| Course Title: THERMAL ENGINEERING – I | Course Code: AS20-03PC07 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits:03 |
| Type of Course: Lecture + Tutorial | Total Contact Periods:48 Hrs + 16 Hrs |
| Continuous Internal Evaluation- 30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Engineering Thermodynamics | |

Course Overview:

Thermal Engineering is a specialized sub-discipline of mechanical engineering and chemical engineering that deals with the movement of heat energy and transfer. The energy can be transformed between two mediums or transferred into other forms of energy. Many plants use heat exchangers in their operations.

Course Objective:

To apply the laws of Thermodynamics to analyze air standard cycles and to understand and evaluate the perform analysis of the major components and systems of IC engines, refrigeration cycles and their applications.

Course Outcomes:

| CO# | Course Outcomes |
|--------|--|
| C223.1 | Understand working principles of an IC Engine |
| C223.2 | Analyze combustion in SI and CI engines |
| C223.3 | Study performance of an IC Engine |
| C223.4 | Understand working principles of Air-Compressors and Analyze Reciprocating Air- Compressors |
| C223.5 | Understand working principles of Rotary air compressor and to analyze Centrifugal and Axial flow compressors |
| C223.6 | Understand the basic concepts of power and refrigeration cycles. Their efficiency and coefficients of performance. |

COURSE CONTENT (SYLLABUS)

UNIT - I

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air - Standard, air-fuel and actual cycles - Engine systems - Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system.

UNIT - II

Normal Combustion and abnormal combustion in SI engines - Importance of flame speed and effect of engine variables - Abnormal combustion, pre-ignition and knocking in SI Engines - Fuel requirements and fuel rating, anti-knock additives - combustion chamber - requirements, types of SI engines.

Four stages of combustion in CI engines - Delay period and its importance - Effect of engine variables - Diesel Knock- Need for air movement, suction, compression and combustion induced turbulence in Diesel engine - open and divided combustion chambers and fuel injection- Diesel fuel requirements and fuel rating

UNIT - III

Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power - Determination of frictional losses and indicated power - Performance test - Heat balance sheet and chart.

Classification of compressors - Fans, blowers and compressors - positive displacement and dynamic types - reciprocating and rotary types.

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

UNIT - IV

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, mechanical details and principle of working - efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation -velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient - velocity diagrams - power.

Axial Flow Compressors: Mechanical details and principle of operation - velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations- Polytrophic efficiency.

UNIT - V

Gas Turbines: Simple Gas Turbine Plant - Ideal Cycle - Closed Cycle and Open Cycle for Gas Turbines, Constant Pressure Cycle, Constant Volume Cycle, Efficiency - Work Ratio and Optimum Pressure Ratio for Simple Gas Turbine Cycle. Parameters of Performance, Actual Cycle, Regeneration, Intercooling and Reheating - Closed and Semi-Closed Cycle

Refrigeration: Mechanical Refrigeration and types - units of refrigeration-Air Refrigeration system, details and principle of operation-applications of air refrigeration, Vapour compression refrigeration systems - calculation of COP.

Text Books:

1. I.C. Engines / V. Ganesan / Mc Graw Hill
2. Thermal Engineering / Mahesh M Rathore / Mc Graw Hill
3. Thermal engineering in power systems, B.Sunden, R.SAmano, WIT Press
4. Thermal engineering, D.K Chavan, G,K Pathak/Rajson publications Pvt.Ltd/Second edition.
5. Thermal engineering, S.L Gavhale/Niraliprakashan publications

References Books:

1. Applied Thermodynamics for Engineering Technologists / Eastop / Pearson.
2. Fundamentals of Classical Thermodynamics / Vanwylen G.J., Sonntag R.E. / Wiley Eastern.

