CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
Kandlakoya, Hyderabad – 501 401

ACADEMIC REGULATIONS R 18
FOR CBCS & OUTCOME BASED B.TECH. REGULAR PROGRAMMES

(Effective for the students admitted into I year from the Academic Year 2018-19 onwards)

1.0 Under-Graduate Degree Programme in Engineering & Technology

CMR College of Engineering & Technology, Hyderabad offers 4 Years (8 Semesters) Bachelor of Technology (B.Tech.) degree Programme, under Choice Based Credit System (CBCS), with effect from the Academic Year 2018 - 19 and onwards, in the following Branches of Engineering.

S.No.	Branch
I.	Civil Engineering
II.	Electrical & Electronics Engineering
III.	Mechanical Engineering
IV.	Electronics & Communication Engineering
V.	Computer Science & Engineering

2.0 Admission Procedure

2.1. Admissions will be done as per the norms prescribed by the Government of Telangana. The Government orders in vogue shall prevail.

2.2. The candidate should have passed the qualifying examination Intermediate or equivalent on the date of admission.

2.3. Seats in each program in the college are classified into

Category–A (70% of intake) and Category-B (30% of intake) besides Lateral Entry. Category -A seats will be filled by the Convener, TSEAMCET Admissions. Category - B seats will be filled by the College as per the guidelines of the Competent Authority.

2.4. Lateral Entry seats for 20% of the candidates from the approved strength of the course shall be admitted into the III Semester directly based on the rank secured by the candidate in TSECET in accordance with the guidelines from the Competent Authority.

2.5 The medium of instruction for the entire UG Degree Course in Engineering & Technology (E&T) shall be ENGLISH only.

3.0 B.Tech. Degree Course Structure

3.1 The B.Tech. Programmes of CMR College of Engineering & Technology are of semester pattern, with 8 Semesters constituting 4 Academic Years, each Academic Year having two Semesters (First/Odd and Second/Even). Each Semester shall have a minimum of 90 Instructional Days.

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below. The Course Structure is organized based on the AICTE Model Curriculum for Under-Graduate Degree Courses in Engineering & Technology (Jan. 2018).

3.2.1 Semester Scheme:

Each UG Programme is of 4 Academic Years (8 Semesters), with the year being divided into two Semesters of minimum 90 Instructional days/Semester and in addition each Semester having - ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/ Course Structure as suggested by AICTE are followed.

3.2.2 Course Credits:

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

- One Credit - for One hour/ Week/ Semester for Theory/ Lecture (L)/Tutorial Courses; and,
- One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses

Other student activities like NCC, NSS, NSO, Induction Program, Study Tour, Guest Lecture etc., and other Courses identified as Mandatory Courses (MC) shall not carry Credits.

3.2.3 Course Classification:

All Courses offered for the UG Programme are broadly classified as:

(a) Foundation Courses (Fn C)
(b) Core Courses (Co C)
(c) Elective Courses (Eℓ C)

- **Foundation Courses** (Fn C) are further categorized as :
    i. HSMC (Humanities,Social Sciences and Management Courses)
    ii. BSC (Basic Science Courses)
    iii. ESC (Engineering Science Courses)
- **Core Courses** (Co C) and Elective Courses (Eℓ C) are categorized as PS (Professional Subjects), which are further subdivided as –
    i. PCC (Professional Core Courses)
    ii. PEC (Professional Elective Courses)
    iii. OEC (Open Elective Courses)
    iv. PROJ (Project)
- **Minor Courses** (1 or 2 Credit Courses, belonging to HSMC/ BSC/ ESC/ PCC as per relevance); and
- **Mandatory Courses** (MC - Non-credit oriented).

3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course-Structure Grouping for the each of the UG PROGRAMME E&T (B.Tech. Degree Programmes), is as listed below:

S. No.	*Broad Course Classification*	*Course Group/ Category*	*Course Description*	*Suggested Breakup of Credits by AICTE(160)*
1	**Foundation Courses (Fn C)**	**BSC – Basic Science Courses**	Includes - Mathematics, Physics and Chemistry Subjects	**25***
2		**ESC - Engineering Science Courses**	Includes fundamental engineering subjects	**24***
3		**HSMC – Humanities and Social Sciences including Management Courses**	Includes subjects related to Humanities, Social Sciences and Management	**12***
4	**Core Courses (Co C)**	**PCC– Professional Core Courses**	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	**48***
5	**Elective Courses (Eℓ C)**	**PEC – Professional Elective Courses**	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	**18***
6		**OEC – Open Elective Courses**	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	**18***

7	**Core Courses**	**Project**	B.Tech. Project or UG Project or UG Major Project	**15***
8		**Industrial Training/ Mini-Project**	Industrial Training/ Internship/ UG Mini-Project/ Mini-Project	
9		**Seminar**	Seminar/ Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engg.	
10		**Mandatory Courses (MC)**	Mandatory Courses (non-credit)	**Nil**
Total Credits for B. Tech. Programme				**160**

* Minor variation is allowed as per need of the respective disciplines.

4.0 Course Work

4.1 A student, after securing admission, shall pursue the B.Tech. UG Programme in a minimum period of 4 Academic Years, and a maximum period of 8 Academic Years (starting from the Date of Commencement of I Year).

4.2 As suggested by AICTE, 'Mandatory Induction Programme' shall be offered for all the Branches of Engineering at the start of the I Year UG Degree Course, to enable the newly admitted students get acquainted with the new professional environment, to develop awareness and understanding of the engineering education requirements, and to get them prepared for the academic schedules ahead. The features, activities and pattern of the Induction Programme shall be as per the guidelines suggested in the AICTE Model Curriculum.

4.3 Each student shall Register for and Secure 160 Credits for the completion of the UG Programme and the Award of the B.Tech. degree in the respective branch of Engineering.

5.0 Course Registration

5.1 A ‘Faculty Advisor or Counselor’ shall be assigned to each student, who will advise him about the UG Programme, its Course Structure and Curriculum, Choice/Option for Subjects/ Courses for the purpose of registration, based on his competence, progress, pre-requisites and interest.

5.2 The Academic Section of the College invites ‘Registration Forms’ from students apriorie (before the beginning of the Semester), through ‘on-line submissions’, ensuring ‘DATE and TIME Stamping’. The On-line Registration Requests for any ‘Current Semester’ shall be completed before the commencement of SEEs (Semester End Examinations) of the ‘Preceding Semester’.

5.3 Students are advised to individually register for all the number of credits indicated in that semester workload of the respective UG Degree Course Structure - this is termed as the ‘Semester Work Load’ (SWL).

5.4 A student can apply for ONLINE Registration, ONLY AFTER obtaining the ‘WRITTEN APPROVAL’ from his assigned Faculty Advisor, which should be submitted to the College Academic/Examination Section through the Head of the Department (a copy of the same is to be retained by the Head of the Department, Faculty Advisor and the student).

5.5 A student may be permitted to register for the courses in a semester of his choice subject to para 5.4 with the typical work load suggested in the course structure of that semester. A student may register for courses over and above the courses listed in the course structure of the semester with possible additional courses of his choice, limited to a maximum of 3 Credits, based on his PROGRESS and SGPA/ CGPA, and completion of the ‘PRE-REQUISITES’ as indicated for various Subjects/ Courses in the Department Course Structure and Syllabus contents.

5.6 The choice for the ‘additional’ Courses above the typical SWL must be indicated clearly, which needs the specific approval and signature of the Faculty Advisor/ Counselor and the HoD on the hard-copy.

5.7 If the Student submits ambiguous choices or multiple options or erroneous entries - during On-Line Registration for the Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration, as applicable.

5.8 The Course Options exercised through ‘ON-LINE’ Registration are final and CANNOT be changed; further, alternate choices will also not be considered. However, if the Course that has already been listed for Registration (by the Head of Department) in a Semester and 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 Course (subject to offering of such a Course), or for another existing Course (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.9 Dropping of the Courses may be permitted ONLY AFTER obtaining the prior approval from the Faculty Advisor assigned and the Head of the department (subject to the retaining of the SWL), ‘within 15 Days of Time’ from the beginning of the current semester.

5.10 For Mandatory Courses like NCC/ NSS/ NSO etc., a ‘Satisfactory Participation Certificate’ from the concerned authorities for the relevant Semester is essential. No Marks or Grades or Credits shall be awarded for these activities.

6.0 Courses to be offered

6.1 A typical Section (or Class) Strength for each Semester shall be 60.

6.2 An Elective course may be offered to the Students, ONLY IF a Minimum of 20 Students (1/3 of the Section Strength) opt for the same. The Maximum Strength of a Section is limited to 80 (60 + 1/3 of the Section Strength).

6.3 More than one teacher may offer the same Course (Laboratory/ Practicals may be included with the corresponding Theory Course 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). The decision of the Head of the department in this regard is final.

6.4 If more entries for Registration of a course come into picture, the Head of the Department shall decide on offering of such a Course.

7.0 Attendance Requirements

7.1 A student shall be eligible to appear for the End Semester Examinations, if he acquires a minimum of 75% of attendance in aggregate of all the Courses (excluding Mandatory or Non-Credit Courses) for that Semester.

7.2 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 medical grounds, based on the student's representation with supporting evidence. Provision of such condonation is however limited to a maximum of 3 times during the maximum permissible UG study period.

7.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

7.4 Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

7.5 Students, whose shortage of attendance is not condoned in any Semester, are not eligible to appear for End Examinations of that Semester. Such students are 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 Courses registered in that Semester in which they got detained, by seeking re-admission for that Semester as and when offered; in case if 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 Courses offered under that category.

8.0 Academic Requirements

The following Academic Requirements have to be satisfied, in addition to the Attendance Requirements mentioned in Item No.**7.**

8.1 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 35% marks (25 out of 70 marks) in the End Semester Examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing **'P'** Grade or above in that Subject/ Course.

8.2 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to Technical Seminars, if he secures not less than 40% of the total marks to be awarded. The student would be treated as failed, if he -

(i) does not present the technical Seminars as required in the VI and VIII Semesters, or
(ii) Secures less than 40% of marks in Technical Seminar Evaluations.

He may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent Semester, as and when it is scheduled.

8.3 A Student will not be promoted from I Year to II Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 19 Credits of I Year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.4 A Student will not be promoted from II Year to III Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 47 Credits up to IV Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.5 A Student will not be promoted from III Year to IV Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 72 Credits up to VI Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.6 A Student shall **-** register for all courses covering 160 credits as specified and listed (with the relevant Course Classifications as mentioned) in the course structure, put up all the Attendance and Academic requirements for 160 credits securing a minimum of 'P' Grade (Pass Grade) or above in each Course, and 'earn All 160 credits securing SGPA ≥ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) ≥ 5.0, to successfully complete the UG Programme.

8.7 If a student registers for any 'additional courses' (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totaling to 160 Credits as specified in the Course Structure of his Department, the performances in those 'additional Courses ' (although evaluated and graded) shall not be taken into account while calculating the SGPA and CGPA. For such 'additional Courses ' registered, the % of marks and the Letter Grade alone shall be indicated in the Grade Card as a performance measure subject to the completion of the Attendance and Academic Requirements as stated under Clauses 7.0 and 8.1 – 8.7.

8.8 Students who fail to earn 160 credits as per the course structure, and as indicated above, within 8 Academic Years from the Date of Commencement of their I Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

8.9 When a Student is detained due to shortage of attendance in any Semester, he may re-register for that Semester, as and when offered, with the Academic Regulations of the Batch into which he re-registers. However, no Grade Allotments or SGPA/ CGPA calculations will be done for that entire Semester in which he got detained.

8.10 When a Student is detained due to lack of Credits in any year, he may re-register for the next year, after fulfilment of the Academic Requirements, with the Academic Regulations of the Batch into which he re-registers.

8.11 A student who is eligible to appear in the End Semester Examination in any Course, but was absent for it or failed (thereby failing to secure P Grade or above), may reappear for that Course at the supplementary examination as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that Course will be carried over, and added to the Marks to be obtained in the supplementary examination, for evaluating his performance in that Course.

9.0 Evaluation - Distribution and Weightage of Marks

9.1 The performance of a student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory or Practicals or Seminar or Drawing/Design or Minor Course or Major Project Phase-I or Major Project Phase-II. These evaluations shall be based on CIE (Continuous Internal Evaluation) and SEE (Semester End Examination), and a Letter Grade corresponding to the % marks obtained shall be given.

9.2 For Theory subjects 30 marks are allocated for Continuous Internal Evaluation. Continuous Internal Evaluation during a semester is based on two internal examinations conducted during the semester. 70 marks are allocated for the Semester End Examination SEE.

(a) Each internal examination consists of two parts, part-A consisting of 5 short answer questions carrying two marks each, Part-B consisting of 3 essay type questions carrying 5 marks each with a total duration of 1 hour 40 minutes. The essay paper shall contain one question from each unit with internal choice. While the first internal examination shall be conducted from 1 to 2.5 units of the syllabus, the second internal examination shall be conducted on 2.5 to 5 units. Five (05) marks are allocated for Assignment (as specified by the subject teacher concerned). There will be two assignments in the semester for each course consisting of 5 marks each. The first Assignment should be submitted before the conduct of the first internal examination and second

Assignment should be submitted before the conduct of the second internal examination.

(b) The total marks secured by the student in each internal examination are evaluated for 30 marks. The final marks secured in internal evaluation by each candidate are arrived at by giving a weightage of 70% to the best secured internal examination and 30% weightage to the least secured internal examination. A student who is absent from any assignment/ internal examination for any reason what so ever shall be deemed to have secured ‘zero’ marks in the test/ examination and no makeup test/ examination shall be conducted.

9.3 For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 40 internal marks, and 60 marks are assigned for Laboratory/Practical End Semester Examination (SEE). Out of the 40 marks for internals, day-to-day work in the laboratory shall be evaluated for 30 marks; and for the remaining 10 marks - internal practical test shall be conducted by the concerned laboratory teacher. For Practical Subjects, the end semester examination SEE shall be conducted with an external examiner and the laboratory teacher. The external examiner from other institutions or industry shall be appointed by the Controller of Examinations.

9.4 For the subjects having design and / or drawing, (such as Engineering Graphics, AutoCAD, Engineering Drawing, Machine Drawing and Estimation etc.,) the internal evaluation carries 40 marks (the distribution is 20 marks for day-to-day work and 20 marks for internal examination) and 60 marks shall be for end semester examination. There shall be two internal examinations in a semester. The final marks secured by each candidate in the internal evaluation is arrived at by giving a weightage of 70% to the best secured internal examination and 30% weightage to the least secured internal examination.

9.5 **Open Electives (OE):** Students have to choose One OE-I and one OE-II during VII Semester, one OE-III and one OE-IV in VIII Semester from the list of Open Electives given. However, Students cannot opt for an Open Elective Course offered by their own (parent) Department, if it is already listed under any category of the Courses offered by parent Department in any Semester. The Courses offered under Open Electives in an academic year will be reviewed and finalized by the College Academic Committee before the commencement of the academic year.

9.6 There shall be a Mini-Project-I/ Internship-I, to be taken up in the college or industry during the summer vacation after IV Semester examination. The Mini-Project-I/ Internship-I shall be evaluated during the V Semester. The Mini-Project-I/Internship-I shall be submitted in a report form and should be presented before a committee, which shall be evaluated for Satisfactory or Non-satisfactory. The committee consists of Head of the Department, the supervisor of Mini-Project-I/Internship-I, a senior faculty member of the department.

9.7 There shall be a Mini-Project-II/ Internship-II, to be taken up in the college or industry during the summer vacation after VI Semester examination. The Mini-Project-II/ Internship-II shall be evaluated during the VII Semester. The Mini-Project-II/ Internship-II shall be submitted in a report form and should be presented before a committee, which shall be evaluated for Satisfactory or Non-satisfactory. The committee consists of Head of the Department, the supervisor of mini project, a senior faculty member of the department.

9.8 There shall be a Technical Seminar-I presentation in VI Semester. For the Technical Seminar-I, the student shall collect the information on a specialized topic related to his branch other than Mini projects-I & II/ Internships-I & II/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar-I supervisor and a senior faculty member from the department. The Technical seminar will be evaluated for 100 marks. There shall be no SEE or external examination for the Technical Seminar-I.

9.9 There shall be a Technical Seminar-II presentation in VIII Semester. For the Technical Seminar-II, the student shall collect the information on a specialized topic related to his branch other than the Mini projects-I & II/ Internships-I & II/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar-II supervisor and a senior faculty member from the department. The Technical Seminar-II will be evaluated for 100 marks. There shall be no SEE or external examination for the Technical Seminar-II.

9.10 Each student shall start the Project Work during the VII Semester as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of the Department.

a) The Project Work shall be divided and carried out in 2 phases : Phase – I (Project-I) during VII Semester, and Phase – II (Project-II) during VIII Semester, and the student has to prepare two independent Project Work Reports – *one each during each phase*. First Report shall include the Project Work carried out under Phase – I, and the Second Report (Final Report) shall include the Project Work carried out under Phase – I and Phase – II put together. Phase – I and Phase – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each Phase of the Project Work, 40 marks shall be for the Continuous Internal Evaluation(CIE), and 60 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both Phases of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance during the two Project Work Phases/periods); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee/ Board (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Phase - I, the Viva-voce shall be conducted at the end of the VII Semester, before the commencement of the semester End Examinations, at the Department Level by a Committee comprising of the HoD or One Professor and Supervisor (no external examiner), and the Project Phase – II Viva-voce (or Final Project Viva-voce) shall be conducted by a Committee comprising of an External Examiner, the Head of the Department and the Project Supervisor at the end of the VIII Semester, before the commencement of the semester End Examinations. The External Examiner shall be nominated by the CoE from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

d) If a student does not appear for any of the two Viva-Voce examinations at the scheduled times as specified above, he may be permitted to reappear for Project Phase-I and/or Project Phase-II Viva-voce examinations, as and when they are scheduled in that semester; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester(s), as and when they are scheduled, as supplementary candidate. For the registration of Project Phase-II the student must have passed Project Phase-I.

9.11 For NSS/ NSO Mandatory Courses and/or any other Mandatory Non-Credit Course offered in a semester, a 'Satisfactory Participation Certificate' shall be issued to the student from the authorities concerned, only after meeting the minimum attendance requirements in the Course. No Marks or Letter Grade shall be allotted for the Mandatory Courses.

10. 0. Semester End Examination (SEE)

10.1. Theory Courses

The end semester examination will be conducted for 70 marks which consist of Part-A and Part-B. The examination is for 3 hours duration. Question paper pattern is as follows.

Part-A: 20 Marks
There shall be 10 questions each carrying 2 Marks. (Two questions from each Unit)

Part-B: 50 Marks
There shall be 10 questions out of which 5 questions (Internal choice within a unit i.e. two questions from each unit out of which one question to be answered) are to be answered, each question carry 10 marks.

10.2. Laboratory Courses

Each laboratory course is evaluated for 60 marks. The examination shall be conducted by the laboratory teacher and one external examiner appointed by the Controller of Examinations from other institutions or industry in consultation with the Head of the Department.

10.3. Supplementary Examinations

The schedule for supplementary examinations shall be as notified by the institute from time to time.

10.4. For NCC/ NSS/ NSO types of Courses, and/or any other Mandatory Non-Credit Course offered in a Semester, a 'Satisfactory Participation Certificate' shall be issued to the Student from the concerned authorities, only after meeting minimum attendance requirements in the Course. No marks or Letter Grade shall be allotted for these activities and it will not be part of calculation of CGPA.

11.0. Grading Procedure

11.1.Marks will be awarded to indicate the performance of each student in each Theory Course, or Laboratory Course, or Technical Seminar, or Project etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination). 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*
100% or below but not less than 85% (≥ 85% , <= 100%)	**O (Excellent)**	**10**
Below 85% but not less than 70% (≥ 70% , < 85%)	**A (Very Good)**	**9**
Below 70% but not less than 60% (≥ 60% , < 70%)	**B (Good)**	**8**
Below 60% but not less than 55% (≥ 55% , < 60%)	**C (above Average)**	**7**
Below 55% but not less than 50% (≥ 50% , < 55%)	**D (Average)**	**6**
Below 50% but not less than 40% (≥ 40% , < 50%)	**P (Pass)**	**5**

Below 40% (< 40%)	**F (FAIL)**	**0**

11.2 A student obtaining F Grade in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End 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.

11.3. A Letter Grade does not imply any specific % of Marks.

11.4. In general, a student shall not be permitted to repeat any Course(s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'. However, he has to repeat all the Courses pertaining to that Semester, when he is detained (as listed in Items 8.10- 8.11).

11.5. A student earns Grade Point (GP) in each Course, on the basis of the Letter Grade obtained by him in that Course (excluding Mandatory non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Course

11.6. The Student passes the Course only when he gets GP $\geq$ 5 (P Grade or above).

11.7. The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL 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

SGPA = $\{ \sum_{i=1}^{N} C_i \, G_i \} / \{ \sum_{i=1}^{N} C_i \}$ …. For each Semester,

where **'i'** is the Course indicator index (takes into account all Courses in a Semester), 'N' is the no. of Courses '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 the **i**th Course, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that **i**th Course.

11.8. 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 I Year Second Semester onwards, at the end of each Semester, as per the formula

CGPA=$\{\sum_{j=1}^{M} C_j\, G_j\} / \{\sum_{j=1}^{M} C_j\}$… for all S Semesters registered (ie., upto and inclusive of S Semesters, $S \geq 2$),

Where 'M' is the Total no. of Courses (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards up to and inclusive of the Semester S (obviously M > N), **'j'** is the Course indicator index (takes into account all Courses from 1 to S Semesters), C_j is the no. of Credits allotted to the **j**th Course, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that **j**th Course. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

11.9. For Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs will be used.

11.10. For Calculations listed in Item 11.5– 11.8, performance in failed Courses (securing F Grade) will also be taken into account, and the Credits of such Courses will also be included in the multiplications and summations. However, Non-Courses will not be taken into consideration.

12.0. Passing Standards:

12.1. A student shall be declared successful or 'passed' in a Semester, only when he gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UG PROGRAMME, only when he gets a CGPA ≥ 5.00; subject to the condition that he secures a GP ≥ 5 (P Grade or above) in every registered Course in each Semester (during the entire UG PROGRAMME) for the Degree Award, as required.

12.2. A Student shall be declared successful or 'passed' in any Non-Credit Course, if he secures a 'Satisfactory Participation Certificate' for that Mandatory Course.

12.3. 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.

13.0. Declaration of Results

13.1 Computation of SGPA and CGPA are done using the procedure listed in 11.5 – 11.9.

13.2. For Final % of Marks equivalent to the computed final CGPA, the following formula may be used …

% of Marks = (final CGPA – 0.5) x 10

14.0. Award of Degree

14.1 A Student who registers for all the specified Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire UG E&T Programme (UG PROGRAMME), and secures the required number of 160 Credits (with CGPA ≥ 5.0), within 8 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

14.2. A Student who qualifies for the Award of the Degree as listed in Item 14.1, shall be placed in the following Classes …

(a) Students with final CGPA (at the end of the UG PROGRAMME) ≥ 8.00, and fulfilling the following conditions -

(i) should have passed all the Courses in 'FIRST APPEARANCE' within the first 4 Academic Years (or 8 Sequential Semesters) from the Date of Commencement of his First Academic Year,

(ii) should have secured a CGPA ≥ 8.00, at the end of each of the 8 Sequential Semesters, starting from the I Year I Semester 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'**.

(b) Students having final CGPA (at the end of UG PROGRAMME) ≥ 8.00 , but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

(c)Students with final CGPA (at the end of the UG PROGRAMME) ≥ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

(d) Students with final CGPA (at the end of the UG PROGRAMME) ≥ 5.50 but < 6.50, shall be placed in 'SECOND CLASS'.

(e) All other Students who qualify for the Award of the Degree (as per Item 14.1), with final CGPA (at the end of the UG PROGRAMME) ≥ 5.00 but < 5.50, shall be placed in ‘PASS CLASS’.

14.3. A student with final CGPA (at the end of the UG PROGRAMME) < 5.00 will not be eligible for the Award of the Degree.

14.4. Students fulfilling the conditions listed under Item 14.2(a) alone will be eligible candidates for - ‘College Rank’ and ‘Gold Medal’ considerations.

15.0. Withholding of Results

15.1 If the student has not paid fees to College at any stage, or has pending dues against his name due to any reason whatsoever, or if any case of indiscipline is pending against him, the result of the student may be withheld, and he will not be allowed to go into the next higher Semester. The Award or issue of the Degree may also be withheld in such cases.

16.0 Transitory Regulations

16.1 **For Students detained due to shortage of attendance and credits**

i) The Student who has not registered in a particular semester for any reason, or has been detained for want of attendance may be considered eligible for readmission to the same semester in the next Academic Year or subsequent academic years. The student who has been detained for lack of credits can be readmitted to the next Academic Year only on obtaining minimum required credits.

ii) A Student who has been detained in I year I Semester of R14/R15 Regulations due to lack of attendance shall be permitted to join I year I Semester of R18 Regulations and 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.

iii) A student who has been detained in II semester of I Year or any semester of II, III and IV years of R14/R15 regulations for want of attendance shall be permitted to join the corresponding semester of R18 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 R18 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

iv) A student of R14/R15 Regulations who has been detained due to lack of credits shall be promoted to the next Academic Year of R18 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.

v) After re-admission the student is required to study the course as prescribed in the new regulations for the re-admitted programme at that level and thereafter.

vi) A student who has failed in any course(s) under any regulation has to pass those course(s) in the same regulations.

vii) In case the course(s) offered in subsequent semesters are repetitive, substitute courses identified by the BOS for replacement of completed courses by the students will be given. The students will be suggested to register the said substitute course(s) in the new regulation. One Internal examination for the substitute course(s) may be conducted before commencement of end semester examinations.

viii) The marks/credits/SGPA are transferred and converted (as per applicable regulations) for all subjects of old regulation if necessary and treated as successfully cleared in the new prescribed program course structure.

ix) For readmitted students the courses studied and cleared in earlier Regulation and not offered those courses in new applicable Regulation are not considered for SGPA & CGPA calculation when secured credits are greater than maximum credits for the award of degree.

x) The decision of BOS is final in case of any ambiguity in identifying the equivalent/substitute courses

xi) The decision of Academic council is final in case of any ambiguity in transitory regulations

16.2. **For Transferred Students**

i) The students seeking transfer to CMRCET from various other Universities/Institutions have to pass the failed course(s) which are equivalent to the course(s) of CMRCET, and also have to pass the course(s) of CMRCET which the students have not studied at the earlier institution. Further the students have passed some of the course(s) at the earlier institutions, and if the same course(s) are prescribed in different semesters of CMRCET and repeated, then substitute courses(with equal credits) identified by BOS may be given to the students

ii) For not cleared course(s) in the previous Institute, equivalent course(s) will be identified by the BOS for pursuing the same. The students will be suggested to pursue the course and to register the said equivalent course(s) in the new regulation and to qualify in examinations.

iii) Marks/Grades/Credits obtained in the courses completed in previous Institution are to be converted in to equivalent Grades/Credits/SGPA/CGPA as per CMRCET regulations.

iv) One Internal examination for the course(s) not studied in previous institution and taken as additional/substitute courses in CMRCET may be conducted before commencement of end semester examinations.

v) If necessary the student may be given additional course(s) in place of the course(s) studied in earlier Institution which are not part of CMRCET regulation to balance and meet the credit requirement for the award of degree as per applicable regulation

vi) The students who seek transfer to CMRCET from various other Universities/Institutions, and satisfy credits requirement as per earlier institution but not satisfy the credit requirements as per CMRCET after finalizing equivalent course(s), may be permitted to continue the programme. However such a student has to meet the requirement of credits for promotion to the next year as per CMRCET applicable regulations.

vii) For transferred students the courses studied and cleared in earlier Institution and not offered those courses in CMRCET are not considered for SGPA & CGPA calculation when secured credits are greater than maximum credits for the award of degree.

viii) In case of any ambiguity in identifying the equivalent/substitute courses, the decision of BOS is final.

ix) The decision of Academic council is final in case of any ambiguity in transitory regulations

17.0 Student Transfers

17.1 There shall be no Branch transfers after the completion of Admission Process.

17.2 Transfer of candidates from other Institutions will be governed by the regulations of Telangana State Government issued from time to time.

18.0 Scope

i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".

ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".

iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor/ Principal is final.

v) The College may change 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 College Authorities.

ACADEMIC REGULATIONS FOR B. TECH. (LATERAL ENTRY SCHEME)

(Applicable for the students admitted into II year B. Tech. (Lateral Entry Scheme) from the Academic Year 2019-20 and onwards)

1. **Eligibility for award of B. Tech. Degree (LES)**

1.1. The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

1.2. The candidate shall register for 122 credits and secure 122 credits from II to IV year B.Tech. Program (LES) for the award of B.Tech. Degree. They are exempted from the courses of I year offered to regular entry students.

1.3. The students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seats.

1.4. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

2. **Promotion Rule**

A student shall be eligible for promotion in B.Tech programme, if he/she acquires the minimum number of credits as given below:

2.1. A student shall be promoted from II Year to III Year only if he/she fulfills the academic requirements of 24 credits out of 41 credits (60% of average credits) up to II year II Semester, from all the examinations, whether or not the candidate takes the examinations.

2.2. A student shall be promoted from III year to IV year only if he/she fulfills the academic requirements of 49 credits out of 83 credits (60% of average credits) up to III Year II

Semester from all the examinations, whether or not the candidate takes the examinations.

2.3. A student shall register and put up minimum attendance in all 122 credits and earn all 122 credits to be eligible for the award of degree.

2.4. Students who fail to earn 122 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission stands cancelled.

3. **Award of Class**

All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B.Tech. (Lateral Entry Scheme).

MALPRACTICE RULES

Disciplinary Action for Malpractices/Improper Conduct in Examinations

	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.
(b)	Gives assistance or guidance or receives it from any other candidate orally or	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates

	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.	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 examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from 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 practicals 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 end semester 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.
4.	Smuggles the answer book or additional sheet or takes out or arranges to send out the	Expulsion from the examination hall and cancellation of performance in that subject and all the other

	question paper during the examination or answer book or additional sheet, during or after the examination	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 end semester 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 Chief Superintendent/Assistant–Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the or organizes a walk out or instigates others **to** examination hall walk out, or threatens the officer- in-charge 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 officer- in-charge, 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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates are also debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	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.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the 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 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	If the student belongs to the college, expulsion from the examination performance in that subject and all other subjects shall and cancellation of the candidate has already appeared including practical examinations and project work and shall not be

	to 8.	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 other 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.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College Academic Committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

Punishments to the candidates as per the above guidelines.

Malpractice identified at Spot center during valuation

1) The following procedure is to be followed in the case of malpractice cases detected during valuation, scrutiny etc. at spot center. Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will

recommend suitable action on the candidate.