Department of Mechanical Engineering

3. Internal Combustion Engines Fundamentals - John B. Heywood - McGraw Hill Ed.
4. Thermal science and Engineering, M.L Mathur, F.S. Mehta / third edition / Jain Brothers
5. Thermal engineering, R.S Khurmi, J.K Gupta / S.Chand publications

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. Fundamentals of conduction and radiation- SWAYAM
2. Convective heat transfer- SWAYAM
3. Below are the NPTEL references

Web References:

| Website |
|--|
| Classification, Working principles, Valve and Port Timing Diagrams http://nptel.ac.in/courses/103105110/1 https://www.youtube.com/watch?v=hV3LImCslpo |
| Introduction, Comparison of Air Standard and Actual Cycles http://nptel.ac.in/courses/103105110/2 |
| Time Loss Factor, Heat Loss Factor, http://nptel.ac.in/courses/103105110/3 |
| <i>Combustion in S.I. Engines</i> Normal Combustion and abnormal combustion http://nptel.ac.in/courses/103105110/7 https://www.youtube.com/watch?v=fNcZDrfT498 |
| Diesel Knock, Need for air movement http://nptel.ac.in/courses/103105110/14 https://www.youtube.com/watch?v=UfqXhnr2Ho4 |
| open and divided combustion chambers and nozzles used http://nptel.ac.in/courses/103105110/15 |
| Testing and performance: Parameters of performance http://nptel.ac.in/courses/101101001/26 |
| Brake power, Determination of frictional losses and indicated power, http://nptel.ac.in/courses/101101001/29 |

FLUID MECHANICS & HYDRAULIC MACHINERY

II B.TECH., MECH -II SEM

| | |
|---|-----------------------------------|
| Course Title: FLUID MECHANICS & HYDRAULIC MACHINERY | Course Code:AS20-03PC09 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits: 3 |
| Type of Course: Lecture + Tutorial | Total Contact Periods:48 Hrs + 16 |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Engineering Mechanics | |

Course Overview:

Mechanics of Fluid is a fundamental subject dealt for Mechanical, Electrical, Chemical, Civil and Aeronautical Engineering branches in an interdisciplinary manner. Machineries associated with fluid handling are of utmost importance for the aforesaid Engineers. The characteristic performances of these machines are studied to ascertain the suitability of the same for the specific purpose. The dynamics of fluid deals with all kinds of understanding the intricacies of the subject. The subject deals with various elements that are used in Hydro Electric power plant and ocean power plant. Various equipment's are studied with their performance like Pelton turbine, Francis Turbine and various other pumps. The purpose of studying this course is to imbibe the basic knowledge on fluid mechanics. This will be useful for Mechanical, civil and electrical engineering students for designing and applying to flow systems. Flow systems are applied for turbines, pumps, pipes etc.

Course Objective:

| |
|---|
| basic principles of fluid mechanics. |
| various types of flows. |
| boundary layer concepts and flow through pipes. |
| performance of hydraulic turbines. |
| functioning and characteristic curves of the pumps. |

Course Outcome (s)

| CO | Course Outcomes |
|--------|---|
| C224.1 | Explain the effect of fluid properties on a flow system. |
| C224.2 | Identify the fluid flow pattern and describe continuity equation. |
| C224.3 | Analyse a variety a practical fluid flow and measuring devices and utilise fluid mechanics principles in design. |
| C224.4 | Explain the Boundary Layer Theory Concepts in Fluid Flow Systems. |
| C224.5 | Analyse an appropriate turbine with reference to given situation in power plants. |
| C224.6 | Estimate performance parameters of a given centrifugal and reciprocating pump |

COURSE CONTENT (SYLLABUS)

Unit-I

Fluid Statics: Dimensions and Units: physical properties of fluids-specific gravity, viscosity, surface tension, capillarity- vapour pressure-atmospheric, gauge and vacuum pressure- measurement of pressure- piezometer, U-Tube and Differential Manometers.

Unit- II

Fluid kinematics: stream line, path line and steak line and stream line, classification of flows steady & un steady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.

Fluid dynamics: Surface & body forces, Euler's & Bernouli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venture meter and orifice meter, flow nozzle.

Unit- III

Closed conduit flow: Reynolds's experiment, Darcy Weisbach equation, minor losses in pipes, pipes in series and pipes in parallel, total energy line-hydraulic gradient line.

Boundary layer concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift.

Unit-IV

Basics and hydraulic turbine turbo machinery: Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

Unit-V

Performance of hydraulic turbines and pumps: Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.

Centrifugal pumps: Classification, working, work done-barometric head-losses and efficiencies specific speed-performance characteristic curves, NPSH.

Reciprocating pumps: Working, discharge, slip, indicator diagrams.