2) A notice is to be served to the candidate(s) involved through the Principal to his address and to the candidate(s) permanent address regarding the malpractice and seek explanations.
3) The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing in correct or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquire.
4) Based on the explanation and recommendation of the committee action may be initiated.
5) **Malpractice committee:**

(a)	Controller of Examinations	Chairman
(b)	Assistant Controller of Evaluation	Member
(c)	Chief Examiner of the Course/ Subject Expert	Member
(d)	Concerned Head of the Department	Member
(e)	Concerned Invigilator	Member

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CMR COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING

Institute Vision:

To be a premier academic institution striving continuously for excellence in technical education, research and technological services to the nation.

Institute Mission:

1. Create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with a concern for the society.
2. Pursue and disseminate research findings and offer knowledge-based technological services to satisfy the needs of society and the industry.
3. Promote professional ethics, leadership qualities and social responsibilities.

Department Vision:

To produce technically competent engineers and become a center of excellence in the field of Mechanical Engineering and related fields

Department Mission:

1. To educate and empower the students with the state of art knowledge in the area of mechanical engineering and allied fields.
2. To create, explore and develop innovations through research and consultancy.
3. To develop self learning abilities, leadership qualities and professional ethics among the students to service the society.

Program Educational Objectives:

PEO1: Excel in their professional career and in higher education in Mechanical Engineering and related fields.

PEO2: Imbibe professional ethics, Communicative skills and the team sprit to work independently or cohesively with a group.

PEO3: Demonstrate lifelong learning skills for sustainable development and service to the society.

Program Outcomes:

1. Ability to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems in mechanical engineering.
2. Ability to Identify and formulate research literature and analyze complex engineering problems in Mechanical Engineering using first principles of mathematics, natural sciences and engineering sciences.
3. Ability to design solutions for complex engineering problems and design system components or processes that meet the specified needs considering public health and safety, and cultural, societal, and environment.
4. Ability to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to obtain solutions to Mechanical engineering problems.
5. Ability to create, select and apply appropriate techniques, resources and modern engineering activities, with an understanding of the limitations.
6. Ability to 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. Ability to understand the knowledge of contemporary issues related to Mechanical Engineering and their impacts on

societal and environmental contexts and to progress for sustainability.

8. Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Ability to communicate effectively oral, written and in graphic forms on complex engineering activities.
11. Ability to 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. Ability to recognize the need for and having the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES:

PSO-1: Ability to formulate and analyze complex engineering problems in various domains of Mechanical Engineering like Thermal, Design, Production and Industrial Engineering .

PSO-2: Capability to build and apply innovative ideas in design for development of industrial products with the aid of contemporary computerised tools, while ensuring paramount manufacturing traditions.

B.Tech (Mechanical Engineering) Course Structure R-18

SEMESTER-I						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30004	Linear Algebra and Calculus	BSC	3	1	0	4
A30008	Engineering Physics	BSC	3	1	0	4
A30311	Engineering Mechanics	ESC	3	1	0	4
A30312	Engineering Graphics	ESC	1	0	4	3
A30010	Engineering Physics Lab	BSC	0	0	3	1.5
A30505	Basic Internet of Things Lab	ESC	0	0	2	1
A30020	Introduction to Social Innovation	HSMC	0	0	2	1
Total:			10	3	11	**18.5**

SEMESTER - II						
Course Code	Course	Category	Hours per Week			C
			L	T	P	
A30001	English	HSMC	2	0	0	2
A30005	ODEs and Multivariable Calculus	BSC	3	1	0	4

A30011	Engineering Chemistry	BSC	3	0	0	3
A30501	Programming for Problem Solving	ESC	3	0	0	3
A30002	English Language Communication Skills Lab	HSMC	0	0	3	1.5
A30012	Engineering Chemistry Lab	BSC	0	0	3	1.5
A30502	C Programming Lab	ESC	0	0	3	1.5
A30314	Engineering Workshop	ESC	0	0	3	1.5
A30019	Engineering Exploration& Practice	BSC	0	0	3	1.5
Total:			11	1	15	**19.5**
Total Credits In I Year: 38						

SEMESTER - III						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30226	Basic Electrical and Electronics Engineering	ESC	3	0	0	3
A30321	Materials Engineering	PCC	3	0	0	3
A30323	Thermodynamics	PCC	3	1	0	4

A30181	Mechanics of Solids	PCC	3	0	0	3
A30324	Machine Drawing	PCC	1	0	2	2
A30322	Materials Engineering Lab	PCC	0	0	3	1.5
A30227	Basic Electrical and Electronics Engineering Lab	ESC	0	0	3	1.5
A30107	Strength of Materials Lab	PCC	0	0	3	1.5
A30021	Social Innovation in Practice	HSMC	0	0	2	1
A30016	Gender Sensitization	MC	0	0	2	0
Total:			13	1	15	**20.5**

SEMESTER - IV						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30325	Applied Thermodynamics	PCC	3	0	0	3
A30182	Fluid Mechanics & Hydraulic Machines	PCC	3	0	0	3
A30329	Kinematics of Machinery	PCC	2	1	0	3
A30007	Numerical Techniques & Probability Distributions	BSC	3	1	0	4
A30327	Manufacturing	PCC	3	0	0	3

	Processes					
A30326	Applied Thermodynamics Lab	PCC	0	0	3	1.5
A30113	Fluid Mechanics & Hydraulic Machinery Lab	PCC	0	0	3	1.5
A30328	Manufacturing Processes Lab	PCC	0	0	3	1.5
A30015	Soft Skills & Professional Ethics	MC	0	0	2	0
A30022	NSS/NCC	MC	0	0	2	0
Total:			14	2	13	**20.5**
Total Credits In II Year: 41						

SEMESTER - V						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30331	Dynamics of Machinery	PCC	3	0	0	3
A30332	Manufacturing Technology	PCC	3	0	0	3
A30335	Machine Design	PCC	3	0	0	3
A30334	Thermal Engineering	PCC	3	0	0	3
Professional Elective-I						
A30351	Non Destructive Testing Methods	PEC	3	0	0	3

A30361	Mechatronic Systems	PEC	3	0	0	3
A30371	Refrigeration & Air Conditioning	PEC	3	0	0	3
A30333	Manufacturing Technology Lab	PCC	0	0	3	1.5
A30003	Advanced English Communication Skills Lab	HSMC	0	0	3	1.5
A30339	Theory of Machines Lab	PCC	0	0	3	1.5
A30017	Indian Constitution	MC	2	0	0	0
A30018	Essence of Indian Traditional Knowledge					
Total:			17	0	9	**19.5**
A30391	Mini Project-I	MC	**During Summer Vacation/Non Credit**			
A30393	Internship-I	MC				

SEMESTER – VI						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30013	Business Management and Financial Analysis	HSMC	4	0	0	4
A30336	Engineering Metrology& Measurements	PCC	3	0	0	3
A30338	Heat Transfer	PCC	3	0	0	3

A30343	Automation in Manufacturing	PCC	3	0	0	3
	Professional Elective-II					
A30352	Plant Layout and Material Handling	PEC	3	0	0	3
A30362	Industrial Robotics	PEC	3	0	0	3
A30372	Automobile Engineering	PEC	3	0	0	3
A30337	Engineering Metrology & Measurements Lab	PCC	0	0	3	1.5
A30342	Heat Transfer Lab	PCC	0	0	3	1.5
A30344	Automation in Manufacturing Lab	PCC	0	0	3	1.5
A30014	Environmental Sciences	MC	2	0	0	0
A30395	Technical Seminar-I	PROJ	2	0	0	2
Total:			20	0	9	**22.5**
Total Credits In III Year: 42						

SEMESTER – VII						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30341	Operations Research	PCC	3	0	0	3
	Professional Elective-III					

A30353	Micro Machining Processes	PEC	3	0	0	3
A30363	Tribology	PEC	3	0	0	3
A30373	Computational Fluid Dynamics	PEC	3	0	0	3
	Professional Elective-IV					
A30354	Process Management Standards	PEC	3	0	0	3
A30364	Mechanics of Composite Materials	PEC	3	0	0	3
A30374	Non Conventional Sources of Energy	PEC	3	0	0	3
	Professional Elective-V					
A30355	Surface Engineering	PEC	3	0	0	3
A30365	Finite Element Methods	PEC	3	0	0	3
A30375	Jet Propulsions & Rocket engineering	PEC	3	0	0	3
	Open Elective-I	OEC	3	0	0	3
	Open Elective-II	OEC	3	0	0	3
A30397	Project Phase-I	PROJ	0	0	6	3
			18	0	6	**21**
A30392	Mini Project-II	MC	**During Summer Vacation/ Non Credit**			
A30394	Internship-II	MC				

SEMESTER - VIII							
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
	Professional Elective-VI					
A30356	Quality Engineering & Management	PEC	3	0	0	3
A30366	Tool Design	PEC	3	0	0	3
A30376	Cryogenic Engineering	PEC	3	0	0	3
	Open Elective-III	OEC	3	0	0	3
	Open Elective-IV	OEC	3	0	0	3
A30396	Technical Seminar-II	PROJ	2	0	0	2
A30398	Project Phase-II	PROJ	0	0	14	7
Total			11	0	14	**18**
Total Credits In IV Year: 39						

OPEN ELECTIVES OFFERED BY DEPARTMENT OF CIVIL ENGINEERNG IN VII AND VIII SEMESTERS						
Course Code	Course Title	Elective	Hours per Week			
			L	T	P	C
A30160	Disaster Management And Mitigation	OE-I	3	0	0	3
A30161	Remote Sensing and GIS	OE-I	3	0	0	3
A30162	Green Buildings	OE-II	3	0	0	3
A30163	Air Pollution and Control	OE-II	3	0	0	3
A30164	Basic Civil Engineering	OE-III	3	0	0	3
A30165	Sustainability Concepts in Civil Engineering	OE-III	3	0	0	3
A30166	Environmental Protection and Management	OE-IV	3	0	0	3
A30167	Alternate Building Materials	OE-IV	3	0	0	3

OPEN ELECTIVES OFFERED BY CSE Dept.						
Course Code	**Course Title**	**Elective**	**Hours per Week**			
			L	**T**	**P**	**C**
A30554	JAVA PROGRAMMING	OE-I	3	0	0	3
A30531	PYTHON PROGRAMMING	OE-I	3	0	0	3
A30555	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS	OE-II	3	0	0	3
A30537	DATA ANALYTICS WITH R	OE-II	3	0	0	3
A30530	ARTIFICIAL INTELLIGENCE	OE-III	3	0	0	3
A30539	ETHICAL HACKING	OE-III	3	0	0	3
A30538	DEEP LEARNING	OE-IV	3	0	0	3
A30556	CYBER SECURITY	OE-IV	3	0	0	3

OPEN ELECTIVES OFFERED BY ECE Dept.								
S.No	**Course Code**	**Course Title**	**Category**	**Elective**	**L**	**T**	**P**	**C**
1	A30471	Principles of Electronic Communications	OEC	OE-I	3	0	0	3
2	A30472	Basic Electronics Engineering	OEC	OE-I	3	0	0	3
3	A30473	Image Processing	OEC	OE-II	3	0	0	3
4	A30474	Digital Electronics	OEC	OE-II	3	0	0	3
5	A30475	Data Communications	OEC	OE-III	3	0	0	3
6	A30476	Microcontrollers & Applications	OEC	OE-III	3	0	0	3
7	A30477	Fundamentals Of Embedded Systems	OEC	OE-IV	3	0	0	3
8	A30478	Sensors & Transducers	OEC	OE-IV	3	0	0	3

OPEN ELECTIVES OFFERED BY EEE Dept.							
S No	**Course Code**	**Course Title**	**OE**	**L**	**T**	**P**	**C**
1	A30258	Basics of Power Electronics & Drives	OE-I	3	0	0	3
2	A30252	Power Generation Systems	OE-I	3	0	0	3
3	A30260	Electrical Safety	OE-II	3	0	0	3
4	A30259	Electrical & Hybrid Vehicles	OE-II	3	0	0	3
5	A30255	Energy Efficiency in Electrical Utilities	OE-III	3	0	0	3
6	A30253	Fuel Cell Technology	OE-III	3	0	0	3
7	A30256	Energy Audit & Conservation	OE-IV	3	0	0	3
8	A30257	Nano Technology	OE-IV	3	0	0	3

OPEN ELECTIVES OFFERED BY MBA Dept.							
S No	**Course Code**	**Course Title**	**OE**	**L**	**T**	**P**	**C**
1	C30161	Logistics and Supply Chain Management	OE-I	3	0	0	3
2	C30162	Knowledge Management	OE-I	3	0	0	3
3	C30163	Management of Industrial Relations	OE-II	3	0	0	3
4	C30164	Entrepreneurship	OE-II	3	0	0	3
5	C30165	Basics of Insurance & Taxation	OE-III	3	0	0	3
6	C30166	Business Ethics & Corporate Governance	OE-III	3	0	0	3
7	C30167	Marketing Management	OE-IV	3	0	0	3
8	C30168	Intellectual property rights	OE-IV	3	0	0	3

I SEMESTER

(A30004) LINEAR ALGEBRA AND CALCULUS

(Common to all branches)

B. Tech. (ME) I-Semester

L	T	P	C
3	1	0	4

UNIT-I

Matrices: Types of matrices, Symmetric, Hermitian, Skew-symmetric, Skew-Hermitian, Orthogonal matrices, Unitary matrices, 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, Gauss elimination method, Gauss-Seidel iteration method.

UNIT -II

Eigen values and Eigen vectors: Eigen values, Eigen vectors and their properties, Diagonalization of a square matrix, Cayley-Hamilton theorem (without proof) - Inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and nature of the quadratic forms, Reduction of quadratic form to canonical form by linear and orthogonal transformations.

UNIT -III

Sequences &Series:

Sequence: Definition of a sequence, Limit, Convergent, Divergent and oscillatory sequences.

Series: Definition of a series, Convergent, Divergent and Oscillatory Series, Series of positive terms, Comparison test, P-test, D-Alembert's ratio test, Raabe's test, Cauchy's integral test, Cauchy's root test, Logarithmic test.

Alternating series: Leibnitz test, Alternating convergent series, Absolute and conditionally convergence.

UNIT -IV

Calculus:

Mean value theorems: Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation and applications, Cauchy's mean value theorem, Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates),

Improper Integral: Beta, Gamma functions and their applications.

UNIT -V

Multivariable calculus (Partial Differentiation and applications): Definitions of Limit and continuity, Partial differentiation, Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36th Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9th Edition), Erwin kreyszig, John Wiley & Sons,2006.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics (3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Calculus and Analytic geometry, (9th Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008.

4. Higher Engineering Mathematics, (11th Reprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.
5. Engineering Mathematics – I, T.K.V. Iyengar, B. Krishna Gandhi &Others, S.Chand 2013 .
6. Applied Mathematics for Engineers & Physicists (3rd edition) by Pipes &Harvill, McGraw Hill International Book company.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Solve linear system by using various methods of matrices.
2. Find Eigen values, Eigen vectors and diagonalization of a square matrix.
3. Analyze the nature of sequence and series.
4. Verify mean value theorems & evaluation of improper integrals by using Beta and Gamma functions
5. Find maxima & minima of functions of several variables.

(A30008) ENGINEERING PHYSICS

B. Tech. (ME) I-Semester

L	T	P	C
3	1	0	4

UNIT-I

Waves & Oscillations: Simple harmonic oscillators, Phasor representation of simple harmonic motion, Damped harmonic oscillator – heavy, critical and light damping, Energy decay in a damped harmonic oscillator, Quality factor, forced harmonic oscillations and resonance, Mechanical and electrical oscillators-analogy between them, Transverse wave on a string, the wave equation on a string(qualitative), standing waves, longitudinal waves and the wave equation for them, acoustics waves and speed of sound(qualitative).

UNIT-II

Interference: Huygen's principle, Superposition of waves and interference of light, Interference due to division of wave front- Young's double slit experiment, Interference due to division of amplitude- interference in thin films (reflected light), Newton's rings- determination of wavelength of light, Michelson's interferometer(qualitative).

Diffraction: Diffraction (definition), Distinctions between Fraunhofer & Fresnel diffraction, Fraunhofer diffraction due to single slit and Double Slit - Conditions for principle maxima - secondary maxima and minima, Fraunhofer diffraction due to a grating - Construction of diffraction grating - Rayleigh criterion of resolving power- Resolving power of a grating.

UNIT-III

Lasers: Characteristics of lasers, Absorption, spontaneous and stimulated emission of radiation, Einstein's coefficients and relation between them, Population inversion, Lasing action, Ruby laser, Helium-Neon laser, Semiconductor diode laser, Applications of lasers.

Fiber Optics: Principle of Optical fiber, Construction of optical fiber, acceptance angle and acceptance cone, Numerical

Aperture, Types of optical fibers: Single and Multimode fibers, Step Index optical fibers & Pulse dispersion (qualitative treatment) - Graded index optical fibers & Pulse dispersion (qualitative treatment), Attenuation in optical fibers, optical fiber communication, optical fiber sensors.

UNIT-IV

Dielectric Properties: Electric dipole, Dipole moment, Relative permittivity, Polarization and polarizability, Electric susceptibility, Displacement vector, Electronic and Ionic polarization, Orientation polarization (qualitative treatment), Internal fields in solids, Clausius–Mossotti equation, Piezo electric and Pyro-electric materials, Ferro electric materials.

Magnetic Properties: Permeability, Field intensity, Magnetic field induction, Magnetization, Magnetic Permeability &Susceptibility, Classification of Dia., Para, Ferro, Ferri and Anti-Ferro magnetic materials on the basis of magnetic moment (qualitative treatment), Explanation of Hysteresis curve on the basis of Domain theory of ferro magnetism.

UNIT-V

Engineered materials: Origin of nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Practical examples of low dimensional system such as Quantum wells, wires, dots, Fabrication –Top down and Bottom –up approach (qualitatively) Characterization by XRD & TEM, Applications.

TEXT BOOKS:

1. Engineering Physics by B.K. Pandey, S. Chaturvedi, Cengage Learning India Pvt. Ltd., 1st Edition, 2012.
2. Engineering Physics by PK Palanisamy, SciTech Publications, 3rd edition, 2015.

REFERENCES:

1. The Physics of vibrations and wave by H.JohnPain,Wiley, 6th edition, 2005.
2. Fundamentals of Physics by Halliday, R.Resnick and J.Walker,John Wiley and Sons, 6th edition, 2001.

3. Mechanics of Particles, Waves & Oscillations by Anwar Kamal, New Age International Ltd, 3rd edition, 2004.
4. Vibrations and waves in physics by Ian G. Main, Cambridge University press, 3rd edition,1994.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Compare different types of waves and harmonic oscillations.
2. Describe different phenomenon of optics.
3. Explain the basic concepts of lasers and optical fiber characteristics.
4. Classify various polarization processes in solids & different dielectric materials. Describe different types of magnetic materials.
5. Describe basic principles of low dimensional Engineering materials.

(A30311) ENGINEERING MECHANICS

B. Tech. (ME) I-Semester

L	T	P	C
3	1	0	4

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, 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.

UNIT II:

Friction: Introduction, Types of Friction, Laws of Friction, Static and Dynamic Friction.

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:

Moment of Inertia: Area moment of inertia- Definition, Parallel Axis theorem, Perpendicular Axis theorem, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections.

Mass moment inertia: Moment of inertia of Masses-Transfer formula for Mass Moment of Inertia, Mass Moment of circular plate, Cylinder, Cone, Sphere, Hook.

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 5:

Introduction to Kinetics of Rigid Bodies:

Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

TEXT BOOKS:

1. Timoshenko, Stephen P., and Donovan Harold Young. "Engineering mechanics." (1956).
2. Singer, Ferdinand Leon. Engineering mechanics. HarperCollins Publishers, 1975.

REFERENCE BOOKS:

1. Shames, Irving Herman, and G. Krishna Mohana Rao. Engineering mechanics: statics and dynamics. Englewood Cliffs: Prentice-Hall, 2005.

2. Meriam, James L., and L. Glenn Kraige. Engineering mechanics: dynamics. Vol. 2. John Wiley & Sons, 2012.
3. McLean, William George, and Eric William Nelson. "Schaum's outline of theory and problems of engineering mechanics, statics and dynamics." (1978).

E-RESOURCES:

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/

COURSE OUTCOMES:

Upon successful completion of the course, student should be able to:

1. Apply fundamental concepts of kinematics and kinetics of particles to analyze Simple practical problems.
2. Apply basic knowledge of math and physics to solve real-world problems.
3. Explain measurement error, and propagation of error in processed data.
4. Use basic kinematics concepts – displacement, velocity and acceleration and their angular counterparts to solve related problems.
5. Use basic dynamics concepts – force, momentum, work and energy to solve related problems and Apply Newton's laws of motion for engineering problems.

(A30312) ENGINEERING GRAPHICS

B. Tech. (ME) I-Semester

L	T	P	C
1	0	4	3

UNIT I:

Introduction to Engineering Graphics:

Principles of Engineering Graphics and their significance, Conic sections (General method only); Cycloid, Epicycloid, Hypocycloid; Scales – Plain, Diagonal, Vernier.

UNIT II:

Orthographic Projections:

Principles of Orthographic Projections-Conventions - Projections of Points and lines, Projections of plane regular geometric figures.

UNI III:

Projections of Regular Solids:

Projections of solids inclined to both the Planes.

Sections and Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone.

UNIT IV:

Development of surfaces of Right Regular Solids: Prism, Pyramid, Cylinder and Cone.

Intersection of solids- Cylinder Vs Cylinder, Cylinder Vs Prism.

UNIT V:

Isometric Projections

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids;

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

TEXT BOOKS:

1.Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2.Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

REFERENCE BOOKS:

1.Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
2.Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

E-RESOURCES:

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

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Understand and apply the use of engineering curves in tracing the part of different machine components.
2. Evaluate the concepts of projections and acquire knowledge of visualization skills and convert it into pictorial representation.
3. Create and analyze the 3-D objects of machine components in real world.
4. Explore and evaluate the internal architecture of product by section and development of surfaces.
5. Create and imagine the solid and real objects in real world with axonometric projection.

(A30010) ENGINEERING PHYSICS LAB

B. Tech. (ME) I-Semester

L	T	P	C
0	**0**	**3**	**1.5**

(Any 8 experiments are to be performed)

1. Melde's experiment: To determine the frequency of a vibrating bar or turning fork using Melde's arrangement.
2. Torsional pendulum: To determine the rigidity modulus of the material of the given wire using torsional pendulum.
3. Newton's rings: To determine the radius of curvature of the lens by forming Newton's rings.
4. Diffraction grating: To determine the number of lines per inch of the grating.
5. Dispersive power: To determine the dispersive power of prism by using spectrometer.
6. Coupled Oscillator: To determine the spring constant by single coupled oscillator.
7. LCR Circuit: To determine the Quality factor of LCR Circuit.
8. Optical fibre: To determine the Numerical aperture of a given fibre and bending losses of Optical fibres.
9. Diffraction grating: Determination of wavelength of a source (LASER).
10. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
11. R-C Circuit: To determine the time constant of R-C circuit.
12. Diffraction grating: To determine the number of lines per inch of the grating element.

LABORATORY MANUAL:

1. Laboratory Manual of Engineering Physics by Dr. Y. Aparna & Dr. K. Venkateswara Rao (V.G.S Publishers).
2. Laboratory Manual of Engineering Physics, Published by CMR College of Engineering & Technology

COURSE OUTCOMES

On completion of the course students will be able to

1. Explain the concept of oscillations and resonance.
2. Determine energy gap of a semiconductor diode, Planck’s constant and magnetic fields.
3. Describe the characteristics of semiconductor devices
4. Design new experiments in engineering.
5. Evaluate the basic properties of lasers and optical fibers.

(A30505) BASIC INTERNET OF THINGS LAB

B. Tech. (ME) I-Semester

L	T	P	C
0	0	2	1

Lab Requirements:

Raspberry Pi3 single board Computer, Android SDK, Eclipse IDE, JDK1.8.

Week 1: Introduction to IoT

- Definition of IoT
- History of IoT
- IoT Architecture
- Enabling Technologies for IoT
- Fundamental characteristics of IoT
- Benefits and Applications of IoT
- Introduction to Basic Components

Basic Components				
Jumper wires	LEDs (Light Emitting Diodes)	Resistors	Potentiometer	Diode
Photo resistor	Buzzer	Temperature Sensor	DC Motor	Push Button
RC Servo	Relays	Breadboard		

Week 2: Programming in python

- Introduction to Python
- Python Installation
- Understanding Python Basics
- Using Arithmetic in your programs
- Learning about Loops

Week 3: Platform Based Development – Raspberry Pi

Introduction to Raspberry Pi

- Why Raspberry Pi?
- Setting up the Raspberry Pi
- Python on Raspberry Pi

Week 4: Basic Experiments Level-1

Demonstration of the following Experiments

Experiment 1: Your First Circuit – To Blink an LED (Light Emitting Diode)

Experiment 2: To Blink an RGB LED

Additional Experiments (optional)

Experiment 1: To read the temperature and display the same in serial monitor.

(use LM35 Temperature sensor)

Experiment 2: To make an LED glow when controller detects a button pressed.

Week 5: Basic Experiments Level -2

Demonstration of the following Experiment

Experiment 1: To control an LED according to the range of analog input sensed using photo resistor. (use Light Dependent Resistor(LDR)

Additional Experiments (optional)

Experiment 1: To interface the Liquid Crystal Display (LCD) with the Arduino Uno to display the characters on the LCD.

Week 6: Basic Experiments Level -3

Demonstration of the following Experiment

Experiment1: To interface the Ultrasonic Sensor with the Arduino Uno to determine the distance of an object from the sensor.

Additional Experiments (optional)

Experiment1: To interface the Infrared sensor with the Arduino Uno to sense the path is clear/indicate the presence of any obstacles.

Week 7: Introduction to Android

- Explain the structure of Android App.
- Create Hello World application with Android.

Week 8

- Create Application to change the Background Color and Background Image
- Explain simple User interface components in Android and create simple Application

Week 9

- Create an application that display color or image as background when selected the radio buttons or checkboxes.
- Create an Application to perform addition, Subtraction, multiplication, division.

Week 10

- Explain what activity, intent and its functions is.
- Create an application with Android intent.

Week 11

Create a simple android application with the following event handlers.

- On Click
- On Key Down
- On Focus changed

Week 12

- Explain about Toast, Create Application with User defined Toast Notifications.
- Create login page by using login activity.

REFERENCE BOOKS:

1. Arshdeep Bahga,Vijay Madisetti, Internet of Things: A Hands-On Approach, Orient Blackswan Private Limited - New Delhi; First edition (2015).
2. John Horton, Android Programming for Beginners, PACKT publications.

COURSE OUTCOMES

At the end of the course the student will be able to:

1. Identify and differentiate various components used in IoT Architecture.
2. Write & execute programs in python programming language.
3. Use python programming language to interface with raspberry.
4. Demonstrate the various real time applications using Raspberry Pi.
5. Create and deploy mobile applications using android.

(A30020) INTRODUCTION TO SOCIAL INNOVATION

B. Tech. (ME) I-Semester

L	T	P	C
0	0	2	1

UNIT 1

Community Study: Types and features of communities- Rural, Suburban, Urban and regional, Service based learning, Aims of community based projects, Community visits.

UNIT 2

Social Innovation across Four Sectors: The four sectors – the non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors.

UNIT 3

Stages of Social Innovation: Social organizations and enterprises, social movements, politics and government, markets, academia, philanthropy, social software and open source methods, common patterns of success and failure.

UNIT 4

Engineering Ethics: Introduction to ethics, moral values, significance of professional ethics, code of conduct for engineers, identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

UNIT 5

Steps for Patent filing and Startups, poster presentation.

REFERENCES:

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public

Sectors; Georgia Levenson Keohane; Tata McGraw Hill
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave Macmillan
3. Engineering Ethics: An Industrial Perspective ; Gail Baura; Elsevier
4. Intellectual Property and Financing Strategies for Technology Startups; Gerald B. Halt, Jr., John C. Donch, Jr., Amber R. Stiles, Robert Fesnak; Springer
5. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher: Asia Law House ISBN: 9789381849514, 938184951X Edition: 1st Edition, 2012.
6. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press- New Delhi, ISBN: 9780198089605, 0198089600 Edition: 2012.

COURSE OUTCOMES:

On Completion of the course, the students will be able to

1. Illustrate the factors affecting social innovation
2. Illustrate the impact of social innovation in various sectors
3. Adopt the ethical values in doing innovation, which leads to betterment of society.

II SEMESTER
(A30001) ENGLISH

B. Tech. (ME) II-Semester

L	T	P	C
2	0	0	2

UNIT-I:

Reading: **On the Conduct of Life: William Hazlitt** from "**Language and Life: A Skills Approach"** Published by Orient Black Swan, Hyderabad.
Grammar: Prepositions
Vocabulary: Word Formation I: Introduction to Word Formation
Writing: Clauses and Sentences

UNIT-II:
Reading: **The Brook: Alfred Tennyson** from "**Language and Life: A Skills Approach"** Published by Orient Black Swan, Hyderabad.
Grammar: Articles
Vocabulary: Word Formation II: Root Words from Other Languages
Writing: Punctuation
Life Skills: Self Improvement- 'How I Became a Public Speaker': *George Bernard Shah*

UNIT-III:
Grammar: Noun-Pronoun Agreement, Subject-Verb Agreement
Vocabulary: Word Formation III: Prefixes and Suffixes from Other Languages
Writing: Principles of Good Writing
Life Skills: Time Management- 'On Saving Time': *Seneca*

UNIT-IV:
Grammar: Misplaced Modifiers
Vocabulary: Synonyms and Antonyms
Writing: Essay Writing

Life Skills: Innovation- Muhammad Yunus – A biography

UNIT –V:

Reading: **Politics and English Language: George Orwell** from “**Language and Life: A Skills Approach”** Published by Orient Black Swan, Hyderabad.

Grammar: Clichés, Redundancies

Vocabulary: Common Abbreviations

Writing: Writing a Summary

TEXTBOOKS:

1. A Text book entitled **“Language and Life: A Skills Approach”** Published by Orient Black Swan, Hyderabad.ISBN:978-93-5287-422-4

REFERENCES:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

COURSE OUTCOME:

1. At the end of the course the student will be able to:
2. Apply the Noun-Pronoun Agreement, Subject-Verb Agreement in sentence formation.
3. Identify the Root Words from other Languages.
4. Describe the word formation in English language.
5. Employ Synonyms, Antonyms, Affixation and Acronyms in writing and speaking correct English.
6. Compose essays and summaries in English.

7. Apply the time management skills to make best use of time effectively.
8. Apply the public speaking skills in giving presentations and speeches in English.

(A30005) ODEs AND MULTIVARIABLE CALCULUS

(Common to all branches)

B. Tech. (ME) II-Semester

L	T	P	C
3	1	0	4

UNIT-I

First Order ODE: Exact, Linear and Bernoulli's differential equations, Applications, Newton's law of cooling, Law of natural growth and decay.
Equations not of first degree: Equations solvable for p, Equations solvable for y, Equations solvable for x and Clairaut's type.