Text Books:

1. Fluid mechanics and hydraulic machines by R.K.Bansal.
2. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH.
3. Fluid mechanics, SI version, Munson,Okhshi, Huebsch, Rothmayer, Wiley Student edition
4. Fluid mechanics, Frank M White/seventh edition
5. Fluid mechanics, Fox, Mcdonald and Pritchard/Eight edition

References:

1. Fluid Mechanics by Yunus A. Cengel, John M. Cimbala
2. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
3. Fluid mechanics and machinery by D. Rama Durgaiyah, New age international.
4. Hydraulic machines by Banga and Sharma, Khanna publishers.
5. Fluid mechanics and hydraulic machines,Subramanya.K

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

Web Reference/E-Books:

5. <http://www.musaliarcollege.com/e-Books/ME/Fluid%20Mechanics%20&%20Hydraulic%20Machines.pdf>

INSTRUMENTATION AND CONTROL SYSTEMS

II B.TECH., MECH -II SEM

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|---|---------------------------------------|
| Course Title: INSTRUMENTATION AND CONTROL SYSTEMS | Course Code: AS20-03ES06 |
| Teaching Scheme (L:T:P): 3:1:0 | Credits: 1 |
| Type of Course: Theory + Tutorial | Total Contact Periods: 48 Hrs+ 16 Hrs |
| Continuous Internal Evaluation- 30 Marks | Semester End Exams- 70 Marks |
| Prerequisites: Basic of Electrical and electronic Engineering | |

Course Overview:

Student will learn about properties, characteristics of thermal system

Course Objective:

Student will understand the basic characteristic of a typical instrument and identifying errors and their types that would occur in an instrument. Identifying properties used for evaluating the thermal systems. The concept of transducer and various types and their characters.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C225.1 | understand about types of measurements and devices |
| C225.2 | understand about pressure and flow measurements |
| C225.3 | analyse about speed, accelerating devices |
| C225.4 | apply measuring techniques |
| C225.5 | able to understand about temperature control devices |
| C225.6 | understand about humidity and measuring devices |

COURSE CONTENT (SYLLABUS)

UNIT - I

INTRODUCTION: Definition, Basic principles of measurement, Measurement systems, generalized configuration and functional descriptions of measuring instruments, examples. Dynamic

performance characteristics, sources of error, Classification and elimination of error.

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement, Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT - II

MEASUREMENT OF PRESSURE: Units, classification, different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement, Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

MEASUREMENT OF LEVEL: Direct method, Indirect methods, capacitive, ultrasonic, magnetic, Bubbler level indicators.

FLOW MEASUREMENT: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot, wire anemometer, Laser Doppler Anemometer (LDA).

UNIT - III

Measurement of Force, Torque and Power: Elastic force meters, load cells, Torsion meters, Dynamometers.

MEASUREMENT OF SPEED: Mechanical Tachometers, Electrical tachometers, Noncontact type of tachometer- Stroboscope.

MEASUREMENT OF ACCELERATION AND VIBRATION: Different simple instruments, Principles of Seismic instruments, Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

UNIT - IV

STRESS STRAIN MEASUREMENTS: Various types of stress and strain measurements, electrical strain gauge, gauge factor, method of usage of resistance strain gauge for bending compressive and tensile strains, usage for measuring torque, Strain gauge Rosettes.

MEASUREMENT OF TEMPERATURE: Classification, Ranges, Various Principles of measurement Expansion Type: Bimetallic Strip-Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals.

UNIT - V

MEASUREMENT OF HUMIDITY: Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

ELEMENTS OF CONTROL SYSTEMS: Introduction, Importance, Classification, Open and closed Systems, Servomechanisms, Examples with block diagrams, Temperature, speed & position control systems.

Text Books:

1. Principles of Industrial Instrumentation and Control Systems /Alavala / Cengage
2. Instrumentation, Measurement and Analysis/ B.C. Nakra and K.K. Choudhary/ Mc Graw Hill.
3. Mechanical Measurements and Controls/ D.S. Kumar, 4th edition, Metropolitan Book Co. Pvt Ltd., New Delhi, India.
4. Instrumentation and control systems,W.Bolton
5. Instrumentation and control systems,K.PadmaRaju,Y J Reddy/Mc Graw Hill Eduaction

Reference Books:

1. Process Control Instrumentation Technology/ Curtis D. Johnson / Person
2. Mechanical Measurements / Sirohi and Radhakrishna / New Age International
3. Mechanical Measurements& Instrumentation,Er.R.K Rajput/ Katson Books