UNIT –II

Ordinary Differential Equations of Higher Order: Second and higher order linear differential equations with constant coefficients, Non-Homogeneous terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$, Method of variation of parameters, Equations reducible to linear ODE with constant coefficients, Legendre's equation, Cauchy-Euler equation.

UNIT –III

Multivariable Calculus (Integration): Evaluation of Double Integrals (Cartesian and polar coordinates), Change of order of integration (only Cartesian form), Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals, **Applications:** Areas (by double integrals) and volumes (by double integrals and triple integrals).

UNIT –IV

Vector Differentiation: Vector point functions and scalar point functions, Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT –V

Vector Integration: Line, Surface and volume Integrals. Theorems of Green's, Gauss and Stoke's (without proofs) and their applications.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36th Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9th Edition), Erwin kreyszig, John Wiley & Sons,2006.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics (3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Differential Equations with Applications & Historical Notes (2ndEdi) by George F Simmons, Tata Mc. graw Hill Publishing Co Ltd.
3. Advanced Engineering Mathematics(8thEdition) by Kreyszig, John Wiley & Sons Publishers
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry(9thEdition), Pearson, Reprint, 2002
5. Mathematics for Engineering and Scientists (6th Edi), by. Alan Jeffrey, 2013, Chapman & Hall / CRC
6. Engineering Mathematics – I by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2012 Yr. Edition S.Chand.
7. Differential Equations(3rd Ed), S. L. Ross Wiley India, 1984.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Identify whether the given differential equation of first order is exact or not.
2. Solve higher order linear differential equations using various methods.
3. Evaluate multiple integrals and using multiple integrals evaluate areas and volumes.
4. Evaluate Gradient, Divergence, Curl and directional derivatives.
5. Evaluation of integrals by converting line to surface integral and surface to volume integrals.

(A30011) ENGINEERING CHEMISTRY

B. Tech. (ME) II-Semester

L	T	P	C
3	**0**	**0**	**3**

UNIT-I

Molecular Structure and Theories of Bonding:

Introduction, Concept of atomic and molecular orbitals, Linear combination of atomic orbitals (LCAO), Molecular orbitals of diatomic molecules, Molecular orbital energy level diagrams of diatomic molecules- N_2, O_2 and F_2, π −molecular orbitals of butadiene and benzene.

Crystal Field Theory (CFT):

Salient features of CFT, Crystal field splitting patterns of transition metal ion d-orbitals- tetrahedral, octahedral and square planar complexes.

UNIT-II

Electrochemistry:

Introduction, Conductance- Specific conductance, Equivalent conductance, Molar conductance and their inter relationship, Numerical problems, Electrochemical cell, Electrode potential, Standard electrode potential and E.M. Fof the cell, Nerns't equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode. Electro chemical series and its applications. Concept of concentration cells, Electrolytic concentration cell and numerical problems, Batteries- primary (Lithium cell), secondary (Lead acid storage battery and Lithium ion battery) and Fuel cells (H_2-$O_2$and methanol-oxygen).

Corrosion:

Causes and effects of corrosion, Theories of chemical and electrochemical corrosion, Mechanism of electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion- Galvanic, Waterline and Pitting corrosion, Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection, Sacrificial anode and Impressed current cathodic methods, Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating- Copper plating and electroless plating - Nickel plating.

UNIT –III

Spectroscopic Techniques and Applications:

Principles of spectroscopy and selection rules, Applications of UV-Visible spectroscopy, Vibrational and rotational spectroscopy (IRspectroscopy)-Applications, Nuclear magnetic resonance-Chemical shift, Splitting pattern and Integration, Introduction to magnetic resonance imaging.

UNIT-IV

Water Technology:

Sources of water, Impurities in water, Hardness of water, Temporary and permanent hardness, Units of hardness, Estimation of temporary and permanent hardness of water, EDTA method, Numerical problems, Potable water treatment-Specifications, Steps involved in treatment-Sedimentation, Coagulation, Filtration, Sterilisation, Desalination of Brackish Water, Reverse Osmosis and Electro dialysis.

Industrial water treatment, Boiler troubles-Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming.Hot lime and cold lime soda process-Numerical problems, Zeolite process and Ion exchange process. Internal conditioning methods like Phosphate, Carbonate, Calgon and Colloidal conditioning.

UNIT-V

Stereochemistry:

Representations of three dimensional structures, Structural isomers and stereoisomers, Configurations and symmetry, Chirality- Enantiomers, Diastereomers, Optical activity, Absolute configurations and conformational analysis of n-butane.

Organic Reaction Mechanisms and Synthesis of a Drug Molecule:

Introduction, Substitution reactions- Nucleophilic substitution reactions(Mechanisms of SN^1 and SN^2 reactions, Addition reactions-Electrophilic and nucleophilic addition reactions, Addition of HBr to propene, Mar kownikoff and anti markownikoff'sadditions,Grignard additions on carbonyl compounds, Elimination reactions- Dehydro halogenation of Alkyl halides, Shetzeff rule.
Oxidation reactions- Oxidation of Alcohols using $KMnO_4$ and chromic acid, Reduction reactions-reduction of carbonyl compounds using $LiAlH_4$, $NaBH_4$, Synthesis of a commonly used drug molecules (Paracetamol and Ibuprofen).

TEXT BOOKS:

1. "Engineering Chemistry", P.C Jain and Jain Monika,Dhanpat Rai Publication Company, 16th Edition, 2015.
2. Text Book of Engineering Chemistry by A. Jaya Shree, Wiley India Pvt. Ltd, New Delhi.

REFERENCE BOOKS:

1. University chemistry, by B. H. Mahan, Narosa Publication.1998.
2. Chemistry: Principles and Applications, by M. J. Sienko and R.A. Plane, McGraw-Hill, 3rd edition, 1980.
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell, McGraw-Hill, 3rdrevised edition, 1983.
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan.

5. Physical Chemistry, by P. W. Atkins, W.H. Freeman and Company, 5th Edition, 1994.
6. “Text Book of Engineering Chemistry”, B.Rama Devi, Ch. VenkataRamana Reddy and PrasanthRath, Cengage Learning 2017.
7. “Organic Chemistry”, Morison and Boyd, Pearson publications, 7th Edition 2011.
8. Organic Chemistry: Structure and Function by K.P.C.Volhardt and N.E.Schore,5thEdition .

COURSE OUTCOMES:

After completion of the course students will be able to

1. Explain the benefits of treated water as source in steam generation and other fields like production of steel, paper, textiles, atomic energy etc.
2. Analyze and describe how electrochemical concepts can be used in various practical applications, like batteries, fuel cells etc.
3. Apply knowledge of corrosion science to problems in materials engineering.
4. Explain the prevention of corrosion of metals.
5. Visualize the chemical applications of electricity.
6. Analyze microscopic chemistry in terms of atomic and molecular orbitals.
7. List major chemical reactions that are used in the synthesis of drugs.

(A30501) PROGRAMMING FOR PROBLEM SOLVING

B. Tech. (ME) II-Semester

L	T	P	C
3	0	0	3

UNIT -I

Introductory Concepts: Introduction to Computers, computer characteristics, modes of operation, Types of Programming Languages.

Idea of Algorithm: Steps to solve logical and numerical problems.

Representation of Algorithm: Flowchart/ Pseudo code with examples.

Algorithms to programs: Source code, variables (with data types), variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Introduction to C: Some simple C programs, desirable program characteristics.

C Fundamentals: The C Character Set, Identifiers and Keywords, Data Types, Constants, Variables and array declarations, expressions, statements, Symbolic Constants.

Operators and Expressions: Unary Operators, Arithmetic Operators, Relational and Logical Operators, Bitwise Operators, Conditional Operators, Assignment Operators, Special Operators, Precedence & Associativity of Operators, Evaluation of Expressions.

Data Input and Output: Preliminaries, Single Character Input- The getchar Function, Single

Character Output- The putchar Function, Entering Input Data- The scanf Function, More About the scanf Function, Writing Output Data- The printf Function, More About the printf Function, The gets and puts Functions.

UNIT –II

Control Statements: Preliminaries, Branching: The if-else Statements, Looping: The while

Statement, the do while Statement, the for Statement, Nested Control Structures, the switch
Statement, the break Statement, the continue Statement, the goto Statement.

Arrays: Defining an Array, Processing an Array, Multidimensional Arrays.

UNIT -III

Functions: A Brief Overview, defining a Function, Accessing a Function, Function Prototypes,
Passing Arguments to a Function, Recursion, Passing Arrays to Functions.

Program Structure: Storage Classes- Automatic Variables, External Variables, Static Variables
and Register Variables, Multi files Programs, More about Library Functions.

Strings: String Handling Functions, Sample C Programs without using library functions.

UNIT –IV

Pointers: Fundamentals Pointer Declarations, Passing Pointers to Functions, Pointers and One- Dimensional Arrays, Dynamic Memory Allocation, Operations on Pointers, Pointers and Multidimensional Arrays, Arrays of Pointers, Passing Functions to other Functions, More about Pointer Declarations.

Structures and Unions: Defining a Structure, Processing a Structure, User Defined Data Types-type def & Enumerations, Structures and Pointers, Passing Structures to Functions, Bit fields, Self-Referential Structures and Unions..

UNIT -V

Data Files: Opening and Closing a Data File, Creating a Data File, Processing a Data File,
Unformatted Data Files and Command Line Parameters.

Searching and Sorting: Linear and Binary Search, Bubble Sort, Selection Sort and Insertion
Sort.

TEXT BOOKS:

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

REFERENCE 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

COURSE OUTCOMES

The student shall be able

1. Write algorithms and to draw flowcharts for solving problems.
2. Convert the algorithms/flowcharts to C programs.
3. Code and test a given logic in C programming language.
4. Decompose a problem into functions and to develop modular reusable code.
5. Write C programs using arrays, pointers, strings and structures.
6. Perform searching and sorting.

(A30002) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

B. Tech. (ME) II-Semester

L	T	P	C
0	**0**	**3**	**1.5**

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB shall have **two** parts

A. **Computer Assisted Language Learning (CALL) Lab**
B. **Interactive Communication Skills(ICS) Lab**

INTRODUCTION:
The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

EXERCISE – I
CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session

EXERCISE – II
CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.

EXERCISE – III

CALL Lab: Minimal Pairs- Word accent and Stress Shifts.
ICS Lab: Descriptions – Place, Person, Object

EXERCISE – IV

CALL Lab: Intonation and Common errors in Pronunciation.
ICS Lab: Extempore- Public Speaking

EXERCISE – V
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Giving Directions

COURSE OUTCOMES:
At the end of the lab session, learner comprehends, acquaints and adopts the following.

1. Illustrates How to Work in Teams
2. Demonstrates Soft Skills and Communications Skills well and Exhibits Decorum with ease
3. Minimizes the usage of Mother Tongue and Apprises Neutral Accent
4. Prepares for employability skills
5. Speaks English Confidently and does Presentations with self-confidence
6. Distinguishes between Sympathy and Empathy
7. Demonstrates the art of persuasion

(A30012) ENGINEERING CHEMISTRY LAB

B. Tech. (ME) II-Semester

L	T	P	C
0	**0**	**3**	**1.5**

1. Estimation of Hardness of water by EDTA method.
2. Estimation of Alkalinity of water.
3. Estimation of Copper by Colorimetric Method.
4. Conductometric Titration of a strong acid vs a strong base.
5. Conductometric Titration of a week acid vs a week base.
6. Potentiometric Titration of a strong acid vs a strong base.
7. Potentiometric Titration of week acid vs a week base.
8. Preparation of Paracetmol and Asprin.
9. Determination of Viscosity of a Liquid.
10. Determination of Surface Tension of a liquid.
11. Adsorption of acetic acid on Activated charcoal.
12. Estimation of iodine in table salt.
13. Thin Layer Chromatography (Ortho-Nitro phenol & Para-Nitro phenol).
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

Course outcomes:

At the end of the course the student will be able to

1. Predict the extent of hardness range present in water sample and its consequences if used for various industrial operations
2. Prepare drugs like Aspirin and Paracetmol
3. Estimate the strength of solutions, p^H of various solutions
4. Evaluate the viscosity and surface tension of liquids
5. Employ the conductometric and potentiometric titrations
6. Describe the principles of adsorption phenomenon.

REFERENCES:

1. Engineering Chemistry Lab Manual, Glaze Publishers 2018.
2. Engineering chemistry by B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
3. A Textbook of Engineering Chemistry, Sashi Chawla, Dhanapath Rai & Sons.

(A30502) C PROGRAMMING LAB

B. Tech. (ME) II-Semester

L	T	P	C
0	0	3	1.5

[Note: The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are:
CodeLite: https://codelite.org/
Code:Blocks: http://www.codeblocks.org/
DevCpp: http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Lab 1: Familiarization with programming environment
Lab 2: Simple computational problems using arithmetic expressions
1. Write a C program to find the roots of a quadratic equation.
2. Write a C program to convert centigrade to Fahrenheit.

Lab 3:
3. Write a C program to find maximum of given three numbers.
4. Write a C program to find the factorial of a positive integer.

Lab 4:
5. Write a C program to determine if the given number is a prime number or not.
6. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to print the Fibonacci sequence up to nth term.

Lab 5:
7. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user using Sieve of Eratosthenes algorithm.
8. Write a C program to convert a positive integer to a roman numeral. Ex. 11 is converted to XI.

Lab 6:

9. Write a C program to print the Pascal triangles pyramid

10. Write a C program to calculate the following series

i) Sin(x) ii) Cos(x) iii) log(x)

Lab 7:

11. Write a C program that reads two matrices and uses functions to perform the following:

i) Addition of two matrices ii) Multiplication of two matrices iii) Transpose of a Matrix

Lab 8:

12. Write a C program to read N students data (Roll no, Name, Marks1, Marks2, Marks3) and find the topper (Use array of structures and implement using functions).

Lab 9:

13. Write a C program that reads 15 names each of up to 30 characters, stores them in an array and use an array of pointers to display them in ascending (i.e. alphabetical) order.

14. Two's complement of a number is obtained by scanning it from right to left and

complementing all the bits after the first appearance of a 1. Thus 2’s complement of

11100 is 00100. Write a C program to find the 2’s complement of a binary number.

Lab 10:

15. Write a C program to display the contents of a file to standard output device.

16. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents

Lab 11:

17. Write a C program that uses non-recursive functions to count the number of palindromes in a given string.

18. Write a C program to replace a substring with another in a given line of text.

Lab 12:

19. Write C programs for implementing the following methods
i) Bubble sort ii) Binary Search

ADDITIONAL PROGRAMS:

20. Write a C program that implements the Insertion sort method to sort a given list of
integers in ascending order.
21. Write a C Program to implement selection sort.
22. Write a C program that uses functions to perform the following operations:
(i) To insert a sub-string into a given main string from a given position.
(ii) To delete n characters from a given position in a given string.
23. Write a C program to compare two files, printing the first line where they differ.
24. Write a C program to reverse the first n characters in a file. The file name and n are specified on the command line. Use fseek( ) function
25. Write a C program to merge two files into a third file (i.e., the contents of the first file
Followed by those of the second are put in the third file).

REFERENCE 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
4. Hall of India
5. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

7. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

COURSE OUTCOMES:

1. The student shall be able
2. Write & Execute programs using C-language Syntax.
3. Correct syntax errors for a given program as reported by the C- Compiler.
4. Develop the real world applications using Arrays, Structures in C and test the applications by execution.
5. Demonstrate the usage of various types of pointers in programs by execution in C.
6. Create, read and write to and from simple text and binary files and verify through execution.

(A30314) ENGINEERING WORKSHOP

(COMMON TO ALL BRANCHES)

B. Tech. (ME) II-Semester

L	T	P	C
0	0	3	1.5

I Trade for Exercise:

(Two experiments each from any six trades of the following)

1. Carpentry
2. Fitting
3. Tin-smithy
4. House-wiring
5. Foundry
6. Plumbing
7. Welding
8. Black smithy

II Trades for Demonstration and Exposure:

1. Power tools
2. Machine Tools- Operations on Lathe.

TEXT BOOK:

1. P Kannaiah and K L Narayana, Workshop Manual, Scitech publishers, Second Edition

COURSE OUTCOMES:

On completion of the course, students will be able to

1. Create the different patterns with desired shape and size by using wood.
2. Align and assemble different components to create a product by fitting operations.
3. Fabricate the given material to desired product in a particular pattern by tin smithy.

4. Understand the basic principles of electrical systems in day-to-day applications.
5. Mould the component to desire pattern and shape by black smithy.
6. Create the object by casting process using molten metal.
7. Assemble the components with permanent joint by welding process.
8. Understand the process, transfer of fluid or gases from one place to another place by connecting set of pipes with different requirements in plumbing process

(A30019) ENGNEERINGEXPLORATION & PRACTICE

B. Tech. (ME) II-Semester

L	T	P	C
0	0	3	1.5

MODULE 1

Introduction to Engineering and Engineering Study: Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer.

MODULE 2

Engineering Design: Engineering Design Process, Multidisciplinary facet of design, Importance of analysis in engineering design, general analysis procedure, Pair wise comparison chart, Introduction to mechatronics system, generation of multiple solution, decision matrix, Concepts of reverse engineering

MODULE 3

Mechanisms: Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism.

MODULE 4

Platform based development: Introduction to various platform based development, programming and its essentials, Introduction to transducers and actuators and its interfacing. Concepts of reverse engineering

Data Acquisition and Analysis: Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of data acquisition tools for descriptive statistics, Data

Acquisition, Exporting acquired data to analysis using visual representation

MODULE 5

Project Management: Introduction, Significance of teamwork, Importance of communication in engineering profession, Project management tools: Checklist, Timeline, Gantt Chart, Significance of documentation

Sustainability: Introduction to sustainability, Sustainability leadership, Life cycle assessment, carbon footprint

REFERENCES:

1. Engineering Fundamentals: An Introduction to Engineering (MindTap Course List) 5th Edition by Saeed Moaveni

2. Software Project Management (SIE), (Fifth Edition); Bob Hughes, Mike Cotterell, Rajib Mall; Published by Tata McGraw-Hill Education Pvt. Ltd (2011) ; ISBN 10: 0071072748 ISBN 13: 9780071072748

3. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press (Pvt.) Ltd., New Delhi.

4. Arduino Cookbook, 2nd Edition by Michael Margolis: O'Reilly Media

5. Data Acquisition and Analysis - Building an Excel Budget Forecast Workbook by Andrew Greaney (Kindle Edition) ISBN: 1521903468

6. Concepts in Engineering Design – 2016; by Sumesh Krishnan (Author), Dr. Mukul Shukla (Author), Publisher : Notion Press

COURSE OUTCOMES:

On Completion of the course, the students will be able to

1. Explain the role of an Engineer as a problem solver.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. Analyze a given problem using process of engineering problem analysis.

4. Build simple systems using engineering design process.
5. Analyze engineering solutions from sustainability perspectives.
6. Use basics of engineering project management skills in doing projects.
7. Demonstrate data acquisition and analysis skills using a tool.

III SEMESTER

(A30226) BASIC ELECTRICAL & ELECTRONICS ENGNEERING

B. Tech. (ME) III-Semester

L	T	P	C
3	**0**	**0**	**3**

Unit-I: Electrical Circuits Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations, mesh and nodal analysis, network theorems –super position ,Thevenin's ,maximum power transfer theorem, simple problems.
Instruments: Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments.

Unit-II: DC Machines: Principle of operation of DC Generator & motor – EMF equation - types – DC motor types –torque equation – applications – three point starter.

Unit-III: Transformers: Principle of operation of single phase transformers –EMF equation – losses – efficiency and regulation. AC Machines: Principle of operation of induction motor – slip – torque characteristics – applications. Principle of operation of alternators – regulation by synchronous impedance method.

Unit–IV: Diodes: P-n junction diode, symbol, V-I Characteristics, Diode Applications, and Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems).
Transistors: PNP and NPN Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

Unit-V: Cathode Ray Oscilloscope: Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

TEXT BOOKS:

1. Basic Electrical and Electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and Electronics Engineering-D P Kothari. I J NagarathMcGraw Hill Education

REFERENCES:

1. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabratajit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

COURSE OUTCOMES:

On completion of the course, students will be able to

1. Analyze the basic electrical circuits, parameters, measuring instruments
2. Explain the operation of the transformers in the energy conversion process,
3. Explain construction, operation, and characteristics of DC and AC machines
4. Describe different semiconductor devices, their voltage-current characteristics, realization of various electronic circuits with the various semiconductor devices, and cathode ray oscilloscope.

(A30321) MATERIALS ENGINEERING

B. Tech. (ME) III-Semester

L	T	P	C
3	0	0	3

UNIT-I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics.

Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip Systems, critically resolved shear stress.

Mechanical Property measurement: Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength.

UNIT-II

Static failure theories: Ductile and brittle failure mechanisms, Tresca, Von-mises, Maximum normal stress, Mohr-Coulomb and Modified Mohr-Coulomb;

Fracture mechanics: Introduction to Stress-intensity factor approach and Griffith criterion. Fatigue failure: High cycle fatigue, Stress-life approach, SN curve, endurance and fatigue limits, effects of mean stress using the Modified Goodman diagram; Fracture with fatigue, Introduction to non-destructive testing (NDT).

UNIT-III

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 microstrctural aspects ofledeburite, austenite, ferrite and cementite, cast iron.

UNIT-IV

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermal transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties- austempering,martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening

UNIT-V

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; Aluminum and Al-Cu – Mg alloys- Nickel based super alloys and Titanium alloys.

Composite Materials-Structure and Applications

TEXT BOOKS:

1. Dieter, George Ellwood, and David J. Bacon. Mechanical metallurgy. Vol. 3. New York: McGraw-hill, 1986.
2. Sidney H Avner, “Introduction to Physical Metallurgy”, McGraw Hill Education, Second Edition.

REFERENCE 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 ofIndia Private Limited, 4th Indian Reprint, 2002
3. V. Raghavan, “Material Science and Engineering’, Prentice Hall of India Private Limited,1999.
4. Jindal, U. C. Material Science and Metallurgy. Pearson Education India, 2012.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/108/112108150/
2. https://nptel.ac.in/courses/112/104/112104220/
3. https://nptel.ac.in/courses/113/107/113107078/

COURSE OUTCOMES:

On completion of the course, students will be able to

1. Identify crystal structures for various materials and understand the defects in such structures
2. Evaluate mechanical properties of engineering materials.
3. Explain how to tailor material properties of ferrous and non-ferrous alloys.
4. Describe how to quantify mechanical integrity and failure in materials.
5. Identify heat treatment process for common engineering applications for ferrous and non-ferrous materials.

(A30323) THERMODYNAMICS

B. Tech. (ME) III-Semester

L	T	P	C
3	**1**	**0**	**4**

Note: Steam Tables are permitted for examinations.

UNIT-I

Introduction: Definition and Basic Concept of Thermodynamics. Microscopic and Macroscopic approach, concept of continuum, thermodynamics system, surroundings and universe, thermodynamic equilibrium, process, cycle, property, intensive and extensive properties, quasi–static process, Reversibility and irreversibility, energy in state and transmission. Measurement of temperature, Zeroth law of thermodynamics, principles of thermometry, reference points, Temperature Scales, constant volume gas thermometer.

UNIT-II

Heat and work interactions, pdv work or displacement work for various thermodynamic process First law of Thermodynamics: Statement of First Law, Joule's experiment, work and Internal energy, Energy as property of system, First Law of Thermodynamics applied to process and cycle, steady flow energy equation.

UNIT-III

Limitations of first law-thermal reservoir, heat engine, heat pump, performance parameters.

Second Law of Thermodynamics: Physical description of second law, Kelvin–Planck and Clausius statement of Second Law of thermodynamics, Equivalence of Kelvin–Planck and Clausius statement, Reversible and irreversible processes, Carnot Theorems, Clausius Inequality, Calculation of entropy change during various thermodynamic processes principle of

Entropy increase, T–S diagrams, Available and Unavailable energies, Helmholtz and Gibb’s functions.

UNIT-IV

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.

Properties of pure substances, Concept of phase change, Graphical representation of pressure, Volume and Temperature, (PVT)–T and H diagrams, Properties of steam, Use of steam Tables and Mollier diagram, Thermodynamic relations involving entropy, Enthalpy, Internal Energy, Maxwell relations and Clapeyron equation.

UNIT-V

Air standard cycles: Air standard cycles–Otto, Diesel, Dual Combustion Cycle, comparison of cycles, description and representation on P-V and T-S diagrams, thermal efficiency, mean effective pressure on air standard basis, Basic Brayton cycle.

TEXT BOOKS:

1. Nag, P. K. Engineering thermodynamics. Tata McGraw-Hill Education, 2013.
2. Yadav, R. "Thermodynamics and Heat Engines”." Central Publishing House (2001).

REFERENCE BOOKS:

1. Cengel, Yunus A., and Michael A. Boles. Thermodynamics: An Engineering Approach, -PDF. McGraw-Hill, 2008.
2. Moran, Michael J., Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey. Fundamentals of

engineering thermodynamics. John Wiley & Sons, 2010.

3. Sonntag, R. E., Borgnakke, C., Van Wylen, G. J., & Van Wyk, S. (1998). Fundamentals of thermodynamics (Vol. 6). New York: Wiley.
4. Rao, Y. V. C. Engineering thermodynamics through examples. Universities Press, 2003.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/108/112108148/
2. https://nptel.ac.in/courses/112/105/112105123/
3. https://nptel.ac.in/courses/112/104/112104113/
4. https://nptel.ac.in/courses/112/102/112102255/
5. https://nptel.ac.in/courses/112/105/112105220/
6. https://nptel.ac.in/courses/112/105/112105266/
7. https://nptel.ac.in/courses/112/103/112103275/

COURSE OUTCOMES:

After completing this course the students will be able to

1. Apply energy balance to systems and control volumes, in situations involving heat and work interactions.
2. Evaluate changes in thermodynamic properties of substances.
3. Evaluate the performance of energy conversion devices.
4. Differentiate between high grade and low grade energies.
5. Compare different air standard cycles.

(A30181) MECHANICS OF SOLIDS

B. Tech. (ME) III-Semester

L	T	P	C
3	**0**	**0**	**3**

UNIT-I

Deformation in solids- Hooke's law, stress and strain- tension, compression and shear stresses- elastic constants and their relations- volumetric, linear and shear strains, bars of varying sections, composite bars, temperature stresses, principal stresses and principal planes- Mohr's circle.

UNIT-II

Beams and types transverse loading on beams- shear force and bend moment diagrams-Types of beam supports, simply supported and over-hanging beams, cantilevers. Theory of bending of beams, bending stress distribution and neutral axis, shear stress distribution, point and distributed loads.

UNIT-III

Deflection of a beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorems.

UNIT-IV

Torsion, stresses and deformation in circular and hollow shafts, stepped shafts, deflection of shafts fixed at ends, stresses and deflection of helical springs.

UNIT-V

Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure

COURSE OUTCOMES:

After completing this course the students should be able to

1. Identify various types of loads applied on machine components of simple geometry.
2. Explain the nature of internal stresses that will develop within the components.
3. Evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
4. Evaluate the stresses and deformations in cylinders.
5. Evaluate stresses in shafts.

TEXT BOOKS:

1. Sadhu, Singh. "Strength of Materials." (2007).
2. Popov, Egor Paul, and Toader A. Balan. Engineering mechanics of solids. Vol. 2. Englewood Cliffs, NJ: Prentice Hall, 1990.

REFERENCE BOOKS:

1. Timoshenko, Stephen, and Gleason Harvey MacCullough. "Elements of strength of materials." (1949).
2. Beer, Ferdinand P., et al. "Mechanics of materials." In SI Units, McGraw-Hill, UK, App (1992).
3. William, A. "Nash, Schaum's outline of theory and problems of strength of materials." (2003).

E-RESOURCES:

1. https://nptel.ac.in/courses/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/

(A30324) MACHINE DRAWING

B. Tech. (ME) III-Semester

L	T	P	C
1	**0**	**2**	**2**

Question Paper Pattern: Question paper has two parts. Part one has five questions out of which answer two questions (each 5 marks). Part two has one question (assembly with three views) and it is to be answered compulsorily (it carries 50 marks)

Part I: Machine Drawing Conventions:

Need for drawing conventions – introduction to ISI conventions

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations and their liberal usage.

Drawing of Machine Elements and simple parts

5. Selection of Views, additional views for the following machine elements and parts with every drawing proportions
6. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
7. Keys, cotter joints and knuckle joint
8. Rivetted joints for plates
9. Shaft coupling, spigot and socket pipe joint.

10. Journal, pivot and collar and foot step bearings.

Part II: Assembly Drawings:

Drawings of assembled views for the part drawings of the following, using conventions and easy drawing proportions

11. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
12. Machine tool parts: Tail stock, Tool Post, Machine Vices.
13. Other machine parts - Screw jack, Petrol engine connecting rod, Plummer block
14. Simple designs of steam stop valve, spring loaded safety valve, feed check valve and air cock.

Note: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS:

1. Narayana, K. L. Machine drawing. New Age International, 2009.
2. Bhatt, N. D., and V. M. Panchal. Machine Drawing. Charotar, 1991.

REFERENCE BOOKS:

1. Gill, Pritam Singh. A Textbook of Machine Drawing. SK Kataria& Sons, 2013.
2. Sidheswar, N., P. Kannaiah, and V. V. S. Sastry. Machine drawing. Tata McGraw-Hill, 1978.

COURSE OUTCOMES:

On completion of this course, student will be able to

1. Draw conventional representation of materials and machine elements.
2. Draw different types of fasteners.

3. Draw different types of riveted joints, couplings and bearings.
4. Draw assembly drawings of engine parts, machine parts and valves.

(A30322) MATERIALS ENGINEERING LAB

B. Tech. (ME) III-Semester

L	T	P	C
0	0	3	1.5

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.

COURSE OUTCOMES:

On completion of this course, student will be able to

1. To perform metallographic methods for characterizing the micro structure of the various metals
2. Plot the hardness variations of various heat treated and non-heat treated steels
3. Prepare various crystal structures with help of sticks streams, marbles, steel balls, wires and different adhesives.

(A30227) BASIC ELECTRICAL & ELECTRONICS ENGNEERING LAB

B. Tech. (ME) III-Semester

L	T	P	C
0	0	3	1.5

EXPERIMENTS:

PART A:

1. Verification of KCL and KVL.
2. Verification of Superposition theorem
3. Verification of Maximum power transfer theorem.
4. Verification of Thevenin‘s theorem.
5. Magnetization characteristics of D.C. Shunt generator.
6. Brake test on DC shunt motor.
7. Brake test on 3-phase Induction motor.
8. Regulation of an alternator by synchronous impedance method.

PART B:

1. PN Junction Diode Characteristics (Forward bias, Reverse bias)
2. Transistor CE Characteristics (Input and Output)
3. Study of CRO.
4. Class A Power Amplifier
5. Zener Diode Characteristics

7. Rectifier without Filters (Full wave & Half wave)
8. Rectifier with Filters (Full wave & Half wave).

Note: Total 10 experiments are to be conducted. (Five experiments from PART-A, Five experiments from Part B)

Course Outcomes:

On completion of the course, students will be able to

1. Verify KCL & KVL
2. Analyze the performance characteristics of DC machines.
3. Determine the regulation of 3-Ø alternator.
4. Analyze the operation and characteristics of different types of diodes and transistors.
5. Analyze diode rectifier circuits.

(A30107) STRENGTH OF MATERIALS LAB

B. Tech. (ME) III-Semester

L	T	P	C
0	0	3	1.5

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.

COURSE OUTCOMES:

After completion of the experiments in this lab, the student shall be able to:

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.
2. Calculate direct stress (normal and shear) from Compression and Shear tests on given specimen.
3. Calculate modulus of rigidity of given material from Torsion test on circular shaft and spring test.
4. Calculate Impact strength and hardness of given material from Charpy/Izod impact tests and Brinell / Rockwell hardness tests.
5. Calculate strain in given cantilever beam using electrical resistance strain gauge.

(A30021) SOCIAL INNOVATION IN PRACTICE

B. Tech. (ME) III-Semester

L	T	P	C
0	**0**	**2**	**1**

UNIT 1

Identify community issues to be addressed, Requirements Analysis: Extensive User requirements analysis, generating effective System Requirement document.

UNIT 2

Social Innovation – Case Studies

Presentation of the case studies with a focus on impact and vision on society.

UNIT 3

Process of Social Innovation

Prompts – identifying needs, Proposals – generating ideas, Prototyping – testing the idea in practice,

UNIT 4

Sustaining-developing a business model, Scaling and diffusion-growing social innovations, Systematic change.

UNIT 5

Report writing, Documentation and Panel presentation

REFERENCE BOOKS:

1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, Yeheskel Hasenfeld; Palgrave Macmillan
3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean

COURSE OUTCOMES:

On Completion of the course, the students will be able to

1. Summing up several social issues to be addressed
2. Analyze the feasibility and economical factors
3. Develop a scalable business model.

(A30016) GENDER SENSITIZATION

B. Tech. (ME) III-Semester

L	T	P	C
0	0	2	0

UNIT-I:

Understanding Gender

Lesson 1 – Gender: Why should we study it?

Lesson 2 – Socialization: Making Women, Making Men

Lesson 12 – Just Relationships: Being together as Equals

UNIT-II:

Gender and Biology

Lesson 4 – Missing Women: Sex selection and its consequences

Lesson 10 – Gender Spectrum: Beyond the Binary

Lesson 13 – Additional Reading: Our Bodies, Our Health

UNIT-III:

Gender and Labour

Lesson 3 – Housework: The Invisible Labour

Lesson 7 – Women's Work: Its Politics and Economics

UNIT-IV:

Issues of Violence

Lesson 6 – Sexual Harassment: Say No!

Lesson 8 – Domestic Violence: Speaking Out

Lesson 11 – Thinking about Sexual Violence

UNIT-V:

Gender Studies

Lesson 5 – Knowledge: Through the Lens of Gender

Lesson 9 – Who's History? Questions for Historians and Others.

OBJECTIVES OF THE COURSE

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 introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

LEARNING OUTCOMES

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will 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.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labor and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

IV SEMESTER
(A30325) APPLIED THERMODYNAMICS

B. Tech. (ME) IV-Semester

L	T	P	C
3	0	0	3

Note: 1. Steam Tables are permitted for examinations.
2. Refrigeration and psychrometry Tables are permitted for examinations.

UNIT – I

I.C. Engines: Classification - Working principles of Two & Four stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition- Battery and magneto systems, Cooling- air & water cooling systems Lubrication system- mist, dry and wet sump lubrication.

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.

UNIT – IV

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

Rotary Compressor (Positive displacement type): Roots, Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations. **Dynamic Compressors:** Centrifugal compressors: Mechanical details and principle of operation

Axial Flow Compressors: Mechanical details and principle of operation

UNIT – V

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 – effect of superheating and sub cooling, desired properties of refrigerants and common refrigerants.

Psyhrometry: 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.

Air conditioning: Summer and winter Air Conditioning.

TEXT BOOKS:

1. Ganesan, V. Internal combustion engines. McGraw Hill Education (India) Pvt Ltd, 2012.

2. Rajput, R. K. Thermal engineering. Laxmi Publications, 2010.

REFERENCE BOOKS

1. Nag, P. K. Engineering thermodynamics. Tata McGraw-Hill Education, 2013.
2. Mathur, M. L., and R. P. Sharma. Internal combustion engines. Dhanpat Rai Publ., 2005.
3. Pulkrabek, Willard W. Engineering fundamentals of the internal combustion engine. Upper Saddle River: Pearson Prentice Hall, 2014.
4. Rudramoorthy, R. Thermal engineering. Tata McGraw-Hill, 2003.
5. Heywood, John B. "Internal combustion engine fundamentals." (1988).
6. Khurmi, R. S., and J. K. Gupta. A Textbook Of Thermal Engineering (Mechanical Technology). S. Chand, 2008.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/106/112106133/
2. https://nptel.ac.in/courses/112/103/112103262/

COURSE OUTCOMES

On completion of this course, student will be able to

1. Classify the working principles of internal combustion engines.
2. Compare combustion phenomena between SI Engines & CI engines.
3. Estimate the performance parameters of internal combustion engines.
4. Analyze the performance of compressors.
5. Demonstrate basic concepts of refrigeration, psychometric properties and air conditioning systems.

(A30182) FLUID MECHANICS & HYDRAULIC MACHINES

B. Tech. (ME) IV-Semester

L	T	P	C
3	0	0	3

Unit I

Fluid Statics: Dimensions and Units, physical properties of fluids-specific gravity, viscosity, surface tension- Vapour pressure and their influence on fluid motion-Atmospheric, gauge and vaccum 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: Reynold‘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. 'Hydraulics, Fluid mechanics and hydraulic machinery' by MODI and SETH
2. Fluid mechanics and hydraulic machines by Rajput

Reference Books:

1. Fluid Mechanics and fluid power engineering by D.S.Kumar, Kotaria and sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New age international.
3. Hydraulic Machines by Banga and Sharma, Khanna publishers

E-RESOURCES:

1. https://nptel.ac.in/courses/112/105/112105269/
2. https://nptel.ac.in/courses/112/106/112106200/
3. https://nptel.ac.in/courses/112/105/112105206/
4. https://nptel.ac.in/courses/112/105/112105183/
5. https://nptel.ac.in/courses/112/103/112103249/
6. https://nptel.ac.in/courses/112/105/112105171/

7. https://nptel.ac.in/courses/112/104/112104118/
8. https://nptel.ac.in/courses/105/103/105103192/
9. https://nptel.ac.in/courses/105/103/105103095/
10. https://nptel.ac.in/courses/105/103/105103096/

Course Outcomes:
At the end of the course the student will be able to:

1. Explain the basic properties of fluids.
2. Analyze kinematics of fluids and dynamics of fluid flows.
3. Describe the boundary layer theory and impact of jets.
4. Compare different types of turbines and pumps.

(A30329) KINEMATICS OF MACHINERY

B. Tech. (ME) IV-Semester

L	T	P	C
2	1	0	3

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 – Types of constrained motion – completely, partially or successfully and incompletely constrained motion.

Mechanism and Machines – Mobility of Mechanisms: Grubler‘s criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage.

UNIT – II

Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method. **Plane motion of body:** Instantaneous center of rotation-centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method. Klien‘s construction – Corioli‘s acceleration - determination of Corioli‘s component of acceleration

Analysis of Mechanisms: Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism.

UNIT – III

Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel –

Grasshopper – Watt -Tchebicheff‘s and Robert Mechanism - Pantographs

Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman‘s steering gear.

Hooke's Joint: Single and double Hooke‘s joint –velocity ratio – application – problems.

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 and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases, Analysis of Tangent cam with Roller follower.

UNIT – V

Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding. Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of avoiding interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing

Gear Trains: Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile

TEXT BOOKS

1. Rattan, Sarjit S. Theory of machines. Tata McGraw-Hill Education, 2014.
2. Uicker, John Joseph, Gordon R. Pennock, and Joseph Edward Shigley. Theory of machines and mechanisms. Vol. 1. New York, NY: Oxford University Press, 2011.

REFERENCE BOOKS

1. Thomas, Bevan. Theory of Machines, 3/e. Pearson Education India, 1986.
2. Norton, Robert L. Design of machinery: an introduction to the synthesis and analysis of mechanisms and machines. Vol. 924. Boston: McGraw-Hill, 1999.
3. Rao, J. S., Dukkipati, R.V., Mechanism and Machine Theory, New age International Publishers, 1992.

COURSE OUTCOMES

On completion of this course, student will be able to

1. Analyze the mobility concepts of machines & mechanisms.
2. Analyze for velocity & acceleration on various mechanisms
3. Design cam profiles.
4. Analyze the follower motions on specified contours.
5. Design and analyze various power transmission drives

E-RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104121/
2. https://nptel.ac.in/courses/112104114/
3. https://nptel.ac.in/courses/112104121/
4. https://nptel.ac.in/courses/112/105/112105268/
5. https://nptel.ac.in/courses/112/106/112106270/

(A30007) NUMERICAL TECHNIQUES & PROBABILITY DISTRIBUTIONS
(Common to CE, ME, CSE)

B. Tech. (ME) IV-Semester

L	T	P	C
3	1	0	4

UNIT-I:
NUMERICAL METHODS-I

Solution of polynomial and transcendental equations: Bisection method, Iteration method, Newton-Raphson method and Regula-False method.

Interpolation: Finite differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation, Gauss's forward and backward formulae, Lagrange's method of interpolation.

UNIT-II:
NUMERICAL METHODS-II

Numerical integration : Trapezoidal rule, Simpson's 1/3rd and 3/8 rules.

Numerical Solutions of Ordinary Differential Equations - Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order.

UNIT-III:
LAPLACE TRANSFORMS

Laplace transform of standard functions, First shifting theorem, Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transforms of special functions, Laplace transform of periodic functions. Inverse Laplace transform by different methods, Convolution theorem (without Proof), Solving ODEs by Laplace transform method.

UNIT- IV:
RANDOM VARIABLES & DISTRIBUTIONS
Random Variables: Discrete and continuous random variables.
Distributions: Binomial distribution, Poisson distribution and their Properties, Normal distribution, Sampling distribution of means (σ - known and unknown).

UNIT- V:
TEST OF HYPOTHESIS
Test of hypothesis, Null hypothesis, Alternative hypothesis, Type-I & II errors, Critical region, Confidential interval for the mean & proportions. Test of hypothesis for large samples, Single mean, Difference between the means, Single proportion and difference between the proportions. Test of hypothesis for Small samples, Confidence interval for the t- distribution, Tests of hypothesis t -test, F-test, $\chi 2$- test, goodness of fit.

TEXT BOOKS:

1. Higher Engineering Mathematics (36^{th} edition) by B.S. Grewal, Khanna Publishers.
2. Fundamentals of Mathematical Statistics (11^{th} Edition) by S.C.Gupta& VK Kapoor, Sultan Chand & Sons.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics (3^{rd} edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Introductory Methods of Numerical Analysis, S.S.Sastry, 4h Edition, Prentce Hall of India Pvt. Ltd.
3. Advanced Engineering Mathematics (9^{th} edition) by Erwin Kreyszig John Wiley & Sons Publishers.

4. Probability & Statistics by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2015 Yr. Edition S.Chand.
5. Applied Mathematics for Engineers & Physicists (3rd edition) by Pipes & Harvill , McGraw Hill International Book company.

COURSEOUTCOMES:

On completion of the course students will be able to

1. Find the root of given equation and estimate unknown value using interpolation.
2. Find numerical solutions of ordinary differential equations.
3. Use the Laplace transform techniques for solving ordinary differential equations.
4. Analyse random variables involved in probability models.
5. Test hypothesis for large and small samples.

(A30327) MANUFACTURING PROCESSES

B. Tech. (ME) IV-Semester

L	T	P	C
3	0	0	3

UNIT-I

Casting and Moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, Gating and riser design, casting defects and residual stresses.

UNIT-II

Introduction to bulk and sheet metal forming, plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming (forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing and bending).

UNIT-III

Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, Cutting tool materials, Cutting fluids, Coating.

UNIT-IV

Additive manufacturing: Rapid prototyping and rapid tooling.
Joining/fastening processes: Physics of welding, brazing and soldering; design considerations in welding, Solid and liquid state joining processes; Adhesive bonding.

UNIT V:

Unconventional Machining Processes:
Ultrasonic Machining, principles and process parameters, Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power

and control circuits, wire EDM; Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining

TEXT BOOKS:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014
2. Groover, Mikell P. Fundamentals of modern manufacturing: materials processes, and systems. Join Wiley & Sons, 2007.

REFERENCE BOOKS

1. Degarmo, Ep, Jt Black, And Ra Kosher. "Materials and process in manufacturing. 8ª edição." (1997).
2. Rao, Posinasetti Nageswara. Manufacturing technology. Vol. 1. Tata McGraw-Hill Education, 2013.
3. Rao, Posinasetti Nageswara. Manufacturing technology. Vol. 2. Tata McGraw-Hill Education, 2013.
4. Richard, Little L. "Welding and welding technology." (1990).

COURSE OUTCOMES:

On completion of the course students will be able to

1. To describe metal casting processes and solidification of castings
2. To analyze plastic deformation and yield criteria for metal forming processes.
3. To derive forces in metal cutting life estimations of metal cutting processes.
4. To compare various joining processes and design considerations in welding.
5. To distinguish various unconventional machining processes and their applications.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/107/112107144/

2. https://nptel.ac.in/courses/112/107/112107145/
3. https://nptel.ac.in/courses/112/107/112107084/
4. https://nptel.ac.in/courses/112/107/112107239/
5. https://nptel.ac.in/courses/112/107/112107219/
6. https://nptel.ac.in/courses/112/107/112107083/
7. https://nptel.ac.in/courses/112/107/112107215/
8. https://nptel.ac.in/courses/112/107/112107258/
9. https://nptel.ac.in/courses/112/103/112103263/
10. https://nptel.ac.in/courses/112/103/112103244/
11. https://nptel.ac.in/courses/112/107/112107213/
12. https://nptel.ac.in/courses/112/105/112105212/
13. https://nptel.ac.in/courses/112/103/112103202/
14. https://nptel.ac.in/courses/112/107/112107089/
15. https://nptel.ac.in/courses/112/107/112107090/

(A30326) APPLIED THERMODYNAMICS LAB

B. Tech. (ME) IV-Semester

L	T	P	C
0	0	3	1.5

EXPERIMENTS:

1. Flash and Fire Points (Open cup & Closed cup method)
2. Viscosity determination by Redwood & Saybolt methods
3. I.C. Engines Valve / Port Timing Diagrams
4. I.C. Engines Performance Test for 4 Stroke SI engines
5. I.C. Engines Performance Test for 2 Stroke SI engines
6. I.C. Engines Morse, Retardation, Motoring Tests
7. I.C. Engines Heat Balance – CI/SI Engines
8. I.C. Engines effect of A/F Ratio in a SI engine
9. Performance Test on Variable Compression Ratio Engine
10. IC engine Performance Test on a 4S CI Engine
11. Performance Test on Reciprocating Air – Compressor Unit
12. Dis-assembly / Assembly of Engines
13. Study of Boilers

(A student will perform any 10 experiments out of the above during the semester)

COURSE OUTCOMES:

By undergoing this course, student will be able to

1. Obtain the flash and fire points of a given oil sample.
2. Obtain engine performance parameters of a 4 stroke/2 stroke SI engine using the test rig.
3. Disassemble engine, identify the parts and reassemble
4. Explain the functioning of a boiler and identify various parts.

(A30113) FLUID MECHANICS & HYDRAULIC MACHINERY LAB

B. Tech. (ME) IV-Semester

L	T	P	C
0	**0**	**3**	**1.5**

Experiments

Any 10 Experiments to be conducted:

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli‘s equation.
7. Impact of jet on vanes
8. Performance test on reciprocating pump
9. Performance test on single stage centrifugal pump
10. Performance test on multi stage centrifugal pump
11. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
12. Performance and specific speed test on Francis Turbine
13. Performance and specific speed test on Kaplan Turbine

COURSE OUTCOMES:

After completion of the experiments in this lab, the student shall be able to

1. Apply the knowledge in verification of fluid flow and estimate the friction and frictional less in fluid flow.

2. Calibrate discharge measuring devises and finding discharge through the venture meter and the orifice meter
3. Calibrate discharge measuring devises for open channel or free flow like rectangular and triangular notch.
4. Calculate the coefficient of discharge for outlet devises viz small orifices and mouth pieces.
5. Determine performance characteristics of popular turbines and pumps.

(A30328) MANUFACTURING PROCESSES LAB

B. Tech. (ME) IV-Semester

L	T	P	C
0	0	3	1.5

Metal Casting Lab:

1. Moulding - 2 Exercises
2. Melting & Casting - Demonstration
3. Pattern Marking - 1 Exercise

Welding Lab:

1. Arc Welding:
   a) Effect of polarity on welds strength & Heat affected zone
   b) Effect of current on weld strength and Heat affected zone
2. Spot Welding – Effect of current on weld strength.
3. Gas welding and brazing exercises.

Mechanical Press Working:

1. Blanking & Piercing operation & Study of simple Compound and progressive press tools.
2. Hydraulic Press: Deep Drawing and Extrusion Operations.
3. Bending and other operations.

Processing of Plastics:

1. Injection Moulding
2. Blow Moulding

COURSE OUTCOMES:

By undergoing this course, student will be able to

1. To perform the casting process in manufacturing of different types products.
2. To compare the principle and operation of different welding processes required for fabrication.
3. To test the different metal forming processes.
4. To explain the types of plastics and their processing methods

(A30015) SOFT SKILLS & PROFESSIONAL ETHICS

B. Tech. (ME) IV-Semester

L	T	P	C
0	0	2	0

UNIT-I:

Business Communication Skills:
English Language Enhancement the Art of Communication.

UNIT-II:

Intrapersonal & Interpersonal Relationship Skills:
- Intrapersonal Relationships
- Interpersonal Relationships – To be an Effective Team Player

UNIT-III:

Campus to Company:
- Corporate Dressing
- Corporate Grooming
- Business Etiquette
- Communication Media Etiquette

UNIT-IV:

Group Discussions, Interviews and Presentations:
- Group Discussions
- Interviews
- Presentations

UNIT-V:

Entrepreneurial Skills Development:

- Goal Setting
- Entrepreneurial Skills – Awareness and Development

COURSE OUTCOMES

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

1. Express themselves with proper pronunciations and sentence construction
2. Demonstrate a strong teamwork and be a team player
3. Develop a strong personal etiquette
4. Demonstrate good leadership qualities
5. Recognize and identify basic English grammar

REFERENCES

1. UNLEASH the power within…. Soft Skills – Training Manual (Infosys Campus Connect)

(A30022) NSS/NCC

B. Tech. (ME) IV-Semester

L	T	P	C
0	**0**	**2**	**0**

For NSS/ NSO Mandatory Courses and/or any other Mandatory Non-Credit Course offered in a semester, a ‘Satisfactory Participation Certificate’ shall be issued to the student from the authorities concerned, only after meeting the minimum attendance requirements in the Course. No Marks or Letter Grade shall be allotted for the Mandatory Courses.

(A30331) DYNAMICS OF MACHINERY

B. Tech. (ME) V-Semester

L	T	P	C
3	0	0	3

UNIT-I

Precession: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanes and ships.

Static and Dynamic Force Analysis: Static force analysis of planar mechanisms – Analytical Method – Dynamic Force Analysis – D'Alembert's principle, Dynamic Analysis of 4-link mechanism, Slider Crank Mechanism.

UNIT-II

Turning Moment Diagram and Flywheels: Engine Force Analysis – Piston Effort, Crank Effort, etc., Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram –fluctuation of energy – flywheels and their design - Inertia of connecting rod- inertia force in reciprocating engines – crank effort and torque diagrams.

Governors: Types of governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, Isochronism and hunting **–** stability – effort and power of the governors.

UNIT-III

Clutches: Clutches – Types – Single plate, multi-plate and cone clutches.

Brakes And Dynamometers: Types of brakes- Simple block brake, band and block brake-internal expanding shoe brake-effect of braking of a vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT-IV

Balancing : Balancing of rotating masses- Primary, Secondary, and higher balancing of reciprocating masses. -Analytical and graphical methods- Unbalanced forces and couples. Locomotive balancing – Hammer blow – Swaying couple – variation of tractive effort. Examination of “V” and multi cylinder in-line and radial engines for primary and secondary balancing.

UNIT V:

Vibrations: Free Vibration of mass attached to vertical spring –Damped free vibrations- Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly’s method – Raleigh’s method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems, Forced vibrations

TEXT BOOKS:

1. Theory of Machines, S.S.Rattan.
2. Theory of Machines, Shiegley, Mc graw Hill publishers
3. Theory of Machines, R.S.Khurmi & J K Gupta, S Chand Publishers

REFERENCE BOOKS:

1. Theory of Machines, Thomas Bevan, CBS Publishers
2. Theory of Machines, R.K.Bansal (Lakshmi publications)
3. Mechanism and Machine Theory, JS Rao and RV Duggipati, New Age

E-RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104114/
2. https://nptel.ac.in/courses/112104114/
3. https://nptel.ac.in/courses/112104121/
4. https://nptel.ac.in/courses/112/103/112103111/

5. https://nptel.ac.in/courses/112/103/112103112/
6. https://nptel.ac.in/courses/112/101/112101096/

COURSE OUTCOMES:

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

1. Explain gyroscopic effects in ships, aero planes and road vehicles
2. Characterize and design fly wheels
3. Analyze and design governors
4. Apply basic laws of friction to clutches, brakes and dynamometers.
5. Analyze balancing problems in rotating and reciprocating machinery.
6. Describe free and forced vibrations of single degree freedom systems.

(A30332) MANUFACTURING TECHNOLOGY

B. Tech. (ME) V-Semester

L	T	P	C
3	0	0	3

Unit – I

Engine lathe – Principle of working, specification of lathe – types of lathe – work and tool holding devices, Taper turning, Thread turning – Lathe attachments & fixtures . Turret and capstan lathe – Principal features of automatic lathes – classification : Single spindle and multi-spindle automatic lathes – tool layouts.

Unit – II

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill. Design of drill jigs & Fixtures, Boring machines – Fine boring machines – Jig boring machine. Deep hole drilling machine. Kinematic schemes of the drilling and boring machines

Unit – III

Shaping, slotting and planning machines – Principles of working – Principal parts – specification, classification, operations performed- Kinematic scheme of the shaping, slotting and planning machines, machining time calculations

Unit – IV

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Geometry of milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling machines.

Manufacturing of Gears- Gear milling, Gear Hobbing, Gear broaching.

Unit –V

Grinding machine – fundamentals – theory of grinding – classification of grinding machines – cylindrical and surface grinding machine-Tool and cutter grinding machine – special types of grinding machines, Different types of abrasives – bonds, specification of a grinding wheel and selection of a grinding wheel, Kinematic scheme of grinding machines.

Lapping, honing and broaching machines – Comparison of grinding, lapping and honing. Kinematic schemes of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations

Text books:

1. Manufacturing Technology—Metal Cutting and Machine Tools, 4e (Volume II), P N Rao, McGraw-Hill Education.
2. Production Technology, R.K. Jain and S.C. Gupta.

Reference books:

1. Production Technology by H.M.T. (Hindustan Machine Tools)
2. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.
3. Workshop Technology – Vol.-II, B.S. Raghui Vamsi
4. Elements of Work Shop Technology – Vol. II, Hazra Choudry, Media Promoters.
5. Fundamentals of Metal Machining and Machine Tools, Geofrey Boothroyd, McGraw Hill

Course Outcomes:

1. Analyze for cutting forces and favorable conditions for chip formation during metal removal by machining.
2. Understand machining operations performed on different machines and select suitable machining process for practical applications.
3. Apply the knowledge of kinematics in machine built up
4. Calculate machining times and assess tool life.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/105/112105233/
2. https://nptel.ac.in/courses/112/103/112103245/
3. https://nptel.ac.in/courses/112/105/112105126/
4. https://nptel.ac.in/courses/112/105/112105127/

(A30335) MACHINE DESIGN

B. Tech. (ME) V-Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction: General considerations in the design of Engineering Materials and their properties – selection – Manufacturing consideration in design. BIS codes of steels. Factor of safety, Design for strength and rigidity – preferred numbers

Design for static and fatigue Loading-Problems

UNIT-II

Riveted, Bolted and welded joints: Design of Riveted joints, Design of bolted joints, Design of welded joints, Joints with eccentric loading in all the above three cases.

UNIT-III

Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. Use of internal and external circlips, Gaskets and seals (stationary & rotary), Design of Keys.

Shaft Couplings: Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – Bushed Pin Flange coupling .

UNIT-IV

Bearings: Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design. Ball and roller bearings – Static load – dynamic load –

equivalent radial load – design and selection of ball & roller bearings.

UNIT V:

Mechanical Springs: Stresses and deflections of helical springs – Extension and compression springs – Design of springs for fatigue loading.

Design of Gears: Spur gears & Helical gears – Load concentration factor – Dynamic load factor. Surface compressive strength – Bending strength – Design analysis of spur gears – Estimation of centre distance – module and face width – check for plastic deformation.

TEXT BOOKS:

1) Machine Design, V. Bandari, TMH publications
2) Machine Design, Pandya & Shah
3) Machine Design, T.V.Sundararaja Murthy & N.Shanmugam

REFERENCE BOOKS:

1) Design data book : PSG College of Technology
2) Machine Design, RS Khurmi
3) Design of Machine Elements, V.M. Faires
4) Mechanical Engineering Design, JE Shigley

E-RESOURCES:

1. https://nptel.ac.in/courses/112/105/112105124/
2. https://nptel.ac.in/courses/112/105/112105125/
3. https://nptel.ac.in/courses/112/106/112106137/

COURSE OUTCOMES:

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

1. Analyze behavior of element subjected to loads and identify the failure criteria.
2. Analyze the stresses and strains induced in a machine element.
3. Design machine components using theories of failure.
4. Design keys, couplings and joints including riveted, bolted and welded joints.
5. Design the bearings under various environmental and service conditions.
6. Apply the design concepts to evaluate the strength of the gear.

(A30334) THERMAL ENGINEERING

B. Tech. (ME) V-Semester

L	T	P	C
3	0	0	3

UNIT-I

Rankine Cycle – Basic Rankine Cycle, Cycle with Reheating, Regeneration and Binary Vapour Cycle.

Boilers – Classification – Working principles with sketches including H.P.Boilers – Mountings and Accessories – Working principles- Boiler horse power, Equivalent Evaporation, Efficiency and Heat balance – Draught- Classification – Height of chimney for given draught and discharge- Condition for maximum discharge- Efficiency of chimney.

UNIT-II

Steam Nozzles: Stagnation Properties- Function of nozzle – Applications and Types- Flow through nozzles- Thermodynamic analysis – Assumptions -Velocity of nozzle at exit-Ideal and actual expansion in nozzle- Velocity coefficient- Condition for maximum discharge- Critical pressure ratio- Criteria to decide nozzle shape- Super saturated flow, its effects, Degree of super saturation and Degree of under cooling - Wilson line.

Steam Condensers: Requirements of steam condensing plant – Classification of condensers – Working principle of different types – Vacuum efficiency and Condenser efficiency – Air leakage, sources and its affects, Air pump- Cooling water requirement.

UNIT-III

Steam Turbines: Classification of steam turbines

Impulse turbine: Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency. Methods to reduce rotor speed-Velocity compounding and

Pressure compounding- Velocity and Pressure variation along the flow – Combined velocity diagram for a velocity compounded impulse turbine.

Reaction Turbine: Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction –Velocity diagram – Parson's reaction turbine – Condition for maximum efficiency.

UNIT-IV

Gas Turbines: Simple gas turbine – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits

UNIT V:

Jet Propulsion: Principle of Operation, Classification of jet propulsive engines, Working Principles with schematic diagrams and representation on T-S diagram, Thrust, Thrust Power and Propulsion Efficiency

Turbo jet engines: Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

Rockets: Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

TEXT BOOKS:

1. Rathore, Mahesh.M, Thermal Engineering, Tata Mc-Graw Hill.
2. Rajput R.K., Thermal Engineering, Lakshmi Publications, 4th edition.

REFERENCE BOOKS:

1. P.Khajuria & S.P.Dubey , Gas Turbines and Propulsive Systems, Dhanpatrai Publications, 5th revision

2. P.L.Ballaney, Thermal Engineering in S.I. units, Khanna Publications, 24th edition.
3. Ramalingam.K.K, Thermal Engineering, Scitech, 2nd edition
4. R.S. Khurmi & J.K.Gupta, Thermal Engineering, S.Chand Publications, 1st edition.
5. R. Yadav, Thermodynamics and Heat Engines, Central Publishing House,6th revision.

E Resources:

1. https://nptel.ac.in/courses/112/107/112107216/
2. https://nptel.ac.in/courses/112/103/112103277/
3. https://nptel.ac.in/courses/101/104/101104019/

COURSE OUTCOMES:
At the end of the course, the student will be able to

1. Design simple models of heat exchange devices like super heater, economizer, reheater, boiler tubes and chimneys.
2. Test and improve the performance of steam nozzles and stem condensers in a vapor power cycle.
3. Distinguish, analyze and examine the efficiencies of steam turbines.
4. Examine the performance parameters and develop the skills to improve performance of gas turbine.
5. Distinguish and apply the principles of propulsion systems for aeronautics and astronautics.

(A30351) Non Destructive Testing Methods
(Professional Elective-I)

B. Tech. (ME) V-Semester

L	T	P	C
3	0	0	3

UNIT – I

Overview of NDT - NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterization. Relative merits and limitations, various physical characteristics of materials
and their applications in NDT, Visual inspection.

UNIT – II

Surface NDE Methods: Liquid Penetrant Testing – Principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods, Testing Procedure, Interpretation of results. Magnetic Particle Testing-Theory of magnetism, inspection materials Magnetization methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Residual magnetism.

UNIT – III

Thermography and Eddy Current Testing - Principles, Contact and non-contact inspection methods, Techniques for applying liquid crystals, Advantages and limitation – infrared radiation and infrared detectors, Instrumentations and methods, applications. Eddy Current Testing-Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.

UNIT – IV

Ultrasonic Testing and Acoustic Emission - Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A/Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction.