4. Industrial Instrumentation and Control, S.K. Singh / third edition
5. Instrumentation, Walt Boyes.

Web References:

1. http://en.wikipedia.org/wiki/Instrumentation_and_control_engineering
2. <http://en.wikipedia.org/wiki/Instrumentation>
3. <http://www.sciencedirect.com/science/book/9780750664325>
4. http://www.pacontrol.com/download/Instrumentation-Training_Tutorial2.pdf
5. <https://www.slideshare.net/RiddhiPatel129/open-loop-and-closed-loop>
6. <https://lecturenotes.in/subject/446/instrumentation-and-control-system-ics>

E- Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

5. <https://nptel.ac.in/courses/112/104/112104118/>
6. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
7. <https://nptel.ac.in/courses/112105171/10>
8. <https://nptel.ac.in/courses/112105171/46>

THERMAL ENGINEERING LAB II B.TECH., MECH -II SEM

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| Course Title: THERMAL ENGINEERING LAB | Course Code: AS20-03PC09 |
| Teaching Scheme (L: T:P): 0:0:3 | Credits:1.5 |
| Type of Course: Practical. | Total Contact Periods:48 Hours |
| Continuous Internal Evaluation-30 Marks | Semester End Exams-70 Marks |
| Prerequisites: Fluid Mechanics & Hydraulics Lab, Fuels Lab & Heat Transfer Lab | |

Course Overview:

IC Engines which is grassroots knowledge of any Automobile Industries. Boiler Industries, Compressor Industries and this Lab course Designed in Practical in such a way that students are able to understand and perform of basics of Thermodynamics, Fluid Mechanics and Heat Transfer such as Performance characteristics of IC Engines, Volumetric Efficiency, Mechanical Efficiency, Valve Timing and Port Timing Diagrams.

Course Objective

1. Explain the Valve Timing/Port Timing Diagrams.
2. To apply the working principles of IC Engines.
3. To apply the working principles of Compressors
4. Evaluate the performance parameters IC Engines.
5. Explain the Operation Process of Boilers.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|---|
| C226.1 | Calculate with help of crank angle, the student able to draw the Valve Timing Diagram/Port Timing Diagram. |
| C226.2 | Calculate and Analyze volumetric Efficiency of the Compressor with Arial flow Compressor of Two state Compressor. |
| C226.3 | Ability to Analyze the Fire Tube Boilers water Tube Boilers. |
| C226.4 | Ability to Analyze the Boilers and Compressors, Abnormal Combustion, Pre-ignition |
| C226.5 | Evaluate and using single cylinder four stroke Diesel engine performance Test, Heat Balance sheet and exhaust Gas Emissions of present Environmental Conditions |
| C226.6 | Calculate Performance Indicators with help of VCR Engine |

COURSE CONTENT (SYLLABUS)

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test for 4 Stroke SI Engines.
3. I.C. Engines Performance Test for 2 Stroke SI Engines.
4. I.C. Engines Morse, Retardation, Motoring Tests.
5. I.C. Engine Heat Balance - CI/SI Engines.
6. I.C. Engines Economical speed Test on a SI Engine.
7. I.C. Engines effect of A/F Ratio in a SI Engine.
8. Performance Test on Variable Compression Ratio Engine.
9. IC engine Performance Test on a 4S CI Engine at Constant Speed.
10. Volumetric efficiency of Air - Compressor Unit.
11. Dis-assembly / Assembly of Engines.
12. Study of Boilers

References Books:

1. IC Engines-V.Ganeshan
2. Hand Book of IC Engines - Dr. Ing .E. H. Richard van
3. Thermal Engineering Hand Book-B. Sreenivasa Reddy and K.Hemachandra Reddy

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/103/112103262/>
2. <https://coureseera.org/internal-combustion-engines>
3. <https://mech.iitm.ac.in/meiitm/course/internal-combustion-engines/>
4. https://www.iitk.ac.in/dordold/templates/r_d/data/Facilities/ERL.pdf

**FLUID MECHANICS AND HYDRAULIC MACHINERY LAB
II B.TECH., MECH -II SEM**

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|--|---------------------------------|
| Course Title FLUID MECHANICS AND HYDRAULIC MACHINERY LAB | Course Code: AS20-03PC 10 |
| Teaching Scheme (L:T:P): 0:0:3 | Credits: 1.5 |
| Type of Course: Practical. | Total Contact Periods: 48 Hours |
| Continuous Internal Evaluation-30 Marks | Semester End Exams- 70 Marks |
| Prerequisites: Engineering Mechanics | |