Acoustic Emission Technique IV Principle, AE parameters, Applications

UNIT – V

Radiography - Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square law, characteristics of films – graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

TEXT BOOKS:

1. Baldev Raj, T. Jayakumar, M. Thavasimuthu, Practical Non-Destructive Testing, Narosa Publishing House, 2009.

2. Ravi Prakash, Non-Destructive Testing Techniques¨, 1st revised edition, New Age International Publishers, 2010

REFERENCES:

1. ASM Metals Handbook, ¨Non-Destructive Evaluation and Quality Control¨, American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.

2. Paul E Mix, “Introduction to Non-destructive testing: a training guide”, Wiley, 2nd Edition New Jersey, 2005

3. Charles, J. Hellier, Handbook of Non-destructive evaluation”, McGraw Hill, New York 2001.

E-RESOURCES:

1. https://nptel.ac.in/courses/113/106/113106070/

(A30361) Mechatronic Systems
(Professional Elective-I)

B. Tech. (ME) V-Semester

L	T	P	C
3	0	0	3

UNIT – I

Introduction: Definition of Mechanical Systems, Philosophy and approach; Systems and Design: Mechatronic approach, Integrated Product Design, Modeling, Analysis and Simulation, Man-Machine Interface.

UNIT – II

Sensors and transducers: classification, Development in Transducer technology, Optoelectronics- Shaft encoders, CD Sensors, Vision System, etc.

UNIT – III

Drives and Actuators: Hydraulic and Pneumatic drives, Electrical Actuators such as servo motor and Stepper motor, Drive circuits, open and closed loop control.
Embedded Systems: Hardware Structure, Software Design and Communication, Programmable Logic Devices,
Automatic Control and Real Time Control Systems;

UNIT – IV

Smart materials: Shape Memory Alloy, Piezoelectric and Magnetostrictive
Actuators: Materials, Static and dynamic characteristics, illustrative examples for positioning, vibration isolation, etc.

UNIT – V

Micromechatronic systems: Microsensors, Microactuators; Micro-fabrication techniques

LIGA Process: Lithography, etching, Micro-joining etc. Application examples; Case studies, Examples of Mechatronic Systems from Robotics Manufacturing, Machine Diagnostics, Road vehicles and Medical Technology.

Text Books:

1) Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.)
2) Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education

Reference Books:

1) A Textbook of Mechatronics, R. K. Rajput, S. Chand & Company Private Limited
2) Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, William Bolton, Prentice Hall

E-RESOURCES:

1. https://nptel.ac.in/courses/112/103/112103174/

Course Outcomes:

Upon completion of this course, students will get

1. An overview of Mechatronics applications.
2. Learn the uses of micro-sensors and microprocessors.
3. Understand the working of Drives and Actuators.
4. Through knowledge on smart materials and its applications.
5. Learn some Micro-fabrication techniques admits applications in industry.

(A30371) Refrigeration & Air Conditioning
(Professional Elective-I)

B. Tech. (ME) V-Semester

L	T	P	C
3	0	0	3

Unit – I

Introduction to Refrigeration: - Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigeration – Types of Ideal cycle of refrigeration.

Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Air crafts- Air systems – Actual Air refrigeration system – Refrigeration needs of Air crafts – Application of Air Refrigeration, Justification – Types of systems – Problems.

Unit – II

Vapour compression refrigeration: working principle and essential components of the plant – Simple Vapour compression refrigeration cycle – COP – Representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – Actual cycle Influence of various parameters on system performance – Use of p-h charts – Problems.

Unit -III

System Components: Compressors – General classification – comparison – Advantages and Disadvantages. Condensers, classification, Working Principles. Evaporators, classification, Working Principles, Expansion devices, Types, Working Principles, Refrigerants, Desirable properties, common refrigerants used, Nomenclature, Ozone Depletion, Global Warming, Azeotropes and Zeotropes

Unit -IV

Vapour Absorption System: Calculation of max COP – description and working of NH3 – water system – Li – Br system. Principle of operation Three Fluid absorption system, salient features. **Steam Jet Refrigeration System**: Working Principle and Basic Components, Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

Unit – V

Introduction to Air Conditioning: Psychometric Properties & Processes – Sensible and latent heat loads – Characterization – Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, ASHF, ESHF and ADP. Concept of human comfort and effective temperature –Comfort Air conditioning – Industrial air conditioning and Requirements – Air conditioning Load Calculations. **Air Conditioning systems**: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers. Heat Pump – Heat sources – different heat pump circuits – Applications.

Text books:

1. CP Arora, Refrigeration and Air Conditioning, Tata Mc-Graw Hill, 2nd edition.
2. Manohar Prasad, Refrigeration and Air Conditioning, New Age Publishers, 2nd edition.

Reference books:

1. SC Arora & Domkundwar, A Course in Refrigeration and Air conditioning, Dhanpatrai Publications, 7th revision.
2. Dossat Roy.J, Principles of Refrigeration, Pearson Education Asia, 4th edition

3. Ananthanarayanan.P.N, Basic Refrigeration and Air-Conditioning, Tata Mc-Graw Hill, 3rd edition
4. R.S.Khurmi, A Text book of Refrigeration & Air Conditioning, Chand Publications.
5. Ballaney. P.L, Refrigeration & Air Conditioning, Khanna Publications, 15th edition.

E - RESOURCES:

1. https://nptel.ac.in/courses/112/107/112107208/
2. https://nptel.ac.in/courses/112/105/112105128/
3. https://nptel.ac.in/courses/112/105/112105129/

Course Outcomes: At the end of the course students will be able to:

1. Demonstrate the basic concepts of refrigeration and related performance parameters.
2. Analyze the performance of VCR and VAR systems and differentiate with one another.
3. Design and develop the refrigerators using the VCR principles.
4. Demonstrate of psychometric properties and processes used in Air Conditioning.
5. Design and develop the Air-conditioning systems for thermal comfort conditions

(A30333) Manufacturing Technology Lab

B. Tech. (ME) V-Semester

L	T	P	C
0	**0**	**3**	**1.5**

Experiments

1. Machining on lathe: 3 experiments
2. Machining of holes (Practice on reaming, use of drill jigs)
3. Machining of V-block using Shaping machine
4. Cutting of external/ internal slots using Slotting machine
5. Machining on milling machine: 2 experiments
6. Grinding of Tool angles
7. Alignment Testing of lathe/Drilling/Milling

Course Outcomes: On completion of this course, student will be able to

1. Perform machining operations on cylindrical and flat objects to obtain desired shapes using appropriate machine tools.
2. Perform machining operations on Lathe Machines
3. Do Alignment Testing of lathe/Drilling/Milling

(A30003) Advanced English Communication Skills Lab

B. Tech. (ME) V-Semester

L	T	P	C
0	0	3	1.5

INTRODUCTION

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

UNIT-I:

Functional English: Starting a conversation, responding appropriately and relevantly, using the right body language, Role play in different Situations.

UNIT-II:

Vocabulary Building: Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrasal verbs.

UNIT-III:

Group Discussion: Dynamics of group discussion, intervention, summarizing, modulation of voice, body languagea, relevance, fluency and coherence.

UNIT-IV:

Interview Skills: Concept and process, pre-interview planning, opening strategies, answering strategies, Interview through tale and video-conferencing.

UNIT-V:

Resume` and Technical Report Writing: Structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets, summary, formats and styles, Letter-writing.

Reading Comprehension: Reading for facts, guessing meanings from context, scanning, skimming, inferring meaning and critical reading.

COURSE OBJECTIVES

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.

COURSE OUTCOMES

1. Explain the rules of formal and informal situational dialogues and develop vwerbal & non verbal communication skills.
2. Build academic vocabulary, use a variety of accurate sentence structure and utilize digital literacy tools to develop writing and grammar skills.
3. Express clarity of thoughts, capability to hold the discussion with everyone and develop analytical thinking.
4. Develop the skills needed for approaching different types of interviews
5. Illustrate the report writing and summarize the main ideas of report; apply key elements of structure and style in drafting loner documents.

6. Read an increasing range of different types of texts by combining contextual, semantic, grammatical and phonic knowledge.
7. Summarize the personal details, Customize the objectives statement for each position you are applying for job.

(A30339) Theory of Machines Lab

B. Tech. (ME) V-Semester

L	T	P	C
0	0	3	1.5

Experiments

1. Study of velocity ratio in simple, compound, reverted and epicyclic gear trains
2. Study on holding torque determination in epicyclic gear train apparatus.
3. Cam analysis apparatus
4. Coriolis component of acceleration apparatus
5. Determination of sensitiveness of a governor
6. Static balancing using steel balls
7. Determination of the magnitude and orientation of the balancing mass in dynamic balancing
8. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils
9. Study on rope brake dynamometer apparatus
10. Determination of steady state amplitude of a forced vibratory system
11. Determination of the magnitude of gyroscopic couple, angular velocity of precession and representation of vectors
12. Determination of natural frequency of given structure using FFT analyzer

(Student will perform any ten experiments out of the above)

Course Outcomes: At the end of the course, the Student will be able to: 1. Synthesise simple mechanisms.
2. Draw cam profiles.
3. Measure Gyroscopic torque.
4. Understand free, forced, damped vibrations.

(A30017) Indian Constitution

B. Tech. (ME) V-Semester

L	T	P	C
2	0	0	0

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions; State Government and its Administration Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT-III

A: Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,
B: Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-IV

Concept and Development of Human Rights: Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR

1966, Human Rights in India: Protection of Human Rights Act, 1993 (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights.

UNIT-V

Election Commission: Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

Reference Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans

E-RESOURCES:

1. https://nptel.ac.in/courses/109104074/
2. https://nptel.ac.in/courses/109104045/
3. https://nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes:

At the end of the course, the student will be able to:

1. Know the sources, features and principles of Indian Constitution.

2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission.

(A30018) Essence of Indian Traditional Knowledge

B. Tech. (ME) V-Semester

L	T	P	C
2	0	0	0

UNIT I:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II:

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III:

Legal frame work and TK:

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);

B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT IV:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT V:

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Reference Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002

E-RESOURCES:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

Course Outcomes:

After completion of the course, students will be able to:

1. Upon completion of the course, the students are expected to:
2. Understand the concept of Traditional knowledge and its importance
3. Know the need and importance of protecting traditional knowledge.
4. Know the various enactments related to the protection of traditional knowledge.
5. Understand the concepts of Intellectual property to protect the traditional knowledge.

(A30391) Mini Project-I

B. Tech. (ME) V-Semester

L	T	P	C
0	**0**	**0**	**0**

Mini-Project-I will be taken up in the college or industry during the summer vacation after IV Semester examination. The Mini-Project-I will be evaluated during the V Semester. The Mini-Project-I will be submitted in the form of a report and should be presented before a committee, which shall be evaluated for Satisfactory or Non-satisfactory. The committee consists of Head of the Department, the supervisor of Mini-Project-I, a senior faculty member of the department.

(A30393) Internship-I

B. Tech. (ME) V-Semester

L	T	P	C
0	0	0	0

(A30013) Business Management and Financial Analysis

B. Tech. (ME) VI-Semester

L	T	P	C
4	0	0	4

UNIT – I

Introduction of Management Concepts: Concept, Origin, Growth, Nature, Characteristics, Scope and Principles of Management. Functions of Management: Planning, Organizing, Staffing, Directing, Coordinating, Reporting and Budgeting. Scientific Management- FW Taylor Contributions to Management Modern Management- Henry Fayol Contributions to Management Human Relations Approach to Management: Theories of Motivation and Leadership

UNIT – II

Functional areas of Management: Production Management: Systems of Production, PPC functions & Plant Layout. Financial Management: Objectives, Goals, & Functions of Financial Management. Marketing Management: Recent Trends in Marketing & Marketing Mix. Human Resources Management: Nature, Objectives, Scope & Functions of HR Management

UNIT – III

Introduction to Managerial Economics & Business Environment: Definition, Nature, Scope and Functions Managerial Economics, Difference between Micro & Macro Economics Internal & External Scanning of Business Environment, Importance of National Income, Inflation, Deflation, Stagflation, Business Cycle & Product Life Cycle Concepts. Concept & Law of Demand, Factors Influencing and Limitations. Concept of Elasticity of Demand, Types of Elasticity, Methods of Measuring Elasticity. Introduction to Demand Forecasting, Objectives, Scope, Types and Methods.

UNIT –IV

Theory of Production, Cost, Price & Markets: Production Function, Assumptions, Limitations & Types Cost Concepts, Cost-Output Relationship, Break Even Analysis Assumptions, Limitations & Applications (Simple Problems). Theory of Pricing, Objectives, Situations & Types. Introductions Markets, Demand-Supply Schedule for Equilibrium Price, Nature & Types of Competition.

UNIT – V

Introduction to Financial Statement Analysis: Types & Objectives of Business Enterprises, Conventional & Non-Conventional Sources of Financing Business Enterprise. Identification of Financial Statement Formats-Manufacturing A/c, Trading A/c, Profit & Loss A/c, Balance Sheet. Techniques of Analyzing Financial Statements: Analysis & Interpretation through Liquidity, Leverage, Coverage, Activity, Turnover, Profitability Ratios-Simple Problems on Liquidity, Leverage and Activity Ratios.

Outcomes: At the end of the course, the student will,

- Apply Knowledge of management theories & practices to solve business decisions
- Ability to integrate functional departments of an organization
- Ability to understand business environment for making critical decisions in a business.
- Identifies factors involved in production and markets.
- Ability to analyse financial position of a firm.

Text Books:

1. Varshney, Maheswari (2003), Managerial Economics, Sultan Chand, New Delhi,India.

2. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.

Reference Books:

1. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2005

2. Koontz &Weihrich: Essentials of Management, 6/e, TMH, 2005 Thomas N.Duening& John M.Ivancevich Management—Principles and Guidelines, Biztantra, 2003.
3. Ambrish Gupta (2004), Financial Accounting for Management, Pearson Education, New Delhi, India.
4. Domnick Salvatore (2011), Managerial Economics in a Global Economy, 7th edition, Oxford University Press, United States of America.
5. Narayanaswamy (2005), Financial Accounting, A Managerial Perspective, Prentice Hall of India private Ltd, New Delhi, India.
6. Aryasri (2005), Managerial Economics and Financial Analysis, 2nd edition, Tata McGraw Hill, New Delhi, India

(A30336) Engineering Metrology & Measurements

B. Tech. (ME) VI - Semester

L	T	P	C
3	0	0	3

Unit-I

Introduction to Metrology: Definition, types, need of inspection, terminologies, methods of measurement, selection of instruments, measurement errors, units, Measurement standards, calibration, statistical concepts in metrology

Interferometry: Principle of interference, interference bands, interference patterns, flatness interferometer, Gauge length interferometer

Unit-II

Limits fits and tolerances: Interchangeability, selective assembly, limits, fits and tolerances, IS 919 – Part 1 (1993), limit gauging, design of limit gauges.

Linear metrology: Steel Rule, Calipers, Vernier Calipers, Vernier Height Gauge, Vernier Depth Gauge, Micrometers, Universal Caliper, Slip Gauges

Angular Metrology: Vernier Bevel Protractor, Spirit Level, Sine Bar, Angle Gauges.

Miscellaneous measurements: Taper measurement, Bore measurement, radius measurement

Unit-III

Geometry of Surfaces: Importance of Geometrical Tolerances, Measurement of straightness, flatness, squareness, parallelism, cylindricity, non-contact profiling systems

Measurement of surface finish: Introduction, terminology, specifying roughness on drawings, surface roughness parameters, factors affecting surface roughness, ideal surface roughness, roughness measurement methods, precautions in measurement and surface microscopy.

Unit-IV

Screw thread metrology: Introduction, screw thread terminology, screw thread measurements

Gear measurement: Introduction, types of gears, gear terminology, errors in gears, advanced measurement of spur gears

Comparators: Features of comparators, classification of comparators, different comparators, advanced comparators, thread comparators.

Coordinate Measuring Machines: CMM, Types and Features and Applications

Unit V

Mechanical Measurements: General outline of Measurement of Flow, Temperature, Force, Torque, Power (Mechanical, Pneumatic, Hydraulic and Electrical Type), Strain Gauges ,Rosettes and their usage.

Flow and Temperature Measurement: Venturimeter, Orifice Meter, Rotameter, Pitot Tube – Temperature: Bimetallic Strip, Thermocouples, Electrical Resistance Thermometer – Reliability and Calibration – Readability And Reliability.

TEXT BOOKS:

1.D.S.Kumar ,Mechanical Measurement and Control , Metropolitan Book Company,5th Edition,2015, ISBN-10: 8120004388.

2.Raghavendra N V and Krishnamurthy L, Engineering Metrology and Measurements, Oxford University Press, ISBN: 9780198085492, 2013

REFERENCES:

1. Connie L Dotson, Fundamentals of Dimensional Metrology, Cengage Learning,6th Edition, ISBN:9781305177741, 2019
2. Beckwith, Marangoni and Lienhard, Mechanical Measurements,Pearson Education, 6th Edition, 2014, ISBN-10: 0201847655
3. J.F.W. Galyer and Charles Reginald Shotbolt Metrology for Engineers Cengage Learning EMEA; 5th edition, ISBN: 0304318442, 1990

4. Ernest Doebelin and Dhanesh Manik Measurement Systems, ,Tata MC Graw Hill, 6th Edition, 2017, ISBN-10: 9780070699687
5. Gupta, I.C.,A Textbook of Engineering Metrology , Dhanpatrai Publications, 7th Edition, ISBN: 9788189928452, 2018

E-RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104250/
2. https://nptel.ac.in/courses/112/106/112106179/
3. https://nptel.ac.in/courses/112/107/112107242/
4. https://nptel.ac.in/courses/112/106/112106138/
5. https://nptel.ac.in/courses/112/106/112106139/
6. https://nptel.ac.in/courses/112/106/112106140/

Course Outcomes:

1. Students will be able to design tolerances and fits for selected product quality including designing of Limit Gauging.
2. They can understand the standards of length, angles and appropriate selection of instruments considering limitations and accuracy requirements.
3. Students learn the surface finish, Geometry of surfaces, Measurement of Flatness and appropriate techniques for measuring targeted features of surface
4. They can choose appropriate method and instruments for inspection of various thread and Gear elements, use of various comparators and role of CMM in measurements
5. Students will be able to learn various mechanical measurements like Temperature and Flow ; Applications of various equipment and their limitations.

(A30338) Heat Transfer

B. Tech. (ME) VI - Semester

L	T	P	C
3	0	0	3

Unit – I

Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer –General discussion about applications of heat transfer.

Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions

Unit – II

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation, Variable Thermal conductivity – systems with heat sources or Heat generation- Extended surfaces and fins

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Chart solutions of transient conduction systems.

Unit – III Convective Heat Transfer:

Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation, Buckingham , Theorem and method, application for developing semi empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations – Integral Method as approximate method -Application of Von Karman

Integral Momentum Equation for flat plate with different velocity profiles.

Forced Convection: Development of Hydrodynamic and thermal boundary layer and use of empirical relations for Flat plates and Cylinders. **Free Convection:** Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.

Unit – IV

Radiation Heat Transfer : Emission characteristics and laws of black body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

UNIT V

Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

Heat Transfer with Phase Change: Boiling: – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling **Condensation:** Film wise and drop wise condensation –Nusselt‘s Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations

Text books:

1. Fundamentals of Heat Transfer –Incropera& Dewitt/John wiley

2. Heat Transfer – A basic approach/ Ozisik/ Mc Graw- Hill

3. Fundamentals of Engineering Heat & Mass Transfer-R.C.Sachdeva/NewAge.

4. Heat& Mass Transfer-D.S.Kumar/S.K.Kataria& sons

Reference books:

1. Heat Transfer – A Practical Approach – Yunus Cengel, Boles / TMH
2. Heat Transfer / Holman/TMH
3. Engineering Heat and Mass Transfer – Sarit K. Das / Dhanpat Rai Pub
4. Heat and Mass Transfer – R. Yadav /CPH
5. Essential Heat Transfer - Christopher A Long / Pearson Education
6. Heat Transfer-P.K.Nag /TMH
7. Heat Transfer – P. S. Ghoshdastidar/Oxford University press.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/108/112108149/
2. https://nptel.ac.in/courses/112/106/112106155/
3. https://nptel.ac.in/courses/112/101/112101097/
4. https://nptel.ac.in/courses/112/105/112105271/
5. https://nptel.ac.in/courses/112/104/112104159/
6. https://nptel.ac.in/courses/112/108/112108246/
7. https://nptel.ac.in/courses/112/105/112105248/
8. https://nptel.ac.in/courses/112/106/112106170/

Course Outcomes:

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

1. Distinguish basic modes of heat transfer. To develop the differential equations for conduction heat transfer for simple geometries.
2. Solve practical problems of steady and unsteady state heat transfer.
3. Develop simple empirical correlations for practical convective heat transfer.
4. Formulate the radiation heat exchange between two surfaces.
5. Design simple heat exchanger units of moderate capacity.
6. Distinguish different phases of boiling and condensation.

(A30343) Automation in Manufacturing

B. Tech. (ME) VI - Semester

L	T	P	C
3	0	0	3

Unit-I

Introduction: Why automation in manufacturing, Current trends, CAD, CAM, CIM; Rigid automation: Part handling, Machine tools.

Computer Aided Design: Fundamentals of CAD - Hardware in CAD-Computer Graphic

Software and Data Base, Geometric modeling for downstream applications and analysis methods; Computer Aided Manufacturing: CNC technology, PLC, Micro-controllers, CNC Adaptive Control

Unit-II

Introduction: Types and strategies of automation, pneumatic and hydraulic components, circuits, automation in machine tools, mechanical feeding and tool changing and machine tool control.

Flexible automation: Computer Control of Machine Tools and Machining Centers, NC and NC part programming, CNC-Adaptive Control, Automated Material handling. Assembly, Flexible fixturing.

UNIT III:

Automated flow lines: Methods of part transport, transfer mechanism, buffer storage, control function, design and fabrication considerations. Analysis of automated flow lines – General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

Assembly System and Line Balancing: Assembly process and systems, assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – IV:

Automated Material Handling and Storage Systems:
Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems. Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT – V:

Adaptive Control Systems: Introduction, adaptive control with optimization, adaptive control with constraints, application of adaptive control in machining operations.
Consideration of various parameters such as cutting force, temperatures, vibration and acoustic emission in the adaptive controls systems.
Automated Inspection: Fundamentals, types of inspection methods and equipment, Coordinate Measuring Machines, Machine Vision.

TEXT BOOK

- Automation, Production Systems and Computer Integrated Manufacturing : M.P. Groover./ PE/PHI.

REFERENCES

- Computer Control of Manufacturing Systems by Yoram Coren.
- CAD / CAM/ CIM by Radhakrishnan.
- Automation by W. Buekinsham.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104188/
2. https://nptel.ac.in/courses/112/104/112104031/
3. https://nptel.ac.in/courses/112/102/112102102/
4. https://nptel.ac.in/courses/112/102/112102103/

Course Outcomes:

Upon successful completion of this course student should be able to

1. Solve the line balancing problems in the various flow line systems with and without use buffer storage.
2. Understand the different automated material handling, storage and retrieval systems and automated inspection systems.
3. Use of Adaptive Control principles and implement the same online inspection and control.

(A30352) Plant Layout and Material Handling
(Professional Elective-II)

B. Tech. (ME) VI - Semester

L	T	P	C
3	0	0	3

Unit-I

Introduction – classification of layout, advantages and limitations of different layouts, layout design procedures, overview of plant layout.

Unit-II

Process layout and product layout: selection, specification, implementation and flow up, comparison of product and process layout.

Unit- III

Heuristics for plant layout- ALDEP, CORELAP, CRAFT; Group layout, fixed position layout- quadratic assignment model, branch and bound method.

Unit- IV

Introduction, material handling systems, material handling principles, classification of material handling equipment, relationship of material handling to plant layout. Basic material handling systems: selection, material handling methods- path, equipment, function oriented systems.

Unit- V

Methods to minimize cost of material handling – maintenance of material handling equipments, safety in handling. Ergonomics of material handling equipment. Design, miscellaneous equipments.

Text books:

1. Aspects of material Handling/ Dr. KC Arora & Shinde, Lakshmi Publications.

2. Operations Management/ PB Mahapatra /PHI

Reference books:

1. Facility Layout & Location an analytical approach/ RL Francis /LF Mc Linnis Jr, White / PHI

2. Production and Operations Management/ R Panneerselvam/ PHI

3. Introduction to Material handling/ Ray, Siddhartha/ New Age

Course Outcomes: On completion of this course, student will be able to:

1. Identify and select various types of material handling equipment.
2. Identify the characteristics of product and process layouts and their needs in terms of materials handling
3. Design material handling systems for a variety of scenarios pertaining to manufacturing and service industry
4. Describe and determine the effect of product, process, and schedule design parameters on plant layout and materials handling systems design.
5. Apply industrial engineering principles to solve the problems in organizing, planning and controlling the use of men, money, materials and machines for industrial production.

(A30362) Industrial Robotics
(Professional Elective-II)

B. Tech. (ME) VI - Semester

L	T	P	C
3	**0**	**0**	**3**

Unit – I

Introduction: An over view of Robotics -classification by coordinate system and control systems - Components of the Industrial Robotics: Degrees of freedom - End effectors: Mechanical gripper - Magnetic - Vacuum cup and other types of grippers - General consideration on gripper selection and design, Robot actuator and sensors.

Unit - II

Motion Analysis: Basic rotation matrices - Composite rotation matrices - Euler Angles - Equivalent Angle and Axis - Homogeneous transformation -Problems. Manipulator Kinematics: D-H notations - Joint coordinates and world coordinates - Forward and inverse kinematics - problems.

Unit - III

Differential Kinematics: Differential Kinematics of planar and spherical manipulators - Jacobians - problems. Robot Dynamics: Lagrange - Euler formulations - Newton-Euler formulations - Problems on planar two link manipulators.

Unit -IV

Trajectory Planning: Joint space scheme - cubic polynomial fit -Avoidance of obstacles - Types of motion: Slew motion - joint interpolated motion -straight line motion - problems**.**

Robot actuators and Feedback components: Actuators: Pneumatic.

Unit –V

Robot Application in Manufacturing: Material handling - Assembly and Inspection - Work cell design, work volume, Robot screan.

Text books:

1. Industrial Robotics/ Grover M P/ Pearson Edu.
2. Robotics and control / Mittal RK & Nagrath I J TMH.
3. Robotics / Fu & Lee/ Mc Graw Hill.

Reference books:

1. Robotic Engineering/Richard D. Richard D. Klaftez/ Prentice Hall.
2. Robot Analysis and intelligence / Asada and slotine / wiley Interscience.
3. Robot Dynamics &Control/ Mark W. Spong and M. Vidyasagar/ John Wiley& sons (ASIA) Pvt. Ltd.
4. Introduction to Robotic Mechanics and Control / JJ Craig/ Pearson/ 3rd edition.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/105/112105248/
2. https://nptel.ac.in/courses/112/108/112108093/
3. https://nptel.ac.in/courses/112/101/112101098/
4. https://nptel.ac.in/courses/112/101/112101099/

Course Outcomes:

After completion of the course students are able to:

1. Apply robot fundamentals in designing various types of end effectors.
2. Design the end effectors required for different applications.
3. Formulate D-H matrices for forward kinematics problems and develop dynamic equations for robot dynamic problems.
4. Determine the robot trajectory to robotic motion & Basics of Robotics language
5. Select the sensors depending upon robotic application & its uses in various areas.

(A30372) Automobile Engineering
(Professional Elective-II)

B. Tech. (ME) VI - Semester

L	T	P	C
3	0	0	3

UNIT I

Vehicle Structure and Engines

Types of automobiles, vehicle construction and different layouts ,chassis, frame and body, resistances to vehicle motion and need for a gearbox, components of engine-their forms ,functions and materials

UNIT II

Engine Auxiliary Systems

Electronically controlled gasoline injection system for SI engines., Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system ,Turbo chargers, Engine emission control by three way catalytic converter system .

UNIT III

Transmission Systems

Clutch-types and construction ,gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel –torque converter , propeller shaft, slip joints, universal joints ,Differential, and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT IV

Steering, Brakes And Suspension Systems

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System and Traction Control

UNIT V

Alternative Energy Sources

Use of Natural Gas, Liquefied Petroleum Gas. Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance ,Combustion and Emission Characteristics of SI and CI engines with these alternate fuels – Electric and Hybrid Vehicles, Fuel Cell.

Text Books:

1. Kirpal Singh, " Automobile Engineering Vol 1 & 2 ", Standard Publishers, Seventh Edition ,1997, New Delhi
2. Jain,K.K.,and Asthana .R.B, "Automobile Engineering" Tata McGraw Hill Publishers, New Delhi, 2002

References:

1. Newton ,Steeds and Garet," Motor Vehicles ", Butterworth Publishers,1989
2. Joseph Heitner, "Automotive Mechanics,", Second Edition ,East-West Press ,1999
3. Martin W. Stockel and Martin T Stockle , " Automotive Mechanics Fundamentals,"The Goodheart –Will Cox Company Inc, USA ,1978
4. Heinz Heisler , 'Advanced Engine Technology," SAE International Publications,USA,1998
5. Ganesan V.." Internal Combustion Engines" , Third Edition, Tata Mcgraw-Hill ,2007

E-RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104033/
2. https://nptel.ac.in/courses/107106080/

Course Outcomes:

1.To understand the construction and working principle of various parts of an automobile.
2. To have the practice for assembling and dismantling of engine parts and transmission system

(A30337) Engineering Metrology & Measurements Lab

B. Tech. (ME) VI - Semester

L	T	P	C
0	0	3	1.5

A. Engineering Metrology Lab

1. Measurement of lengths, heights, angles, diameters and bores.
2. Use of gear teeth Vernier calipers for checking the chordal addendum and chordal height of the spur gear.
3. Application of Interferometry in measuring Flatness.
4. Thread measurement using Tool maker‘s microscope and 2-wire/ 3-wire methods.
5. Surface roughness measurement by Tally Surf.

B. Measurements Lab

1. Study and calibration of Pressure Gauges
2. Study and calibration of transducers for temperature measurement.
3. Study and calibration of transducers for displacement measurement.
4. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
5. Study and calibration of a rotometer for flow measurement.

Course Outcomes:

On completion of this course, student will be able to

1. Measure experimentally physical parameters of components of mechanical systems.
2. Assess surface flatness & roughness experimentally.
3. Map the complex profiles using tool makers microscope.
4. Perform alignment tests on different machine tools.

(A30342) Heat Transfer Lab

B. Tech. (ME) VI - Semester

L	T	P	C
0	**0**	**3**	**1.5**

Experiments

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.

(A Student will perform any 12 experiments out of the above)

Course Outcomes: After completion of the course students are able to:

1. Analyze the modes of heat transfer problems in the practical perspective.
2. Develop knowledge in making calculations for thermal conductivity of insulating materials and solids of various heat transfer equipment.
3. Acquires the real time steady state and transient heat conduction problems,
4. Apply the concepts of heat transfer in the simple design of various types of fins for different geometry
5. Design and develop the simple heat exchanger systems.