Course Overview:

Fluid Mechanics and Hydraulic Machinery Lab is a common lab for Mechanical, Electrical, and Civil and Aeronautical Engineering branches in an interdisciplinary manner. Machineries associated with fluid handling are of utmost importance for the aforesaid Engineers. The characteristic performances of these machines are studied to ascertain the suitability of the same for the specific purpose. This lab deals with various elements that are used in Hydro Electric power plant and ocean power plant. Various equipment's are studied with their performance like Pelton turbine, Francis Turbine and various other pumps. The purpose of studying this course is to imbibe the basic knowledge on fluid mechanics practically. This will be useful for Mechanical, civil and electrical engineering students for designing and applying to flow systems. Flow systems are applied for turbines, pumps, pipes etc.

Course Objective:

- 1 **Understanding** the basic principles of fluid mechanics.
- 2 **Understanding** the frictional losses through pipes.
- 3 **Evaluating** the performance of hydraulic turbines.
- 4 **Understanding** the functioning and characteristic curves of the pumps.

Course Outcome (s):

| CO | Course Outcomes |
|--------|--|
| C227.1 | Explain the effect of fluid properties on a flow system. |
| C227.2 | Identify the fluid flow pattern and describe continuity equation. |
| C227.3 | Analyse a variety a practical fluid flow and measuring devices and utilise fluid mechanics principles in design. |
| C227.4 | Analyse an appropriate turbine with reference to given situation in power plants. |
| C227.5 | Estimate performance parameters of a given centrifugal pump |
| C227.6 | Estimate performance parameters of a given reciprocating pump |

COURSE CONTENT (SYLLABUS)**List of experiments:**

Perform any 10 out of the 12 Exercises.

1. Verify Berboulli'sTheorm.
2. Calibration ofVenturimeter.
3. Calibration of Orificemeter.
4. Determination of friction factor for a given pipeline.
5. Determination of loss of head due to sudden contraction in apipeline.
6. Impact of Jets.
7. Performance Test on PeltonWheel.
8. Performance Test on FrancisTurbine.
9. Performance Test on KaplanTurbine.
10. Performance Test on Single Stage CentrifugalPump.
11. Performance Test on Multi Stage CentrifugalPump.
12. Performance Test on ReciprocatingPump.

Online Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

Web Reference/E-Books:

1. <http://www.musaliarcollege.com/e-Books/ME/Fluid%20Mechanics%20&%20Hydraulic%20Machines.pdf>

INSTRUMENTATION AND CONTROL SYSTEMS LAB II B.TECH., MECH -I SEM

| | |
|---|---------------------------------|
| Course Title: INSTRUMENTATION AND CONTROL SYSTEMS LAB | Course Code: AS20-03ES07 |
| Teaching Scheme (L:T:P): 0:0:3 | Credits: 1.5 |
| Type of Course: Practical | Total Contact Periods: 48 Hours |
| Continuous Internal Evaluation-30Marks | Semester End Exams-70Marks |
| Prerequisites: ICS | |

Course Overview:

Student will learn about properties, characteristics of thermal system

Course Objective:

Students will able to at the end of the course, the student will be able to Characterize and calibrate measuring devices. Identify and analyze errors in measurement. Analyze measured data using regression analysis. Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C228.1 | understand about types of Pressure Gauges, devices |
| C228.2 | analyse about pressure and flow measurements |
| C228.3 | analyse about speed, accelerating devices |
| C228.4 | apply measuring techniques |
| C228.5 | understand about temperature control devices |
| C228.6 | understand about humidity and measuring devices |

COURSE CONTENT (SYLLABUS)

LIST OF EXPERIMENTS:

Perform any 12 out of the 15 Exercises.

1. Calibration of Pressure Gauges.

2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.
12. Measurement and control of Pressure of a process using SCADA system.
13. Measurement and control of level in a tank using capacitive transducer with SCADA.
14. Measurement and control of temperature of a process using resistance temperature detectorwith SCADA.
15. Measurement and control of flow of a process using SCADA systems.

Web References:

1. http://en.wikipedia.org/wiki/Instrumentation_and_control_engineering
2. <http://en.wikipedia.org/wiki/Instrumentation>
3. <http://www.sciencedirect.com/science/book/9780750664325>
4. http://www.pacontrol.com/download/Instrumentation-Training_Tutorial2.pdf

5. <https://www.slideshare.net/RiddhiPatel129/open-loop-and-closed-loop>
6. <https://lecturenotes.in/subject/446/instrumentation-and-control-system-ics>

E- Resources (SWAYAM/NPTEL/MOOCs/COURSERA):

1. <https://nptel.ac.in/courses/112/104/112104118/>
2. <https://www.classcentral.com/course/swayam-fluid-machines-6562>
3. <https://nptel.ac.in/courses/112105171/10>
4. <https://nptel.ac.in/courses/112105171/46>

**GENDER SENSITIZATION
II B.TECH. MECH -II SEM**

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|--|------------------------------------|
| Course Title: Gender Sensitization | Course Code: AS20- |
| Teaching Scheme (L:T:P): 2: 0: 2 | Credits: 0 |
| Type of Course: Lecture | Total Contact Periods: 32 Hours |
| Continuous Internal Evaluation: Nil | Semester End Exams : 100 Marks |
| Prerequisites: | |

Course Objective:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To expose the students to debates on the politics and economics of work.
4. To help students reflect critically on gender violence.

Course Outcomes(s)

| CO# | Course Outcomes |
|--------|--|
| C229.1 | Develop a better understanding of important issues related to what gender is in contemporary India. |
| C229.2 | Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film. |
| C229.3 | Attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics. |
| C229.4 | Understand what constitutes sexual harassment and domestic violence and be made aware of new forums of Justice. |
| C229.5 | Draw solutions as to how men and women, students and professionals can be better equipped to work and live together as equals. |
| C229.6 | Develop a sense of appreciation of women in all walks of life |

COURSE CONTENT (SYLLABUS)

UNIT I: Understanding Gender:

Introduction

What is Gender and why does it matter

Gender Relations and Status in the Household

Masculinities

Gender Analysis and mainstreaming

Gender: Why Should We Study It? (Towards a World of Equals: Unit -1)

Socialization: Making Women, Making Men (Towards a World of Equals: Unit - 2 Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT II Gender And Biology:

Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit -4)

Declining Sex Ratio. Demographic Consequences.

Teacher's Role in Promoting/Advancing Gender Sensitization

Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10)

Two or Many? Struggles with Discrimination.

UNIT III: Gender and Labour:

Housework: the Invisible Labour (Towards a World of Equals: Unit -3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (Towards a World of Equals: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

Sexual Harassment-Women at all levels of employment and all levels of workplace are affected.

UNIT IV: Issues Of Violence

Sexual Harassment: Say No! (Towards a World of Equals: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:"Chupulu".

Domestic Violence: Speaking Out (Towards a World of Equals: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading:New Forums for Justice.

Promoting gender equality to prevent violence against women Thinking about Sexual Violence (Towards a World of Equals: Unit -11)

Blaming the Victim-"I Fought for my Life...." - Additional Reading: The Caste Face of Violence.

UNIT V: Gender: Co - Existence

Just Relationships: Being Together as Equals (Towards a World of Equals: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.

Additional Reading: Rosa Parks-The Brave Heart.

Text Books:

1. Towards a World of equals. A bilingual text book on Gender written by A. Suneetha. Telugu Academy, Hyderabad in 2015.
2. Seeing like a feminist: Menon Nivedita. Zubaan Penguin books. New Delhi in 2012.
3. Gender Sensitization by C. Rajya Lakshmi, D. S. Vittal, by Himalaya Publishing House.

e- books:

1. <https://fyblog.com/ignou-book-bgdg-172-hindi-english>
2. http://saha.ac.in/web/images/administration/pdf/Gender%20Sensitization%20New-10-4-2017_545c7.pdf
3. https://www.researchgate.net/publication/329541569_EMPOWERING_WOMEN_THROUGH_GENDER_SENSITIZATION

Web References:

1. <https://nptel.ac.in/courses/110/105/110105080/>
2. https://onlinecourses.nptel.ac.in/noc19_hs57/preview
3. <https://nptel.ac.in/content/storage2/courses/109103023/download/Lecture%2027.pdf>