(A30344) Automation in Manufacturing Lab

B. Tech. (ME) VI - Semester

L	T	P	C
0	0	3	1.5

I. Modeling

1. **Drafting:** Development of part drawings for various components in the form of orthographic and isometric views. Representation of dimensioning and tolerances.

a) Conventional Representation of Materials: Conventional representation of parts - screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits - methods of indicating notes on drawings.

b) Study on: Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables - Form and Positional Tolerances - Surface Roughness And Its Indication

c) Detailed and Part Drawings: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

2. **Part Modeling:** Generation of various 3D Models through Protrusion, revolve, sweep. Creation of various features. Study of parent child relation.

3. **Assembly:** Feature based and Boolean based modeling and Assembly Modeling.

II. Analysis

1. Determination of deflection and stresses in 2D and 3D trusses and beams.
2. Determination of deflections, principal and Von-Mises stresses in plane stress, plane strain and Axi-symmetric components.
3. Determination of stresses in 3D and shell structures (at least one example in each case)
4. Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.

5. Steady state heat transfer analysis of plane and axi-symmetric components.

III. Manufacturing

1. Programming CNC turning centre for machining of cylindrical objects.
2. Programming CNC mill for machining flat surfaces.
3. Machining of simple components on CNC lathe and Mill by transferring NC Code / from CAM software.

(**Student will perform at least 3 from each of the above 3 categories and a total of 10 exercises among the above**)

Text books:

1 Production and Drawing /K.L. Narayana & P. Kannaiah/ New Age

2 Machine Drawing with Auto CAD/ Pohit and Ghosh, PE

Reference books:

1 Geometric dimensioning and tolerancing/James D. Meadows/ B.S Publications

2 Engineering Metrology/ R.K. Jain/Khanna Publications

Course Outcomes: By undergoing this course, student will be able to

1. Explain the basic fundamentals that are used to create and manipulate geometric models in computer program**.**
2. Model the 3D geometric information of machine components including assemblies, and automatically generate 2D production drawings
3. Analyze deflections, stresses, natural frequencies, mode shapes and harmonic response of 2D and 3D Structures
4. Write CNC programs for turning and milling machining operations.

(A30014) Environmental Sciences

B. Tech. (ME) VI - Semester

L	T	P	C
2	0	3	0

UNIT-I

Environmental Studies:
Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems, Bio-geo chemical cycle, Classification of Eco system.

UNIT-II

Natural Resources: Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer –pesticide problems, Forest resources, Use and over-exploitation.
Mining and dams – their effects on forest and tribal people, Water resources, Use and over- utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams –benefits and costs, Conflicts over Water, Energy resources.

UNIT-III

Bio-diversity and its conservation, Value of bio-diversity - consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity– In-situ and Ex-situ conservation.

UNIT-IV

Environmental Pollution –Local and Global Issues, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion, Environmental case studies.

UNIT-V

Environmental Problems in India, Drinking water, sanitation and public health, Effects of the activities on the quality of environment, Water scarcity and groundwater depletion, Controversies on major dams – resettlement and rehabilitation of people: problems and concerns, Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction, Economics of development, preservation and conservation, Sustainability: theory and practices, Limits to growth, Equitable use of resources for sustainable life styles, Environmental Impact Assessment.

Text Books

1. Environmental Science - Y.Anjaneyulu, B S Publications.
2. Environmental studies-Deeksha dave, Cengage learning India Pvt. Ltd.,

Reference books

1. Environmental sciences and Engineering - P. Venugopal Rao, PHI learning Pvt. Ltd.,
2. Environmental Science and Technology by M. Anji Reddy, B S Publications.
3. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
4. Cunningham, W.P., et al. , Environmental Encyclopedia, Jaico Publishing House, Mumbai, 2003.

Course Outcomes:

On successful completion of this course, it is expected that students should be able to

1. Acquire the knowledge on environment
2. Acquire the knowledge of various Natural Resources
3. Develop skills in understanding of various environmental problems
4. Develop skills to protect the Environment
5. Knowledge on environmental problems in India

(A30395) Technical Seminar-I

B. Tech. (ME) VI - Semester

L	T	P	C
2	0	0	2

- For the Technical Seminar-I, the student shall collect the information on a specialized topic related to the student branch other than Mini projects-I & II/ Internships-I & II/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department.
- The presentation demonstrating understanding of the topic and technical report will be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar-I supervisor and a senior faculty member from the department.
- The Technical seminar will be evaluated for 100 marks.
- There will be no SEE or external examination for the Technical Seminar-I.

(A30341) Operations Research

B. Tech. (ME) VII - Semester

L	T	P	C
3	**0**	**0**	**3**

Unit – I

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Allocation: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

Unit – II

Transportation Problem:

Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem:

Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

Unit – III

Sequencing:

Introduction – Flow **–**Shop sequencing – n jobs through two machines 'n' jobs through three machines – Job shop sequencing – two jobs through 'm' machines

Replacement:

Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

Unit – IV

Game Theory:

Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

Inventory: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

Unit – V

Waiting Lines: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Dynamic Programming:

Introduction – Terminology- Bellman‘s Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

Text books:

1. Operation Research /J.K.Sharma/MacMilan.
2. Introduction to O.R /Taha/PHI

Reference books:

1. Operations Research: Methods and Problems / Maurice Saseini, Arhur Yaspan and Lawrence Friedman
2. Operations Research /A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi/Pearson Education.
3. Operations Research / Wagner/ PHI Publications.
4. Introduction to O.R/Hillier & Libermann (TMH).

E-RESOURCES:

1. https://nptel.ac.in/courses/112/106/112106134/
2. https://nptel.ac.in/courses/112/106/112106131/
3. https://nptel.ac.in/courses/105/108/105108127/
4. https://nptel.ac.in/courses/112/107/112107142/
5. https://nptel.ac.in/courses/112/107/112107143/

Course outcomes:

By the end of the course, the student will be able to

1. Simulate the linear programming problems for optimization.
2. Decompose the Practical problems into mathematical structures and solve those using the proposed models.
3. Familiar with the engineering models and mastery over the decision making of management related problems.

(A30353) Micro Machining Processes
(Professional Elective-III)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction and Classification of Micro Machining Processes, differences with Conventional machining

Mechanical Type Advanced Micro Machining Processes: Features of Abrasive Jet Micro Machining (AJMM), Ultrasonic Micro Machining (USMM), Abrasive Water Jet Micro Machining (AWJMM); Applications and limitations

UNIT-II

Abrasive based Nano finishing processes: Features of Abrasive Flow Finishing (AFF), Chemo mechanical Polishing (CMP), Magnetic Abrasive Finishing (MAF), Magnetorheological Finishing (MRF), Magnetorheological Abrasive Flow Finishing (MRAFF), Magnetic Float Polishing (MFP) ; Applications and limitations

UNIT-III

Thermoelectric type micro machining processes:

Electric Discharge Micromachining (EDMM), Wire EDM , EDDG, ELID, Laser Beam Micromachining (LBMM), Electron Beam Micromachining (EBMM) ; Applications and limitations

UNIT-IV

Chemical and Electrochemichal Type Advanced Machining Processes:

Electrochemical Micromachininig (ECMM), Electrochemichal Micro Deburring, Chemical and Photochemical Micromachining.

UNIT-V

Traditional Mechanical Micromachining Processes: Micro Turning, Micro Milling, Micro Drilling.

Miscellaneous Processes: Focused Ion Beam (FIB) Machining, Selection Of Micro Machining Processes.

Text Books:

1. V. K. Jain (Editor), Introduction to Micromachining , Narosa Publishing, Second Edition ISBN: 978-81-8487-361-0 , 2019

2. J.A. McGeough , Micromachining of Engineering, CRC Press; 1st edition, ISBN-10: 0849327857, 2001.

Reference Books

1. Golam Kibria, B. Bhattacharyya, J. Paulo Davim (Editors), Non-traditional Micromachining Processes: Fundamentals and Applications, Springer, ISBN: 978-3-319-52009-4,2017
2. J Paulo Davim, Mark J. Jackson (Editors), Nano and Micromachining Wiley-ISTE ISBN: 978-1-118-61774-8, 2013
3. Holly Dunham (Editor), Micromachining Techniques and Applications, NY Research Press, ISBN-10: 9781632383266 ,2015
4. Regina Luttge, Microfabrication for Industrial Applications, Elsevier, 1st Edition ISBN: 9780815515821, 2011
5. Jiwang Yan ,Micro and Nano Fabrication Technology Springer Singapore, ISBN: 9811300976, 2018

E-RESOURCES:

1. https://nptel.ac.in/courses/112/105/112105231/
2. https://nptel.ac.in/courses/112/107/112107078/
3. https://nptel.ac.in/courses/112/104/112104028/
4. https://nptel.ac.in/courses/112/103/112103250/

Course Outcomes:

1. Knowledge in terms of principle/ methodology used for various micromachining processes used in manufacturing industries.
2. This course also cultivates the ability to develop and optimize the micro machining processes resulting in creation and distribution of value in engineering applications
3. This knowledge imparts in terms of significance and selection of controlling process parameters used for the optimal performance of various engineering materials.
4. It enables to model the material removal and tool wear rate in various micro machining processes
5. Design the requirements to achieve best quality of machined surface while micro machining of various industrial engineering materials.

(A30363) Tribology
(Professional Elective-III)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit I: Surfaces and Friction: Topography of Engineering surfaces- Contact between surfaces - Sources of sliding Friction -Adhesion Plough, Energy dissipation mechanisms, Friction Characteristics of metals - Friction of non-metals. Friction of lamellar solids - Friction of Ceramic materials and polymers, Rolling friction. Source of Rolling Friction, Stick slip motion, Measurement of Friction.

Unit II: Wear: Types of wear - Simple theory of Sliding Wear Mechanism of sliding wear of metals - Abrasive wear. Materials for Adhesive and Abrasive wear situations - Corrosive wear - Surface Fatigue wear situations - Brittle Fracture wear - Wear of Ceramics and Polymers – Wear Measurements.

Unit III: Lubricants and Lubrication Types: Types and properties of Lubricants – Testing methods - Hydrodynamic Lubrication – Elasto hydrodynamic lubrication- Boundary Lubrication - Solid Lubrication Hydrostatic Lubrication.

Unit IV: Film Lubrication Theory: Fluid film in simple shear - Viscous flow between very close parallel plates - Shear stress variation, Reynolds Equation for film Lubrication - High speed unloaded journal bearings - Loaded journal bearings - Reaction torque on the bearings –Virtual Coefficient of friction - The Somerfield diagram.

Unit V: Surface Engineering and Materials for Bearings: Surface modifications - Transformation Hardening, surface fusion - Thermo chemical processes - Surface coatings - Plating and anodizing Fusion Processes - Vapour Phase processes -

Materials for rolling Element bearings - Materials for fluid film bearings - Materials for marginally lubricated and dry bearings.

Text/Reference Books:

1. I.M. Hutchings, Tribology, Friction and Wear of Engineering Material, Edward Arnold
2. T.A. Stolarski, Tribology in Machine Design, Industrial Press Inc.
3. E. P.Bowden and Tabor.D, Friction and Lubrication, Heinemann Educational Books Ltd
4. A. Cameron, Basic Lubrication theory, Longman, U.K.., 1981.
5. M. J.Neale (Editor), Tribology Handbook, Newnes. Butter worth, Heinemann, U.K.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/102/112102015/
2. https://nptel.ac.in/courses/112/102/112102014/

Course Outcomes:

By the end of the course student will be able to:
1. Distinguish between surface topography and modelling a rough engineering surface.
2. Summarize tribological system, mechanisms and forms of interaction of friction surfaces.
3. Compare Hertz contact and rough surface contact.
4. Assess adhesion theories the effect of adhesion on friction and wear.
5. Interpret friction/ lubrication mechanisms and know how to apply them to the practical engineering problem.
6. Summarize the methods to reduce the friction for engineering surface.

(A30373) COMPUTATIONAL FLUID DYNAMICS
(Professional Elective-III)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit – I

Methods to solve a physical problem-Numerical Methods-Brief comparison between FDM, FEM & FVM-Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices. Finite Difference Applications in Heat conduction and Convention – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction , finite difference application in convective heat transfer, closure.

Unit - II

Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods

Unit - III

Errors and stability analysis, introduction, first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme. Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass Newton‘s second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle and special forms of the Navier-stokes equations.

Unit - IV

Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, and conservative body force fields, stream function- Vorticity formulation, Boundary-layer theory, Buoyancy – Driven Convection and stability.

Unit – V

Simple CFD Techniques, viscous flows conservation form space marching, relovation techniques, viscous flows, conservation from space marching relovation techniques, artificial viscosity, the alternating direction implicit techniques, pressure correction technique, computer graphic techniques used in CFD Quasi one dimensional flow through a nozzle, turbulence models, standard and high Reynolds number models and their applications

Text Books

1. Computational Fluid Flow and Heat Transfer/ Muralidharan & Sundarajanan/ Narosa Publications
2. Numerical Methods –E.Balaguruswamy/TMH

Reference books:

1. Computational Fluid Dynamics basics with applications- John.D, Anderson / Mc graw hill.
2. Computational Methods for Fluid Dynamics –Firziger & peric/springer.
3. Numerical methods for Engineer – Chapra & Canale/TMH.
4. Heat Transfer – A basic approach/ Ozisik/ Mc Graw- Hill

E-RESOURCES:

1. https://nptel.ac.in/courses/112/107/112107079/
2. https://nptel.ac.in/courses/112/105/112105045/
3. https://nptel.ac.in/courses/112/107/112107080/

4. https://nptel.ac.in/courses/112/105/112105254/
5. https://nptel.ac.in/courses/112/106/112106186/
6. https://nptel.ac.in/courses/112/106/112106061/
7. https://nptel.ac.in/courses/112/104/112104030/

Course Outcomes:

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

1. Distinguish the different computational methods for fluid flow.
2. Develop and solve simple linear algebraic equations of fluid flows by Matrix inversion techniques.
3. Estimate the error and judge the stability criteria in the solutions of non- linear partial differential equations.
4. Formulate the flow behavior near walls and other practical applications.
5. Develop CFD techniques to analyze quasi one dimensional flow through nozzles and other simple devices.

(A30354) Process Management Standards
(Professional Elective-IV)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit- I: Introduction -The principle of process management - Process structure - Relationship process and organizational structures

Unit -II: Operation management - Operations strategy - Product design and process selection - Total quality management - Supply chain management - Capacity planning - Facility location and layout - Inventory systems

Unit -III: Methods of process management - ARIS - Six Sigma - Lean - Business process reengineering - Enterprise resource planning

Unit-IV: Process modeling - Model of value-added - Value Stream Mapping - Balanced Scorecards

Unit -V: Process management - Defining processes, defining the issues, risks - Measurement of processes, data collection - Data analysis- Process improvement, process standards ISO 9001 ("best practice")

Text Books:

1. Stevenson William J., Operations Management: Theory and Practice, Mcgraw-Hill College, 11th , 2011,ISBN: 9780077133016
2. Marlon Dumas ,Marcello La Rosa , Jan Mendling and Hajo A. Reijers, Fundamentals of Business Process Management , Springer; 2nd ed. 2018 , ISBN-10: 3662565080

Reference Books:

1. Lee J. Krajewski , Manoj K. Malhotra and , Larry P. Ritzman Operations Management: Processes and Supply Chains, 11th Edition,2015 ISBN-10: 1323334750

2. Joseph G. Monks ,Operations Management McGraw-Hill; 1982, ISBN-10: 0070427208

3. Michel Glykas(ed.), Business Process Management , Springer-Verlag Berlin and Heidelberg GmbH & Co.,ISBN: 9783642435768

4. Kumar Akhil ,Business Process Management , Routledge; 1st edition,(Sold by: Amazon Asia-Pacific Holdings Private Limited) 2018, ISBN: 1138181854

5. Laguna Manuel and Johan Marklund Business Process Modeling, Simulation and Design, Chapman and Hall/CRC; 2nd edition , Kindle Edition , 2013,(Sold by: Amazon Asia-Pacific Holdings Private Limited),ASIN: B00CLZT8RI

Course Outcomes:

1.Students will be able to define the principles of Process management.

2. Students will be able to summarize different management systems.

3. Students will be able to know the operations and their management involved in the organizations

4. Able to Apply six sigma and other standards to business processes.

5. Able to analyze process modeling and apply process measurements

(A30364) Mechanics of Composite Materials (Professional Elective-IV)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction to Composite Materials: Introduction, classification, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon-carbon composites,
fiber, reinforced composites and nature-made composites and applications.

Reinforcements: Fibers Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide, fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetting plastics, Metal matrix and ceramic composites.

UNIT – II

Manufacturing Methods: Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM. Macro mechanical Analysis of Lamina introduction.

Definitions: stress, strain, Elastic Moduli, strain Energy. Hooke's Law for different types of materials, Hooks Law for a two dimensional unidirectional lamina, plane stress assumption, reduction of Hooks Law in three dimensions to two dimensions, relationship of compliance
and stiffness matrix to engineering elastic constants of a lamina.

UNIT – III

Hooke’s Law for a Two-Dimensional Angle Lamina, Engineering constants of an Angle Lamina. Invariant Form of Stiffness and compliance Matrices for an Angle Lamina Strength Failure. Envelops, Maximum Strain Failure Theory, Tsai-Hill Failure Theory, Tsai-Wu Failure Theory Comparison of Experimental Results with Failure Theories.

Hygrothermal Stresses and Strains in a Lamina: Hygrothermal Stress-Strain Relationships for a Unidirectional Lamina, Hygrothermal Stress-Strain Relationships for a Angle Lamina.

UNIT - IV

Micromechanical Analysis of A Lamina: Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi Empirical Models Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of

Thermal Expansion, Coefficients of Moisture Expansion .

UNIT - V

Macro mechanical Analysis of Laminates: Introduction, Laminate Code, Stress-Strain Relations for a Laminate, In-Plane and Flexural Modules of a Laminate, Hygrothermal Effects in a Laminate, Warpage of Laminates.

Failure Analysis and Design of Laminates: Introduction Special Cases of Laminates, Failure Criterion for a Laminate, Design of a Laminated Composite, Other Mechanical Design Issues

TEXT BOOKS:

1. Madhujit Mukhopadhyay, Mechanics of Composite Materials, Orient Blackswan, 2004,ISBN-10: 8173714770

2. R.M Jones, Mechanics of composite Materials, CRC Press; 2nd edition ,1998, ISBN-10: 156032712X

REFERENCE BOOKS:

1. Bhagwan D. Agarwal ,Lawrence J. Broutman and , K. Chandrashekhara ,Analysis and Performance of Fiber Composites, Wiley; 3 edition 2006,ISBN-10: 0471268917

2. L.R Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969

3. Isaac M. Daniel, Ori Ishai,Engineering Mechanics of Composite Materials, Volume 13,Oxford University Press, 2006 ,ISBN:019 515097X

4. Valery V. Vasiliev and Evgeny V. Morozov ,Advanced Mechanics of Composite Materials and Structural Elements, Elsevier, 3rd Edition ,2013, ISBN: 9780080982311
5. Autar K. Kaw, Mechanics of Composite Materials ,2005, CRC Press; 2 edition ISBN-10: 0849313430

E-RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104168/
2. https://nptel.ac.in/courses/112/104/112104229/
3. https://nptel.ac.in/courses/112/104/112104221/
4. https://nptel.ac.in/courses/105/108/105108124/

Course Outcomes:

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

1. An ability to identify the properties of fiber and matrix materials used in commercial composites, as well as common manufacturing techniques.
2. An ability to predict the elastic properties of both long and short fiber composites based on the constituent properties.
3. An ability to predict stress, strain and stiffness tensors using ideas from matrix algebra.
4. Select suitable composite material for a given application
5. Ability to understand the mechanisms of failure of composites

(A30374) Non-Conventional Sources of Energy
(Professional Elective-IV)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT - I

Statistics on conventional energy sources and supply in developing countries, Definition- Concepts of NCES, Limitations of RES, Criteria for assessing the potential of NCES. Classification of NCES - Solar, Wind, Geothermal, Bio-mass, Ocean Energy Sources, comparison of these energy sources.

UNIT - II

Solar Energy-Energy available form Sun, Solar radiation data, Solar energy conversion into heat, Flat plate and Concentrating collectors, Mathematical analysis of Flat plate collectors and collector efficiency, Principle of Natural and Forced convection, Solar engines-Stirling, Brayton engines, Photovoltaic, p-n junction, solar cells, PV systems, Stand-alone, Grid connected solar power satellite.

UNIT - II

Wind energy conversion, General formula -Lift and Drag- Basis of wind energy conversion - Effect of density, frequency variances, angle of attack, and wind speed. Windmill rotors- Horizontal axis and vertical axis rotors. Determination of torque coefficient, Induction type generators- working principle.

UNIT - IV

Nature of Geothermal sources, Definition and classification of resources, Utilization for electric generation and direct heating, Well Head power generating units, Basic features- Atmospheric exhaust and condensing, exhaust types of conventional steam turbines. Pyrolysis of Biomass to produce solid, liquid and gaseous fuels, Biomass gasification, Constructional details of gasifier, usage of biogas for chulhas, various types of chulhas for rural energy needs.

UNIT - V

Wave, Tidal and OTEC energy- Difference between tidal and wave power generation, Principles of tidal and wave power generation, OTEC power plants, Operational of small R16 cycle experimental facility, Design of 5 Mw OTEC pro-commercial plant, Economics of OTEC, Environmental impacts of OTEC. Status of multiple product OTEC systems.

TEXT BOOKS:

1. Ashok V Desai, Non-Conventional Energy, Wiley Eastern Ltd, New Delhi, 2003
2. K M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, New Delhi,
2003.

REFERENCE BOOKS:

1. Ramesh R & Kumar K U, *Renewable Energy Technologies*, Narosa Publishing House, New Delhi, 2004
2. Wakil MM, *Power Plant Technology*, Mc Graw Hill Book Co, New Delhi, 2004.
3. Non - Conventional Energy Sources. Rai

E-RESOURCES:

https://nptel.ac.in/courses/112/105/112105051/

Course Outcomes:

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

1. A basic idea on Principles of Solar Radiation, Different Methods of Solar Energy Storage and its Applications,

Concepts of Solar Ponds, Solar Distillation and Photo Voltaic Energy Conversion
2. Introduced to Flat Plate and Concentrating Collectors, Classification of Concentrating Collectors, Wind Energy, Horizontal and Vertical Access Wind Mills, Bio-Conversion
3. Learn different Types of Bio-Gas Digesters & Utilization for Cooking Geothermal Energy Resources, Types of Wells and Methods of Harnessing the Energy, Ocean Energy and Setting of OTEC Plants
4. Tidal and Wave Energy and Mini Hydel Power Plant, Need and Principles of Direct Energy Conversion
5. Concepts of Thermo-Electric Generators and MHD Generators.

(A30355) Surface Engineering
(Professional Elective-V)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Surface engineering: Introduction to surface engineering, Scope of surface engineering for different engineering materials, Surface Preparation methods such as Chemical, Electrochemical, Mechanical: Sand Blasting, Shot peening, Shot blasting, Hydro-blasting, Vapor Phase Degreasing etc.

UNIT-II

Coatings: Classification, Properties and applications of Various Coatings

Chemical Conversion Coating: Chromating, Phosphating, Anodizing, Thermochemical processes: Methodology used, mechanisms, important reactions involved, Process parameters and applications

Metallic coating: Hot Dipping, Galvanizing, Electrolytic and Electro less plating: Methodology used, mechanisms, important reactions involved, Process parameters and applications. Testing/ evaluation of metallic coatings

Coating from Vapour Phase: PVD, and CVD: Various Methods used, mechanisms, important reactions involved, Process parameters and applications.

UNIT-III

Different methods for surface modification: Surface modification by use of directed energy beams, Plasma, Sputtering & Ion Implantation. Surface modification by Friction stir processing. Surface composites.

UNIT-IV

Thermal spray coatings: Processes, Types of spray guns, Comparison of typical thermal spray processes, Surface Preparation, Finishing Treatment, Coating Structures and Properties, Applications.

UNIT-V

Diffusion Coating: Carburizing, Carbonitriding, Siliconizing, Chromizing, Aluminizing, Boronizing, Boronitriding: Various Methods used, mechanisms, important reactions involved, Process parameters and applications.

Text books:

1. Lech Pawlowski, The Science and Engineering of Thermal Spray Coatings , Wiley-Blackwell; 2nd edition, 2008 , ISBN-10: 0471490490
2. P. A. Dearnley, Introduction to Surface Engineering , Cambridge University Press; 1st edition, 2017, ISBN-10: 0521401682

Reference Books:

1. Peter Martin,Introduction to Surface Engineering and Functionally Engineered Materials,Wiley, 2011 , ISBN: 978-0-470-63927-6

2. Joseph R. Davis (Ed) Surface Engineering for Corrosion and Wear Resistance, ASM International , 2001,ISBN: 978-0-87170-700-0
3. Faith Reidenbach(Ed), Surface Engineering ,ASM Handbook, Volume 5: 10th Edition, ASM International , 1994 ,ISBN-10: 087170384X
4. S. Wernick R. Pinner , P. G. Sheasby ,The Surface Treatment and Finishing of Aluminum and Its Alloys , Vol:1 and 2 , ASM International; 5 edition ,1987 ,ISBN-10: 0904477
5. J Paulo Davim (Ed),Materials and Surface Engineering Elsevier,1st Edition, 2012, ISBN: 9780857091512.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/107/112107258/
2. https://nptel.ac.in/courses/112/105/112105053/
3. https://nptel.ac.in/courses/113/107/113107075/

Course Outcomes:

At the end of the course, the students should be able to:

1. Identify the surface preparation methods suitable for different substrate materials.
2. Apply knowledge on properties offered by different Coatings based on the application requirement.
3. Understand & infer testing &evaluation of metallic coatings.
4. Explain importance of specific coatings & its applications on specific Engineering components.
5. Explain the effect of process parameters on the properties & microstructure of the surface coating processes.

(A30365) Finite Element Methods
(Professional Elective-V)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit – I Introduction to Finite Element Method for solving field problems: Stress and Equilibrium. Boundary conditions. Strain – Displacement relations. Stress – strain relations.

One Dimensional Problems: Finite element modeling coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

Unit – II Analysis of Trusses: Stiffness Matrix for Plane Truss and Space Truss Elements, Stress Calculations Analysis of Beams: Element stiffness matrix for two node, two degrees of freedom per node beam element, Load Vector, Deflection, Stresses

Unit – III Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Estimation of Load Vector, Stresses.

Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements. Two dimensional four noded isoparametric elements and numerical integration.

Unit – IV Steady state heat transfer analysis: one dimensional analysis of Slab, fin and two dimensional analysis of thin plate.

Unit – V Dynamic Analysis: Formulation of finite element model, element - Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, truss and beam.

Text books:

1. Introduction to Finite Elements in Engineering, Chandupatla, Ashok and Belegundu, Prentice – Hall/Pearson

2. The Finite Element Methods in Engineering / SS Rao / Pergamon.

Reference books:

1. Finite Element Methods: Basic Concepts and applications, Alavala, PHI
2. Finite Element Method – Zincowitz / Mc Graw Hill
3. Introduction to Finite element analysis- S.Md.Jalaludeen, Anuradha Publications
4. Finite Element Analysis – P.Seshu / PHI
5. Finite Element Analysis – Hutton /TMH
6. Finite Element Analysis – Bathe / PHI
7. Finite Element Method – Krishna Murthy / TMH

E-Resourcs:

1. https://nptel.ac.in/courses/112/106/112106135/
2. https://nptel.ac.in/courses/112/104/112104193/
3. https://nptel.ac.in/courses/112/104/112104205/
4. https://nptel.ac.in/courses/112/106/112106130/
5. https://nptel.ac.in/courses/112/104/112104115/
6. https://nptel.ac.in/courses/112/104/112104116/
7. https://nptel.ac.in/courses/105/106/105106051/
8. https://nptel.ac.in/courses/105/105/105105041/

Course Outcomes:

Upon completing this course, the students will be able to:

1. Identify mathematical model for solution of common engineering problems.
2. Formulate simple problems into finite elements.
3. Solve structural, thermal, fluid flow problems.
4. Determine engineering design parameters for bar, beam structure, 2-D planar problems and scalar field problems.
5. Evaluate the natural frequencies of bar, beam structures.

(A30375) Jet Propulsions & Rocket Engineering
(Professional Elective-V)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit - I

Turbo Jet Propulsion System: Gas turbine cycle analysis – layout of turbo jet engine. Turbo machinery- compressors and turbines, combustor, blade aerodynamics, engine off design performance analysis.

Flight Performance: Forces acting on vehicle – Basic relations of motion – multi stage vehicles.

Unit - II

Principles of Jet Propulsion and Rocketry: Fundamentals of jet propulsion, Rockets and air breathing jet engines – Classification – turbo jet, turbo fan, turbo prop, rocket (Solid and Liquid propellant rockets) and Ramjet engines.

Nozzle Theory and Characteristics Parameters: Theory of one dimensional convergent – divergent nozzles – aerodynamic choking of nozzles and mass flow through a nozzle – nozzle exhaust velocity – thrust, thrust coefficient, Ac / At of a nozzle, Supersonic nozzle shape, non-adapted nozzles, summer field criteria, departure from simple analysis – characteristic parameters – 1) characteristic velocity, 2) specific impulse 3) total impulse 4) relationship between the characteristic parameters 5) nozzle efficiency, combustion efficiency and overall efficiency.

Unit - III

Aero Thermo Chemistry of the Combustion Products: Review of properties of mixture of gases – Gibbs – Dalton laws – Equivalent ratio, enthalpy changes in reactions, heat of reaction and heat of – calculation of adiabatic flame temperature and specific impulse – frozen and equilibrium flows.

Solid Propulsion System: Solid propellants – classification, homogeneous and heterogeneous propellants, double base propellant compositions and manufacturing methods. Composite propellant oxidizers and binders. Effect of binder on propellant properties. Burning rate and burning rate laws, factors influencing the burning rate, methods of determining burning rates.

Unit - IV

Solid Propellant Rocket Engine: Internal ballistics, equilibrium motor operation and equilibrium pressure to various parameters. Transient and pseudo equilibrium operation, end burning and burning grains, grain design. Rocket motor hard ware design. Heat transfer considerations in solid rocket motor design. Ignition system, simple pyro devices.

Liquid Rocket Propulsion System: Liquid propellants – classification, Mono and Bi propellants, Cryogenic and storage propellants, ignition delay of hypergolic propellants, physical and chemical characteristics of liquid propellant. Liquid propellant rocket engine – system layout, pump and pressure feed systems, feed system components. Design of combustion chamber, characteristic length, constructional features, and chamber wall stresses. Heat transfer and cooling aspects. Uncooled engines, injectors – various types, injection patterns, injector characteristics, and atomization and drop size distribution, propellant tank design.

Unit – V

Ramjet and Integral Rocket Ramjet Propulsion System: Fuel rich solid propellants, gross thrust, gross thrust coefficient, combustion efficiency of ramjet engine, air intakes and their classification – critical, super critical and sub-critical operation of air intakes, engine intake matching, classification and comparison of IIRR propulsion systems.

Text books:

1. Gas Turbines and propulsive systems-P.Khajuria& S.P.Dubey/Dhanpatrai publication.
2. Gas Dynamics & Space Propulsion- M.C.Ramaswamy / Jaico Publishing House.

Reference books:

1. Gas Turbines /Cohen, Rogers & Sarvana Muttoo/Addision Wesley & Longman.
2. Gas Turbines-V.Ganesan /TMH.

Course Outcomes:

At the end of the course students will be able to:
1. Identify various types of propulsion systems.
2. Analyze characteristics of nozzle.
3. Distinguish between solid and liquid propulsion systems.
4. Develop Integral Rocket Ramjet Propulsion System

(A30160) DISASTER MANAGEMENT AND MITIGATION
(Open Elective-I: Offered by CE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT - I:

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical reserches.

UNIT - II:

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man indeced hazards & Disasters - Natural Hazards - Planetary Hazards / Disasters - Extra Planetary Hazards / disasters - Planetary Hazards - Endongenous Hazards - Exogenous Hazards

UNIT - III:

Endogenous Hazards - Volcanic eruption - Earthquakes - landslides - Volcanic Hazards / Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards / disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjusment, perception & mitigation of earthquake.

UNIT - IV:

Exogenous hazards / disasters - Infrequent events - Cumulative atmospheric hazards / disasters

Infrequent events: Cyclones - Lightning - Hailstorms

Cyclones: Tropical cyclones & Local stroms - Destruction by tropical cyclones & local stroms (causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters :- Floods - Droughts - Cold waves - Heal waves Floods :- Causes of floods - Flood hazards India - Flood control measures (Human adjustment, perception & mitigation) Droughts :- Impacts of droughts - Drought hazards in India - Drought control measures - Extra Planetary Hazards / Disasters - man induced Hazards / Disasters - Physical hazards / Disasters - Soil erosion

Soil Erosion: Mechanics & forms of Soil Erosion - Factors 7 causes of Soil Erosion - Conservation measures of Soil Erosion.

Chemical hazards / disasters: Release of toxic chemicals, nuclear explosion - Sedimentation processes Sedimentation processes: - Global Sedimentation problems - Regional Sedimentation problems - Sedimentation & Environmental problems - Corrective measures of Erosion & Sedimentation

Biological hazards / disasters: Population Explosion.

UNIT - V:

Emerging approaches in Disaster Management - Three stages

1. Pre-disaster Stage (preparedness)
2. Emergency Stage

3. Post Disaster stage - Rehabilitation

TEXT BOOKS:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

REFERENCES:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

(A30161) REMOTE SENSING AND GIS
(Open Elective-I: Offered by CE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT – I

Introduction to Photogrammetric: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – IIRemote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display-Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters commonly used Map Projections - Projected coordinate Systems

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geo-base data model; Geometric representation of Spatial Feature and data structure, Topology rules

UNIT – V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data
Structure, Data Conversion, Integration of Raster and Vector data.

Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data,
Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map,
Data Editing.

Course Outcomes: At the end of the course, the student will be able to:

- Retrieve the information content of remotely sensed data
- Analyze the energy interactions in the atmosphere and earth surface features
- Interpret the images for preparation of thematic maps
- Apply problem specific remote sensing data for engineering applications

- Analyze spatial and attribute data for solving spatial problems
- Create GIS and cartographic outputs for presentation

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill
2015

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India)
Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A.
Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

(A30554) JAVA PROGRAMMING
(Open Elective-I: Offered by CSE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction: Java Essentials, JVM, Java Features, Creation and Execution of Programs, Data Types, Type Conversion, Casting, Conditional Statements, Loops, Branching Mechanism, Classes, Objects, Class Declaration, Creating Objects, Method Declaration and Invocation, Method Overloading, Constructors–Parameterized Constructors, Constructor Overloading, Cleaning-up unused Objects, Class Variables & Methods-static Keyword, this Keyword.

UNIT–II

Arrays: One-Dimensional Arrays, Two-Dimensional Arrays, Command-Line Arguments, Inner Class. **Inheritance**: Introduction, Types of Inheritance, extends Keyword, Examples, Method Overriding, super, final Keywords, Abstract classes, Interfaces, Abstract Classes Verses Interfaces.

UNIT–III

Packages–Creating and Using Packages, Access Protection, Wrapper Classes, String Class, StringBuffer Class. **Exception**: Introduction, Types, Exception Handling Techniques, User-Defined Exception.

UNIT-IV

Multithreading: Introduction, Main Thread, Creation of New Threads – By Inheriting the Thread Class or Implementing the Runnable Interface, Thread Lifecycle, Thread Priority, Synchronization.

UNIT–V

java.io Package, File Class, FileInputStream Class, FileOutputStream Class, Scanner Class, BufferedInputStream Class, BufferedOutputStream Class, RandomAccessFile Class.

Text Books:

1. Sachin Malhotra, Saurabh Choudhary, Programming in Java (2e), Oxford publications.

Reference Books:

1.Herbert Schildt, Java: The Complete Reference (9e), McGraw Hill Education;

2. C. Thomas Wu, An introduction to object-oriented programming with Java (5e), McGraw-Hill Education;

Course Outcomes

The student shall be able to:

1. Explain the OOPs concepts.
2. Describe various types of Inheritance in Java.
3. Develop robust Java applications using Packages, Exceptions.
4. Implement Java applications using Java Threads.
5. Design Java applications with various modes of Input and output

(A30531) PYTHON PROGRAMMING
(Open Elective-I: Offered by CSE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Python, Installing Python. How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.
Data types and Expressions: Strings, Assignment and Comments, Numeric Data Types and Character Sets, Expressions, Functions and Modules.

UNIT–II

Control Statements: Definite Iteration, Formatting Text for Output, Selection, Conditional Iteration. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions. Functions: Introduction, Defining and Calling a Void Function, designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions-Generating Random Numbers, the math Module, Storing Functions in Modules.

UNIT–III

Python Data structures: Accessing Characters and Substrings in a String, Strings and Number System, String Methods, Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Text Files, Data Encryption, Lists, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples Sequences, Tuples. Dictionaries and Sets: Dictionaries, Sets, Serializing Objects. Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms

UNIT-IV

Design with Classes: Classes and Objects, Classes and Functions, Classes and Methods, Working with Instances, Inheritance and Polymorphism. Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, techniques for Designing Classes

UNIT–V

Graphical User Interfaces: Behavior of terminal based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Simple Graphics and Image Processing: Overview of Turtle Graphics, Two dimensional Shapes, Colors and RBG System, Image Processing.

Text Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011,
Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing

Reference Books:

1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3, The Pragmatic Bookshelf, 2nd edition

Course Outcomes

Students shall be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Express different Decision-Making statements and Functions
3. Interpret Object oriented programming in Python
4. summarize different File handling operations
5. Explain how to design GUI Applications in Python and evaluate different database Operations.

(A30471) PRINCIPLES OF ELECTRONIC COMMUNICATIONS
(Open Elective-I: offered by ECE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit- I: Introduction to Communication System

Block diagram of Communication system, Radio communication: Types of communications, Analog, Pulse, and Digital, Types of Signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Correlation, Convolution, Time Division Multiplexing, Frequency Division Multiplexing.

Unit- II: Amplitude Modulation

Need for modulation, Types of Amplitude modulation: AM, DSBSC, SSBSC, Power and BW requirements, Generation of AM, DSBSC, SSBSC, Demodulation of AM: Diode detector, Coherent detection of DSBSC& SSBSC.

Unit- III: Angle Modulation

Frequency & Phase Modulation, Advantages of FM over AM, Bandwidth consideration, Narrow band FM, Wide band FM, Comparison of FM and PM.

Pulse Modulation

Sampling, Sampling Theorem for Band limited signals, Types of Pulse modulation: PAM, PWM, PPM, Generation and demodulation of PAM, PWM, and PPM.

Unit- IV: Digital communication

Advantage, Block diagram of PCM, Quantization error, DPCM, Adaptive DPCM, DM and Comparison.

Digital Modulation: ASK, FSK, PSK, DPSK, QPSK, coherent and Non-coherent reception.

Unit- V: Information Theory

Concept of Information, Rate of Information and entropy, Source coding for optimum rate of information, Coding efficiency, Shannon Fano coding, Huffman Coding.

Error Control Coding: Introduction, Error detection and Correction codes, Block codes, Convolution codes.

Textbooks:

1. Communication Systems Analog and Digital–R. P. Singh, SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 3rd Edition, 2007.
3. Communication Systems – B.P. Lathi, BS Publication, 2004.

References:

1. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Digital Communications- John G. Proakis, MasoudSalehi- 5th Edition, Mcgarw- Hill,2008.

Course Outcomes

At the end of the course the student should be able to:

1. Understand the concept of Communication systems.
2. Describe the concept of AM and FM transmission and Reception.
3. Analyze the concepts of digital communication systems.
4. Compare the different digital modulation techniques.
5. Discuss about different error detecting and error correcting codes like block codes, cyclic codes and convolution codes.

(A30472) BASIC ELECTRONICS ENGINEERING
(Open Elective-I: offered by ECE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT-I:

P-N Junction Diode:

Basics of semiconductor materials, P-N junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of V-I characteristics, Ideal versus Practical-Resistance levels (Static and Dynamic). Breakdown Mechanisms in Semiconductor Diodes, Zener Diode Characteristics, Voltage Regulation using Zener diode.

UNIT- II:

Rectifiers and Filters:

The P-N junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L- Section Filters, Pi-Section Filters, Comparison of Filters,.

UNIT –III:

Bipolar Junction Transistor:

The Junction Transistor, , Transistor Current Components, , Transistor as an Amplifier, transistor Construction, BJT Operation, symbol, Common base, Common Emitter and Common Collector Configurations, Limits of operation, BJT Specifications, BJT Hybrid model , Determination of H parameters from Transistor characteristics, Comparison of CB, CE, and CC configurations.

UNIT- IV:

Transistor Biasing and Stabilization: Operating Point, The DC and AC Load lines, need for Biasing, Fixed Bias, Collector to base bias Feedback, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in V_{BE} and β, Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability.

UNIT- V:

Field Effect Transistor: The Junction Field Effect Transistor (Construction, principle of operation, Symbol)- Pinch-off Voltage-Volt-Ampere characteristics, The JFET small signal model, MOSFET (Construction, principle of operation, Symbol), MOSFET Characteristics in Enhancement and Depletion modes.

TEXT BOOKS:

1. Millman's Electronic Devices & Circuits-J. Millman, C.C. Halkais&SatyabrataJit, 2 Ed., 1998, TMH.
2. Electronic Devices & Circuits- Mohammad Rashid, Cengage Learning, 2013
3. Electronic Devices & Circuits- David A. Bell, 5 Ed, Oxford

REFERENCE BOOKS:

1. Integrated Electronics- J. Millman and Christos C. Halkais, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits- R.L. Boylstad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI
3. Electronic Devices and Circuits- B. P. Singh, Rekha Singh, Pearson, 2 Ed, 2013.
4. Electronic Devices and Circuits- K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits- Anil K. Maini, Varsha Agarwal, 1 Ed., 2009, Wiley India Pvt Ltd.
6. Electronic Devices and Circuits- S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, 2 ed., 2008, TMH.

Course outcomes:

At the end of the course the student will be able to:

1. Understand and analyze the different types of diodes and its characteristics.
2. Construct various rectifiers and filters.
3. Analyze the characteristics of BJT & FET.
4. Design the DC bias circuitry of BJT and FET.

(A30258) BASICS OF POWER ELECTRONICS & DRIVES
(Open Elective-I: Offered by EEE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT I: POWER SEMICONDUCTOR DEVICES

Power Semiconductor Devices Construction and Characteristics of Power diodes, Power Transistors, Power MOSFET, Insulated Gate Bipolar transistors (IGBTs) Introduction to Thyristor family: SCR, DIACs, TRIACs

UNIT II: PHASE CONTROLLED (AC TO DC) CONVERTERS

Principle of phase controlled converter operation; Operation of 1-phase half wave converter with R, RL and RLE load; 1- phase full wave converter, Bridge Configuration; Operation with R, RL, RLE load; Operation of 1-phase Semi-converter/ Half controlled converter:

UNIT III: THREE -PHASE CONVERTERS

Operation of half wave converter; Full wave fully controlled converters: Semi-controlled converter; Dual Converter: Principle and operation;, Applications of AC-DC converters

UNIT IV: DC TO DC CONVERTERS

The chopper, Basic principle of DC chopper, Classification of DC choppers, Control strategies Basic DC-DC converter (switch regulator) topologies : Principle, operation Step-down (Buck), Step-up (Boost), Step up/down (Buck-Boost), Continuous conduction and Discontinuous conduction operation, Two zone operation, Four quadrant operation (Operating modes),

UNIT V: POWER CONVERTERS FED DRIVES

Single phase separately excited drives: Half Wave converter, Semiconverter and Fully Controlled converter based drives; Braking operation of separately excited drive Semi-converter and Fully Controlled converter based drives 3-phase separately excited drives: Half Wave converter, Semi-converter and Fully Controlled converter based drives; Principle of power control (motoring control) of separately excited and series motor with DC-DC Converter;

Text books:

1. M D Singh and K B Khanchandani, “Power electronics”, TMH, New Delhi, 2nd ed., 2007.
2. P.S. Bimbhra, “Power Electronics”, Khanna Publishers, New Delhi, 2012..
3. Muhammad H. Rashid, “Power Electronics - Circuits, Devices and Applications”, Prentice Hall of India, 3rd ed., 2003.

Reference Books:

1. VedamSubramanyam, “Power Electronics – Devices, Converters and Applications”, New Age International Publishers Pvt. Ltd., Bangalore, 2nd ed. 2006.
2. Ned Mohan, Undeland and Robbins, “Power Electronics – Converters, Applications and Design”, John Willey & sons, Inc., 3rd ed., 2003.
3. V.R.Moorthi, “Power Electronics”, Oxford University press, 2005.
4. G..K. Dubey, S.R. Doradla, A. Joshi, and R.M.K. Sinha, “Thyristorised Power Controllers”, New Age International Ltd. Publishers, 1986 (Reprint 2008).
5. P.T. Krein, “Elements of Power Electronics”, Oxford University Press, 1998.
6. G..K. Dubey, “ Fundamentals of Electrical Drives”, Narosa Publishing House, New Delhi, 2nd ed. 2001

Course Outcomes:

After learning the course the students should be able to:

1. Explain the construction and characteristics of Power semiconductor devices
2. Analyze the operation of single phase and three phase ac-to-dc converters.
3. Compare the various types of dc-to-dc converters.
4. Apply the knowledge of power electronic converter for various applications.

(A30252) POWER GENERATION SYSTEMS
(Open Elective-I: Offered by EEE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT I: THERMAL POWER PLANTS

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers,FBCBoilers,Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants - Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogenerationsystems.

UNIT II: NUCLEAR POWER PLANTS

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors: Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada-Deuterium- Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors.Safety measures for Nuclear Power plants.

UNIT III: SOLAR ENERGY

Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, instruments for measuring solar radiation and sun shine, solar radiation data. Photo-voltaic energy conversion.

Solar energy collection: Flat plate and concentrating collectors

Storage and applications: solar ponds. Solar Applications - solar heating/cooling technique, solar distillation and drying.

UNIT-IV: WIND&BIO-MASS ENERGY:

Wind: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

Bio-mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-V: GEOTHERMAL & OCEAN ENERGY:

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

TEXT BOOKS:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.
2. Non-Conventional Energy Sources /G.D. Rai
3. Renewable Energy Technologies /Ramesh & Kumar /Narosa.

REFERENCES:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd.,2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998

4. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
5. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
6. Solar Energy /Sukhame

Course Outcome:

After learning the course the students should be able to:

1. Explain the construction and operation of thermal power plants
2. Analyze the operation of diesel, gas turbine and combined cycle power plants.
3. Illustrate the construction, operation and safety aspects of nuclear power plants.
4. Compare the power derived from renewable energy sources
5. Identify the economic aspects of power plants

(C30161) LOGISTICS AND SUPPLY CHAIN MANAGEMENT
(Open Elective-I: Offered by MBA Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit – 1

Understanding the Supply Chain: Objective and Importance of Supply Chain Process View of Supply Chain. Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope. Logistics: The Logistical value preposition, The Work of Logistics, Logistical operations, Logistical operating arrangements, Supply chain Synchronization, Supply Chain Drivers and Metrics: Drivers for Supply Chain Performance, Framework for Structuring drivers. Facilities, inventory, transportation, information, sourcing and pricing. Obstacles to Achieving fit, Supply chain performance in India. Case studies

Unit – 2

Designing the Supply Chain Network : Role of distribution in the Supply Chain, Factors influencing Distribution network design, Design options for Distribution network, The role of network design in the Supply Chain, Frame work for Network design decisions, Models for facility location and capacity allocation, Planning Demand and Supply in a Supply Chain: Demand Forecasting in Supply Chain: Components of forecast and forecasting methods, Aggregate Planning in Supply Chain: Role of aggregate planning, Aggregate planning Strategies , Inventory planning and economic theory aberrations. Case studies

Unit – 3

Planning and Managing inventories in Supply Chain: Managing Economies of Scale in Supply Chain, Managing

Uncertainty in a Supply Chain, Determining optimal level of product inventory. Designing and Planning Transportation Networks: Transportation in a Supply Chain. Case studies

Unit – 4

Managing Cross Functional Drivers in a Supply Chain: Sourcing decisions in a Supply Chain and procurement strategies, Pricing and Revenue Management in a Supply Chain, Information Technology and Coordination in a Supply chain. Case studies

Unit- 5

Logistics and Supply chain relationships: Identifying logistics performance indicators –Channel structure – Economics of distribution –channel relationships –logistics service alliances. Managing Global logistics and Global supply chains: Logistics in a global economy – views of global logistics- global operating levels – interlinked global economy - The Global supply chains , Supply Chain Management in Global environment–Global strategy – Global purchasing – Global logistics–Global alliances –Issues and Challenges in Global supply chain Management – Case studies

References

- Sunil Chopra and Peter Meindl: Supply chain Management: Strategy, Planning and Operation, Third edition, Pearson, 2009.
- Donald J.Bowersox and David J.Closs: Logistical Management: The Integrated Supply Chain Process, TMH, 2006.
- Rajasekhar & Acharyulu: Logistics and Supply Chain Management, Excel, 2009.
- Sridhara Bhat: Logistics and supply chain management, Himalaya, 2009.

- John T Mentzer: Supply Chain Management, Sage Publications, 2008
- Donal Waters: Global Logistics, Kogan Page, 2009
- Christain schuh et al:The purchasing chess board, Springer link,2009.
- Philip B.Schary, Tage Skjott-Larsen: Managing the Global Supply Chain, Viva, 2008.
- Joel D wisner, Keong Leong, Keah Choon Tan: Principles of Supply Chain Management- A Balanced approach, Cengage Learning, 2008
- Rahul V Altekar: Supply Chain Management, Concepts and Cases, PHI , 2008
- J.L.Gattorna and D.W.Walters: Managing the Supply Chain, Macmillan, 2008
- Rangaraj: Supply chain Management for competitive advantage, TMH, 2009
- Kachru: Logistics and Supply Chain Management, Excel, 2009
- Shah: Supply Chain Management, Pearson, 2009

COURSE OUTCOMES

On completion of the course students will be able to

1. Analyse importance of managing and handling Logistical operation in an organization.
2. Develop the knowledge of supply chain strategies formulation and implementation
3. Develop, implement and evaluate transportation networks
4. Design and develop effective procurement and pricing strategies
5. Manage effective relationship with the national and international channel members.

(C30162) KNOWLEDGE MANAGEMENT
(Open Elective-I: Offered by MBA Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit 1

The Knowledge Economy: Leveraging Knowledge, Data-Information-knowledge-Wisdom relationship, organizational knowledge, characteristics and components of organizational knowledge –Building knowledge societies- Measures for meeting the challenges of implementing KM programmes.

Unit 2

Knowledge Management and Information Technology: Role Information Technology in Knowledge Management Systems, Knowledge Management tools,Creative effective Knowledge Management Systems through Information Technology, ERP and BPR, Data Warehousing and Data Mining.

Unit 3: Future of Knowledge Management and Industry perspective: Companies on the road to knowledge management, Knowledge Management in Manufacturing and service industry, challenges and future of Knowledge Management.

Unit 4

The Knowledge Process: Universal appeal, Stages of KM Process, Knowledge Capital vs physical capital, Customer Relationship Management, Business Ethics And KM, The Promise of Internet and the Imperatives of the new age.

Unit 5

Implementation of Knowledge Management: Discussion on Roadblocks to success,10-step KM Road Map of Amrit Tiwana, Business Intelligence and Internet platforms, web Portals, Information Architecture: A three-way Balancing Act, KM, the Indian experience, Net Banking in India. –Role of knowledge

Management in Organisational Restructuring. -The Mystique of a Learning Organisation.

References

- Mattison: Web Warehousing & Knowledge Management, Tata McGraw-Hill,2009
- Becerra Fernandez: Knowledge management: An Evolutionary view, PHI, 2009
- Fernando:Knowledge Management, Pearson, 2009
- B.Rathan Reddy: Knowledge management, Himalaya, 2009
- Tapan K Panda: Knowledge Management, Excel, 2009.
- Barnes: Knowledge Management systems, Cengage, 2009.
- Tiwana: The Knowledge Management tool kit, 2/e, Pearson Education, 2009.
- Warier: Knowledge Management, Vikas Publishing House, 2009
- Sislop: Knowledge Management, Oxford University Press, New Delhi, 2009
- Debowski: Knowledge Management, Wiley Student Edition, Wiley India, 2007

COURSE OUTCOMES

On completion of the course students will be able to:

1. Understanding the key theories and models in knowledge management.
2. Critically apply theory to organisations in order to identify and justify effective knowledge management strategies and activities.
3. Access and evaluate information research findings relating to knowledge management.
4. Communicate clearly and effectively incorporating various knowledge management formats and technologies.
5. Implementing the ethical implications in managing knowledge.

(A30162) GREEN BUILDINGS
(Offered by Civil Engg.)
(Open Elective-II: Offered by CE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT I - INTRODUCTION

A historical perspective. General premises and strategies for sustainable and green design, objectives and basis. Bio-mimicry as a design tool based on ecosystem analogy.

UNIT II - GREEN CONSTRUCTION AND ENVIRONMENTAL QUALITY

Sustainable architecture and Green Building: Definition, Green building evaluation systems; LEED Certification; Green Globe Certification; Case studies which look at the environmental approach; Renewable Energy; Controlling the water cycle, Impact of materials on environment; Optimizing construction; Site management; Environmental management of buildings.

UNIT III - PASSIVE DESIGN IN MATERIALS

Passive Design and Material Choice – Traditional Building Materials – Importance of envelope
material in internal temperature control – Specification for walls and roofs in different climate –
Material and Humidity Control.

UNIT IV - ECO HOUSE

The form of the house, the building as an analogy. Building concepts: energy loss, insulation, passive solar gain, active solar gain, health benefits, and sustainable materials. Small scale wind and hydro power systems. Case study of eco house.

UNIT V - SUSTAINABLE AND GREEN BUILDING DESIGN STUDIO

This studio will explore collaborative learning to explore, investigate and apply various parameters of sustainability for design development of projected building/ urban scenarios.

Course Outcomes

- An understanding on sustainability.
- Knowledge on renewable energy conservation through material usage.
- A thorough understanding on designing green buildings.

REFERENCES

1. Ken Yeang: Eco Design- A manual for Ecological design; Wiley Academy, 2006.
2. Sue Roaf et all: Ecohouse, A design guide; Elsevier Architectural Press, 2007.
3. Thomas E Glavinich: Green Building Construction; Wiley, 2008.
4. Brenda and Robert Vale: Green Architecture, Design for a Sustainable Future; Thames and Hudson, 1996.

(A30163) AIR POLLUTION AND CONTROL
(Open Elective-II: Offered by CE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT – I

Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.

UNIT – II

Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths.

UNIT – III

Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3). Development of air quality models-Gaussian dispersion model-Including Numerical problems.

UNIT – IV

Control Techniques: Particulate matter and gaseous pollutants-settling chambers, cyclone separators, scrubbers, filters & ESP - Including Numerical problems. Site selection for industrial plant location.

UNIT – V

Air pollution due to automobiles, standards and control methods. Noise pollution- causes, effects and control, noise standards. Environmental issues, global episodes. Environmental laws and acts.

Course outcomes: After studying this course, students will be able to:

1. Identify the major sources of air pollution and understand their effects on health and environment.
2. Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models.
3. Ascertain and evaluate sampling techniques for atmospheric and stack pollutants.
4. Choose and design control techniques for particulate and gaseous emissions.

Textbooks:

1. M. N. Rao and H V N Rao, “Air pollution”, Tata Mc-G raw Hill Publication.
2. H. C. Perkins, “Air pollution”. Tata McGraw Hill Publication.
3. Mackenzie Davis and David Cornwell, “Introduction t o Environmental Engineering” McGraw-Hill Co.

Reference Books:

1. Noel De Nevers, “Air Pollution Control Engineering”, Waveland Pr Inc.
2.Anjaneyulu Y, “Text book of Air Pollution and Control Technologies”, Allied Publishers.

(A30555) INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

(Open Elective-II: Offered by CSE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMS, The Three-Level ANSI-SPARC Architecture,

Database Languages, Data Models, Functions of a DBMS, Components of DBMS. Relational Model: Introduction, Terminology, Integrity Constraints, Views. The Relational Algebra: Unary Operations, Set Operations, Join Operations, Division Operation, Aggregation and Grouping Operations.

UNIT–II

SQL: The ISO SQL Data Types, Integrity Enhancement Feature–Domain Constraints, Entity Integrity, Referential Integrity, General Constraints, Data Definition–Creating a Database, creating a Table, Changing a Table Definition, removing a Table, Creating an Index, Removing an Index, Views–Creating a View, Removing a View, View Resolution, Restrictions on Views, View Updatability 'WITH CHECK OPTION', Advantages and Disadvantages of Views, View Materialization.

UNIT–III

SQL: Introduction, Data Manipulation–Simple Queries, Sorting Results, Using the SQL Aggregate Functions, Grouping Results, Sub-queries, ANY and ALL, Multi-table Queries, EXISTS and NOT EXIST, Combining Result Tables, Database Updates.

UNIT-IV

Advanced SQL: The SQL Programming Language–Declarations, Assignments, Control Statements, Exceptions, Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers, Recursion.

UNIT–V

Normalization: The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Update Anomalies, Functional Dependencies in brief, The Process of Normalization,1NF, 2NF, 3NF, BCNF.

Text Books:

1.Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill Education, 2003

2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill Education

Reference Books:

1.Thomas M. Connolly, Carolyn E. Begg, Database Systems–A Practical Approach to Design, Implementation, and Management (6e), Pearson publisher

2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson publisher

Course Outcomes

Students shall be able to

1.Describe Database Management System Architecture.

2.Create, update, modify Relational Database Objects.

3.Manipulate data in Relational Database

4.Develop PL/SQL programs using Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers.

5.Explain the purpose of normalization and types Normal forms.

(A30537) DATA ANALYTICS WITH R
(OPEN ELECTIVE-II Offered by CSE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT -I

Introduction, how to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes. R Programming Structures, Control Statements, Loops, - Looping Over Non-Vector Sets, - If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion

UNIT –II

Introduction of Data Science, Basic Data Analytics using R, R Graphical User Interfaces Data Import and Export, Attribute and Data Types, Descriptive Statistics, Exploratory Data Analysis, Visualization Before Analysis, Dirty Data, visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation

UNIT –III

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains

UNIT –IV

Discover R‘s packages to do graphics and create own data visualizations. Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function ,Customizing Graphs, Saving Graphs to Files. Probability Distributions, Normal Distribution-

Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests, ANOVA Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests,

UNIT –V

Overview of Clustering, K-means, Use Cases, Overview of the Method, Perform K-means Analysis using R. Classification, Decision Trees, Overview of a Decision Tree, Decision Tree Algorithms, Evaluating a Decision Tree. Decision Tree in R, Bayes 'Theorem, Naïve Bayes Classifier, Smoothing, Naïve Bayes in R

Text Books:

1. The Art of R Programming, Norman Matloff, Cengage Learning
2. David Dietrich, Barry Heller and Beibei Yang, ―Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data‖, EMC Education Services,

Reference Books:

1. R in Action, Rob Kabacoff, Manning Nathan Marz, James Warren, ―Big Data-Principles and best practices of scalable real-time data systems‖, Edition 2015, DreamTech Press,

Course Outcomes

The student shall be able

1. Write simple applications using R programming language constructs.
2. Explore data and analyze it using R.
3. Implement classification, clustering and feature selection methods with R.
4. Understand Regression Generalized Linear Models.
5. Perform K-means Analysis using R.

(A30473) IMAGE PROCESSING
(Open Elective-II offered by ECE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit- I: Digital Image Fundamentals

Digital Image fundamentals, Components of Digital Image Processing, Sampling andQuantization, Relationship between pixels.

Image Transforms: 2-D FFT, Properties, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform.

Unit-II: Image Enhancement (Spatial Domain)

Introduction, Image Enhancement in Spatial domain, Enhancement through point operation, Types of point operation, Histogram manipulation, Linear and nonlinear gray level Transformation, Local or neighborhood operation, Median filter, image Smoothing & Sharpening

Image Enhancement (Frequency Domain)

Filtering in Frequency domain, obtaining frequency domain filters from spatial filters, Generating filters directly in the frequency domain, image Smoothing&Sharpening.

Unit- III: Image Restoration

Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration.

Unit- IV: Image Segmentation

Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.

Morphological Image Processing: Dilation and Erosion, Structuring Element Decomposition, Opening and Closing, the Hit or Miss Transformation.

Unit- V: Image Compression

Redundancies and their removal methods, Fidelity criteria, Image compression models, Huffman and Arithmetic Coding, Error free compression, Lossy compression, Lossy and Lossless Predictive Coding, Transform based Compression, JPEG 2000 Standards.

Text Books:

1. Digital Image Processing – Rafael C. Gonzalez, Rechard E. Woods, 3rd edition. Pearson, 2008
2. Digital Image Processing – S. Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010

Reference Books:

1. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
2. Fundamentals of Digital Image Processing – A. K. Jain, PHI, 1989.
3. Digital Image processing and Computer vision – Somka, Hlavac, Boyle Cengage learning (Indian edition) 2008.
4. Introductory Computer vision Imaging Techniques and Solutions – Adrian low, 2008, 2nd Edition.
5. Introduction to Image Processing & Analysis – John C. Russ, J. Christian Russ, CRC press, 2010.

Course outcomes

At the end of the course the student will be able to:

1. Describe the fundamentals of digital image processing.
2. Distinguish between spatial domain enhancement and frequency domain enhancement.
3. Analyze the image restoration and segmentation methods.
4. Discriminate between lossless and lossy compression techniques.

(A30474) DIGITAL ELECTRONICS
(Open Elective-II offered by ECE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT I:

NUMBER SYSTEM AND BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS

Number Systems, Base Conversion Methods, Complements of numbers, Codes – binary codes, Binary Coded Decimal code and its properties, unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.

Boolean Algebra: Basic theorems and properties - Switching Functions, Canonical and Standard forms-Algebraic simplification Digital Logic Gates, Properties of XOR gates &Universal gates-Multilevel NAND/NOR realizations.

UNIT-II:

MINIMIZATION AND DESIGN OF COMBINATIONAL CIRCUITS:

Introduction, The Minimization with Theorem, The Karnaugh Map Method, Five and Six Variable Maps , Prime and Essential Implicants, Don't Care Map Entries, minimization using tabular method, Partially Specified Expressions Multi Output minimization and combinational design, ArithmeticCircuits, Comparator, Multiplexer, Code-converters.

UNIT-III:

SEQUENTIAL MACHINES FUNDAMENTALS

Introduction, Basic Architectural Distinctions between combinational and sequential circuits. The Binary Cell, Fundamentals of Sequential Machine Operations, The Flip-flop, D-Latch &Flip-flop, the clocked T-flip-flop, the clocked J-K flip-flop, Design of a clocked flip-flop. Conversion from one type of Flip-Flop to another, Timing and Triggering Consideration.

UNIT-IV:

SEQUENTIAL CIRCUIT DESIGN AND ANALYSIS

Introduction, State Diagram, Analysis of synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization using Flip-Flops.

Counters –Design of single mode counter, Ripple counter, Ring counter, Shift register, Shift register sequences, Ring counter using Shift register.

UNIT-V:

FSM Charts: Finitestate machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

TEXT BOOKS:

1. Switching& Finite Automata theory – ZviKohavi, &Niraj K. Jha, 3rd Edition, Cambridge.

2. Digital Design -Morris Mano, PHI, 3rd Edition, 2006.

REFERENCE BOOKS:

1 Introduction to switching design and logic design _ Fredriac J. Hill, Gerald R. Peterson, 3rd ED, John Wiley & Sons Inc

2. Digital fundamentals – A Systems approach-Thomas L. Floyd, Pearson, 2013.

3. Digital logic design- Ye Brian and Holds Worth, Elsevier.

4. Fundamentals of Logic Design - Charles H. Roth, Thomson Publications, 5th Edition, 2004.

5. Digital Logic Applications and Design - John M. Yarbrough, Thomson Publications, 2006.

6. Digital Logic and state machine design – Comer, 3rd, oxford, 2013.

Course Outcomes

At the end of the course the student will be able to:

1. Understand the various number systems and conversions.
2. Solve the Boolean expressions using Boolean laws and minimization techniques.
3. Design and analyze the combinational circuits.
4. Design and analyze the sequential circuits.

(A30260) ELECTRICAL SAFETY
(Open Elective-II: Offered by EEE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT I: CONCEPTS AND STATUTORY REQUIREMENTS

Introduction – electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety – first aid-cardio pulmonary resuscitation (CPR).

UNIT II : ELECTRICAL HAZARDS

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications-excess energy current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

UNIT III: PROTECTION SYSTEMS

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit protection-no load protection-earth fault protection. FRLS insulation-insulation and continuity test-system grounding-equipment grounding-earth leakage circuit breaker (ELCB)-

cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards-Personal protective equipment – safety in handling hand held electrical appliances tools and medical equipments.

UNIT IV SELECTION, INSTALLATION, OPERATION AND MAINTENANCE

Role of environment in selection-safety aspects in application - protection and interlock-self diagnostic features and fail-safe concepts-lock out and work permit system-discharge rod and earthing devices safety in the use of portable tools-cabling and cable joints-preventive maintenance.

UNIT V HAZARDOUS ZONES

Classification of hazardous zones-intrinsically safe and explosion proof electrical apparatus-increase safe equipment-their selection for different zones-temperature classification-grouping of gases-use of barriers and isolators-equipment certifying agencies.

REFERENCES

1.” Accident prevention manual for industrial operations”, N.S.C., Chicago, 1982.
2. Indian Electricity Act and Rules, Government of India.
3. Power Engineers – Handbook of TNEB, Chennai, 1989.
4. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt. Ltd., England
1988.
5. Fordham Cooper, W., “Electrical Safety Engineering” Butterworth and Company, London, 1986.

(A30259) ELECTRICAL & HYBRID VEHICLES
(Open Elective-II: Offered by EEE Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT I: INTRODUCTION TO HEV

Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains

UNIT II: ENERGY STORAGE FOR EV AND HEV

Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super Capacitors

UNIT III: ELECTRIC PROPULSION

EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives.

UNIT IV: DESIGN OF ELECTRIC AND HYBRID ELECTRIC VEHICLES

Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design

UNIT V: POWER ELECTRONIC CONVERTER FOR BATTERY CHARGING

Charging methods for battery, Termination methods, charging from grid, The Z-converter, Isolated bidirectional DC-DC converter, Design of Z converter for battery charging, High-frequency transformer based isolated charger topology, Transformer less topology

Text books:

1. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

Reference Books:

1. Sheldon S. Williamson, Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer, 2013.
2. C.C. Chan and K.T. Chau, Modern Electric Vehicle Technology, OXFORD University Press, 2001.
3. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles Principles and Applications With Practical Perspectives, Wiley Publication, 2011.

List of Open Source Software/learning website:

- E-materials available at the website of NPTEL- http://nptel.ac.in/ MATLAB (Trial version): Software is useful for simulation and analysis of electrical systems

Course Outcomes:

After learning the course the students should be able to:

1. Demonstrate the working of Electric Vehicles and recent trends
2. Analyze different power converter topology used for electric vehicle application
3. Develop the electric propulsion unit and its control for application of electric vehicles

(C30163) MANAGEMENT OF INDUSTRIAL RELATIONS
(Open Elective-II Offered by MBA Department)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

Unit I:

Industrial Relations: Introduction, concepts, importance of Industrial relations, scope and aspects of industrial relations, the management, the government factors affecting industrial relations, evolution of industrial relations policy, the industrial policy resolution 1991.

Unit II:

Anatomy of Industrial disputes and resolutions-I: industrial disputes , classification, causes, tripotisim, bipotism Tripartite and Bipartite Bodies, Standing orders and Grievance Procedure.

Unit III:

Anatomy of Industrial disputes and resolutions-II: Collective Bargaining, Conciliation, Arbitration, Adjudication, The Industrial Dispute Act 1947, Labour Welfare work, Labour Welfare officer, Worker’s Participation.

Unit IV:

Industrial relations legislation-I: Wage Policy and Wage Regulation Machinery, Wage Legislation, Payment of Wages Act 1936, The Payment of Bonus Act,1965, Minimum wages Act-1948.

Unit V:

Industrial relations legislation-II: The Factories Act 1948, Mines Act 1952, Industrial Relations and Technological Change.

<u>Journals</u> : Indian Journal of Industrial Relation; NHRD Journal of Career Management ; Management and Labour Studies; Personnel today; Leadership excellence; Indian Journal of Training & Development.

References:

- Mamoria, Mamoria, Gankar "Dynamics of Industrial Relations" Himalaya Publishing House.2012.
- Dr K S Anandram "Cases in Personnel Management Industrial Relations and Trade Relations" Everest, 2012.
- Arun Monappa,Ranjeet Nambudiri,Selvaraj " Industrial Relations and Labour Laws" , TMH,2012
- A.M.Sharma "Industrial Relations and Labour Laws", Himalaya Publishing House,2013.
- Ratna Sen "Industrial Relations-Text and cases "Macmillan Publishers,2011.
- Kubendran.V,Kodeeswari.K "Industrial Relations and Labour Laws "Himalaya Publishing House,2011.
- Punekar S.D,Deodhar S.B, Saras wathi Sankaren"Labour Welfare,Trade Unionism and Industrial Relations, "Himalaya Publishing House,2012.
- B.D.Singh "Industrial Relations"Excel Books 2008.
- S C Srivastava "Industrial Relations and Labor Laws" Vikas, 2012.
- Padhi " Labour and Industrial Relations" PHI, 2012.
- Venkata Ratnam "Industrial Relations" Oxford, 2012.

COURSE OUTCOMES

On completion of the course students will be able to:

1. Access the concept and Scope of Industrial Relations and its resolution.
2. Outline the knowledge towards Trade unions, Industrial disputes and Grievance Procedure.

3. Identify various Laws on Wages, Welfare and Social Security.
4. Illustrate rules and regulations of working conditions.
5. Enlighten on quality standards in industry.

(C30164) ENTREPRENEURSHIP
(Open Elective-II Offered by MBA)

B. Tech. (ME) VII - Semester

L	T	P	C
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Unit I:

Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- The evolution of entrepreneurship- Approaches to entrepreneurship- Process approach- Twenty first centaury trends in entrepreneurship.

Unit II:

The individual entrepreneurial mind-set and Personality- The entrepreneurial journey- Stress and the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations. Corporate Entrepreneurial Mindset- the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy- sustaining corporate entrepreneurship.

Unit III:

Launching Entrepreneurial Ventures- opportunities identification- entrepreneurial Imagination and Creativity- the nature of the creativity process-Innovation and entrepreneurship. Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising-hybrid- disadvantage of Franchising.

Unit IV:

Legal challenges of Entrepreneurship-Intellectual property protection-Patents, Copyrights-Trade marks and Trade secrets- Avoiding trademark pitfalls. Formulation of the entrepreneurial Plan- The challenges of new venture start-ups, Poor financial

Understanding-Critical factors for new venture development-The Evaluation process-Feasibility criteria approach.

Unit V:

Strategic perspectives in entrepreneurship- Strategic planning-Strategic actions- strategic positioning-Business stabilization- Building the adaptive firms-Understanding the growth stage-Unique managerial concern of growing ventures.

Journal:

- **The Journal of Entrepreneurship,** Entrepreneurship Development Institute of India, Ahmedabad
- **Journal of Human Values**: IIM Calcutta.

References:

1. D F Kuratko and T V Rao "Entrepreneurship- A South-Asian Perspective "Cengage Learning, 2012. **(For PPT, Case Solutions Faculty may visit : login.cengage.com)**
2. Vasant Desai "Small Scale industries and entrepreneurship" Himalaya publishing 2012.
3. Rajeev Roy "Entrepreneurship" 2e, Oxford, 2012.
4. B.Janakiram and M.Rizwana" Entrepreneurship Development :Text & Cases, Excel Books,2011.
5. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
6. Robert Hisrich et al "Entrepreneurship" 6th e, TMH, 2012.
7. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013
8. Shejwalkar, Entrepreneurship Development, Everest, 2011
9. Khanka, Entrepreneurship Development, S.Chand, 2012

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Identify the Qualities, requirements, Risk & Ethical issues to become an Entrepreneur.
2. Analyze and develop the conceptualization of corporate Entrepreneurship.
3. Explore different possibilities to start an Enterprise for young Entrepreneurs.
4. Outline challenging benchmarks for formulation of Entrepreneurship.
5. Evaluate the application of Strategic action for growing ventures.

(A30397) Project Phase-I
(Professional Elective-V)

B. Tech. (ME) VII - Semester

L	T	P	C
0	**0**	**6**	**3**

Each student shall start the Project Work during the VII Semester as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of the Department.

a) The Project Work shall be divided and carried out in 2 phases : Phase – I (Project-I) during VII Semester, and Phase – II (Project-II) during VIII Semester, and the student has to prepare two independent Project Work Reports – one each during each phase. First Report shall include the Project Work carried out under Phase – I, and the Second Report (Final Report) shall include the Project Work carried out under Phase – I and Phase – II put together. Phase – I and Phase – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each Phase of the Project Work, 40 marks shall be for the Continuous Internal Evaluation(CIE), and 60 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both Phases of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance during the two Project Work Phases/periods); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee/ Board (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Phase - I, the Viva-voce shall be conducted at the end of the VII Semester, before the commencement of the semester End Examinations, at the Department Level by a Committee comprising of the HoD or One Professor and Supervisor (no external examiner), and the Project Phase – II Viva-voce (or Final Project Viva-voce) shall be conducted by a Committee comprising of an External Examiner, the Head of the Department and the Project Supervisor at the end of the VIII Semester, before the commencement of the semester End Examinations. The External Examiner shall be nominated by the CoE from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

d) If a student does not appear for any of the two Viva-Voce examinations at the scheduled times as specified above, he may be permitted to reappear for Project Phase-I and/or Project Phase-II Viva-voce examinations, as and when they are scheduled in that semester; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester(s), as and when they are scheduled, as supplementary candidate. For the registration of Project Phase-II the student must have passed Project Phase-I.

(A30392) Mini Project-II

B. Tech. (ME) VII-Semester

L	T	P	C
0	0	0	0

Mini-Project-II to be taken up in the college or industry during the summer vacation after VI Semester examination. The Mini-Project-II shall be evaluated during the VII Semester. The Mini-Project-II shall be submitted in a report form and should be presented before a committee, which shall be evaluated for Satisfactory or Non-satisfactory. The committee consists of Head of the Department, the supervisor of mini project, a senior faculty member of the department

(A30394) Internship-II

B. Tech. (ME) VII-Semester

L	T	P	C
0	0	0	0

(A30356) Quality Engineering & Management
(Professional Elective-VI)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction Quality Management : Quality Management- A conceptual frame work, Strategic Quality Management, benchmarking

Quality Standards and business excellence models: Quality system Standards, Bureau of Indian Standards, Agmark Grading and standardization, Quality council of India, International Organization for Standardization, Conformance to Specifications, Quality Assurance, Quality Circles, Quality audits, ISO 14000, Customer Operations Performance Centre (COPC) 2000

UNIT-II

Total Quality Management (TQM): W. Edwards Deming's Contribution to TQM, Juran's Contribution to TQM, Crosby's contribution to TQM, Ishikawa's contribution to TQM, Comparing the Quality Gurus, Total Productive Maintenance (TPM).

Service quality management and Cost of Quality: Measuring Service Quality, Prevention costs, Appraisal Costs, Internal and External failure costs, Cost of quality models, India's Quality Journey so far, Quality management in India, Quality related priorities of Indian companies, Case studies

UNIT-III

Six sigma and Experimental design: Meaning of Six sigma, The seven magnificent Quality tools, Introduction of experimental design, Taguchi Method in Experimental Design, Concept, Application of QFD, Case Study

UNIT-IV

Statistical Quality Control: Quality control-its introduction and benefits, Variation in processes: factors, process capability & Its analysis, control charts for variables and attributes, Establishing & interpreting control charts, Concept of Acceptance Sampling, sampling by attributes, single and double sampling plans, inspections by samples, AQL, LTPD, consumers and producer's risk, construction and use of operating characteristic curves, use of standard sampling tables and related IS, sampling by variables, Continuous sampling plan, vendor ratings.

UNIT-V

Intellectual Properties System: Definition of intellectual property, importance of IPR; TRIPS and its implications, patent, copyright, industrial design and trademark

Text Books:

1. Amitava Mitra , Fundamentals of Quality Control and Improvement, Wiley, Third edition,2013,ISBN-10: 8126544090
2. Eugene Grant and Richard Leavenworth, Statistical Quality Control , Mcgraw Hill Education, 7 Edition, 2017,ISBN-10: 0070435553

Reference Books:

1. Ramesh Lakhe , Mukesh Singhal , Rakesh Shrivastava , Balkrishna Narkhede , Kranti Dharkar ,ISO 9001:2015

Quality Management System: Requirements, Interpretation and Implementation (Rrl/11) , Kindle Edition (Sold By: Amazon Asia-Pacific Holdings Private Limited)ASIN: B07FBZK6VJ

2. Kanishka Bedi Quality Management , Oxford University Press,2006,ISBN-10: 9780195677959
3. B L Wadehra, Law Relating to Intellectual Property,Lexis Nexis, 2017,ISBN: 9789350350300
4. Kai Yang and Basem Ei-Haik ,Design for Six Sigma, McGraw-Hill Education, 2nd edition, 2008,ISBN-10: 0071547673
5. 5. D.R. Kiran ,Total Quality Management: Key Concepts and Case Studies Butterworth- Heinemann , 2016,ISBN-10: 012811035X

E-RESOURCES:

1. https://nptel.ac.in/courses/112/106/112106249/

(A30366) Tool Design
(Professional Elective-VI)

B. Tech. (ME) VII - Semester

L	T	P	C
3	**0**	**0**	**3**

UNIT – I

Cutting tool materials and single point cutting tools: Cutting tool materials, desired properties. Types, Major Constituent, relative characteristics, latest development: ISO; classification and coding of carbides. Geometry of single point cutting tool. Influence of each geometrical parameters on the cutting tool performance. Factors involved in their selection. Tool signature and geometry in MRS, ORS, NRS. Cutting forces and design features of HSS and carbide tipped tools. Feature of high production cutting tools. Chip breakers and their types.

UNIT – II

Form tools and multi point cutting tools:

Form tools: Radial and tangential: flat and circular. Form correction and tool holding methods.

Drills Geometry: Variation of rake and clearance angles along tips, effect of geometrical parameters on thrust and torque effect of feed rate on rake and clearance, web thinning. Types of drill points, Grinding of drills.

Milling Cutters: Major types, geometry of peripheral, end and face milling cutters. Profile sharpened and form relieved expression for minimum number of teeth. Design features, forces and power estimation, Grinding of milling cutters.

Reamers: Types, geometry, Reaming allowance, design features tolerance disposition.

Broachers: Pull and push types. Internal and External broaches, geometry and design features. Pull force estimation. Keyway, spline, round, square broaches.

UNIT – III

Press tools for sheet metal working: Blanking and piercing. Diet set elements. Simple and progressive dies. Estimation of punch load, clearances, centre of pressure, strip layout, methods of reducing punch load.

Bending dies: Spring back and bending allowance estimation of punch load.

Drawing Dies: Punch load, blank size, number of draws, methods of retaining metal in draw
dies. Metal flow during drawing.

Metal spinning: Configuration and design features of metal spinning, shear forming and low forming.

UNTT – IV

Jigs & Fixtures: Design principles and construction features. Locating methods associated with flat, cylindrical internal and external surface. Types of locating pins. Requirements and choice of locating systems. Redundant location, fool proofing. Setting blocks, types of clamping devices and their basic elements. Quick action clamps and nuts. Equalizing and multiple clamping pneumatics. Hydraulic, magnetic and vacuum clamping. Types of drill jig and their classification. Types of jig bushes, jig feet. Indexing jigs. Economic analysis of Jigs and Fixtures. Economic tool life for minimum cost maximum production and max profit rate.

UNIT – V

Miscellaneous tools: Cam design for single spindle automatics for simple components. Tool layout estimation of cycle time. Gauge design: Taylor's principle, limit gauges for holes andshafts. Estimation of limits on Go and No Go gauges. Forgoing dies: Draft, parting line,filters. Allowances, sequence in multiple impression forging. Flashing, Trimming.

Plastic Tools: Application of plastic as a tooling material viz., for Gauges, Surface plates,
jigs and fixtures. Forming dies.

TEXT BOOKS:

1. Surendra kenav and Umesh Chandra, "Production Engineering Design (Tool Design)", Satyaprakashan, New Delhi, 1994.
2. Donaldson, Leain and Goold, "Tool Design", Tata McGraw Hill, New Delhi, 1983.

Course Objectives:

1. Understand ASA and ORS systems of tool geometry.
2. Design a single point or multi point cutting tool to machine a required job.
3. Design a die and punch for blanking, piercing, drawing and bending operations.
4. Discriminate the knowledge of Jigs and Fixtures design
5. Apply the concepts and design a GO and NO GO gauge.

(A30376) Cryogenic Engineering
(Professional Elective-VI)

B. Tech. (ME) VII - Semester

L	T	P	C
3	0	0	3

UNIT - I:

Introduction to Cryogenic Systems: Mechanical Properties at low temperatures. Properties of Cryogenic Fluids. Gas Liquefaction: Minimum work for liquefaction. Methods to protect low temperature. Liquefaction systems for gages other than Neon. Hydrogen and Helium.

UNIT - II:

Liquefaction Systems for Neon, Hydrogen and Helium: Components of Liquefaction systems. Heat exchangers. Compressors and expanders. Expansion valve, Losses in real machines.

UNIT- III:

Gas Separation and Purification Systems: Properties of mixtures, Principles of mixtures, Principles of gas separation, Air separation systems.

UNIT-IV:

Cryogenic Refrigeration Systems: Working Medium, Solids, Liquids, Gases, Cryogenic fluid storage & transfer, Cryogenic storage systems, Insulation, Fluid transfer mechanisms, Cryostat, Cryo Coolers

UNIT-V:

Applications: Space technology, In-Flight air separation and collection of LOX, Gas industry, Biology, Medicine, Electronics.

TEXT BOOKS:

1. Cryogenic Systems/ R.F. Barren/ Oxford University Press
2. Cryogenic Engineering- Thomas Flynn- CRC Press-2nd Edition
3. Cryogenic Research and Applications: Marshal Sitting/ Von Nostrand/ Inc. New Jersey

REFERENCE BOOKS:

1. Cryogenic Heat Transfer/ R.F.Baron
2. Cryogenic Engineering Edit / B.A. Hands/ Academic Press, 1986
3. Cryogenic Engineering/ R.B. Scottm Vin Nostrand/ Inc. New Jersey, 1959
4. Experimental Techniques in Low Temperature Physics- O.K. White, Oxford Press, 1968
5. Cryogenic Process Engineering/ K. D. Timmerhaus & TM Flynn/ Plenum Press, 1998
6. Hand Book of Cryogenic Engineering – J.G. Weisend – II, Taylor and Francis, 1998

E-RESOURCES:

1. https://nptel.ac.in/courses/112/101/112101004/

(A30164) BASICS OF CIVIL ENGINEERING
(Open Elective-III: Offered by CE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT – I

General introduction to Civil Engineering - Introduction to types of buildings, Components of a residential building, Introduction to industrial buildings; Introduction to planning of residential buildings - Simple building plans;

UNIT – II

Introduction to the various building area terms; Setting out of a building; Surveying – Principles, Objectives, Horizontal measurements with tapes, Ranging;

UNIT – III

Levelling – Instruments, Reduction of levels; Modern surveying instruments; Building materials – Bricks, cement blocks, Cement, Cement mortar, Steel;

UNIT – IV

Building construction – Foundations, Brick masonry, Roofs, Floors, Decorative finishes, Plastering, Paints and Painting;

UNIT – V

Basic infrastructure and services – Elevators, Escalators, Ramps, Air conditioning, Sound proofing, Towers, Chimneys, Water Tanks; Intelligent buildings.

Course Outcomes

1. The students will be able to illustrate the fundamental aspects of Civil Engineering.
2. The students will be able to plan and set out a building.

3. Students will be able to explain the concepts of surveying for making horizontal and vertical measurements.
4. They will able to illustrate the uses of various building materials and explain the method of construction of different components of a building.
5. Students will be able to discuss about various services in a building.

References Books:

1. Chudley, R., Construction Technology, Vol. I to IV, Longman Group, England
2. Chudley, R. and Greeno, R., Building Construction Handbook, Addison Wesley, Longman Group, England
3. Gopi, S., Basic Civil Engineering, Pearson Publishers
4. Kandya, A. A., Elements of Civil Engineering, Charotar Publishing house
5. Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers.

(A30165) SUSTAINABILITY CONCEPTS IN CIVIL ENGINEERING
(Open Elective-III: Offered by CE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

Course Objectives: This course will enable students to

- Learn about the principles, indicators and general concept of sustainability.
- Apprehend the local, regional and global impacts of unsustainable designs, products and processes.
- Student shall be able to apply the sustainability concepts in engineering
- Know built environment frame work sand their use
- Understand how building and design is judged and valued by clients and stakeholders and how to implement sustainability.

UNIT – I

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act.

UNIT – II

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print Carbon sequestration – Carbon capture and storage (CCS).

Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking.

UNIT – III

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

UNIT – IV

Clean Technology and Energy: Energy sources: Basic concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting.

UNIT – V

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.

Course Outcomes: After studying this course, students will be able to:

1. Learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development.
2. Quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits.
3. Understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.

4. Make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society.

Textbooks:

1. Allen, D.T. and S honnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo, A. O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

Reference Books:

1. Mackenthun, K. M.,Basic Concepts in Environmental Management, Lewis Publication.
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency PublicationsRating System, TERI Publications - GRIHA Rating System.
3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
5. Malcolm Dowden, Climate Change and Sustainable Development: Law, Policy and Practice.
6. Daniel A. Vallero and Chris Brasier, “Sustainable Design: The Science of Sustainability and Green Engineering”, Wiley-Blackwell.
7. Sustainable Engineering Practice: An Introduction, Committee on Sustainability, American Society of Civil Engineers.

(A30530) ARTIFICIAL INTELLIGENCE
(Open Elective-III: offered by CSE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT -I

Problem Solving by Search-I:
Introduction to AI, Intelligent Agents
Problem Solving by Search –II:
Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment .

UNIT –II

Problem Solving by Search-II and Propositional Logic
Adversarial Search:
Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.
Constraint Satisfaction Problems:
Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.
Propositional Logic:
Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic

UNIT –III

Logic and Knowledge Representation

First-Order Logic:
Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.
Inference in First-Order Logic:
Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.
Knowledge Representation:
Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

UNIT –IVPlanning Classical Planning:

Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.
Planning and Acting in the Real World:
Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT –V

Uncertain knowledge and Learning

Uncertainty:
Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use
Probabilistic Reasoning:
Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient

Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and
First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Learning:

Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming

Text Books:

1. Artificial Intelligence A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson Education

Reference Books:

1. Artificial Intelligence, E.Rich and K.Knight, , 3rd Edition, TMH
2. Artificial Intelligence, Patrick Henny Winston, 3rd Edition, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

Course Outcomes

Students shall be able to

1.Formulate an efficient problem space for a problem expressed in natural language.

2.Select a search algorithm for a problem and estimate its time and space complexities.

3. Represent knowledge using the appropriate technique for a given problem.

4. Apply AI techniques to solve problems of game playing, and machine learning.

5. Explain various forms of learning techniques.

(A30539) ETHICAL HACKING
(Open Elective-III: offered by CSE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Ethical Hacking, Fundamentals of Computer Networking, TCP/IP protocol stack, IP addressing and routing, TCP and UDP, IP Subnets, Routing protocols, IP Version 6. IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch file Programming.

UNIT–II

Hacking windows, Network hacking, Web hacking- Password hacking. A study on various attacks – Input validation attacks, Buffer overflow attacks, Privacy attacks, Vulnerability assessment: OpenVAS, Nessus, etc. Social Engineering attacks, Malware threats, penetration testing by creating backdoors.

UNIT–III

Introduction to cryptography, private-key encryption, public-key encryption, cryptographic hash functions, digital signature and certificate, applications. Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process

UNIT-IV

Steganography, biometric authentication, network-based attacks, DNS and Email security, Sniffing: Wireshark, ARP Poisoning, DNS Poisoning, Hacking Wireless networks, Denial of Service attacks, Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS, HIDS – Penetrating testing process.

UNIT–V

Elements of Hardware security: Side-Channel attacks, Physical inclinable functions, hardware Trojans, Hacking web applications: vulnerability assessment, SQL Injection, Cross-Site Scripting Penetration Testing Steps, Pen - Test Legal Framework, Automated Penetration Testing Tools, Pen -Test Deliverables

Text Books:

1.Kenneth C.Brancik ―Insider Computer Fraud‖ Auerbach Publications Taylor &
Francis Group–2008.
2.Ankit Fadia ―Ethical Hacking‖ second edition Macmillan India Ltd, 2006
3.Data and Computer Communications -- W. Stallings.

Reference Books:

1.Hacking Exposed Web 2.0, by Rich Annings, Himanshu Dwivedi, Zane Lackey, Tata Mc Graw hill Edition
2.Ethical Hacking & Network Defense, Michael T. Simpson edition
3.Hacking Exposed Windows, Joel Scambray, cissp, Stuart Mcclure, Cissp, Third Edition, Tata McGraw hill edition
4.Hacking Exposed Window server 2003, Joel Scambray Stuart Mcclure, Tata Mc Graw hill Edition

Course Outcomes

Students shall be able to
1.Describe various types DoS attacks.
2.Explain Network, Web, Password Hacking
3.Describe cryptography techniques.
4.Explain Email-security, Sniffing, SQL injection
5.Perform Penetration Test.

(A30475) DATA COMMUNICATIONS
(Open Elective-III: offered by ECE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

Unit I: Introduction to data communications, networking, signals, noise, modulation and demodulation. Data communication network architecture, layered network architecture, open systems interconnection, data communications circuits, serial and parallel data transmission, data communications circuit arrangements, data communication networks, alternate protocol suites. Information capacity, bits, bit rate, baud, and M-ARY encoding.

Unit II: Metallic cable transmission media & optical fiber transmission media: metallic transmission lines, transverse electromagnetic waves, characteristics of electromagnetic waves, transmission line classifications, metallic transmission line types, metallic transmission line equivalent circuit, wave propagation on metallic transmission lines, metallic transmission line losses, block diagram of an optical fiber communications system, optical fiber versus metallic cable facilities.

Unit III: Digital transmission & multiplexing and t-carriers digital transmission: pulse modulation, pulse code modulation, dynamic range, signal–to-quantization noise voltage Ratio, linear versus nonlinear PCM codes

Multiplexing: Time- division multiplexing, t1 digital carrier system, north American digital multiplexing hierarchy, digital line encoding, t carrier systems, European digital carrier system, statistical time – division multiplexing, frame synchronization, frequency- division multiplexing, wavelength- division multiplexing, synchronous optical network

Unit IV: Telephone instruments and signals: The subscriber loop, standard telephone set, basic telephone call procedures, call progress tones and signals, cordless telephones, caller id, electronic telephones, paging systems.

The telephone circuit: The local subscriber loop, telephone message- channel noise and noise weighting, units of powers measurement, transmission parameters and private-line circuits, voice-frequency circuit arrangements, crosstalk.

Unit V:

Data communication codes, bar codes, error control, error detection, error correction, data formats, data communications hardware, character synchronization.

Text Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.

Reference Books:

1. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.Tmh.
2. Computer Communications and Networking Technologies, Gallow, Secondedition Thomson
3. Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education

Course Outcomes:

At the end of the course, the student will be able to:

1. Attain the knowledge on basic concepts of data communication systems.
2. Explain the elements of data communications systems, different types of transmission medias and different digital modulation techniques
3. Attain the knowledge on different telephone instruments, signal and circuits
4. Describe different error detecting and correcting codes.

(A30476) MICROCONTROLLERS & APPLICATIONS

(Open Elective-III: offered by ECE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Microprocessors and Microcontrollers: Introduction to Microprocessor and Micro Controller, Number system and Binary arithmetic. Microprocessor Architecture (8085 and 8086) and Microcomputer System, memory map and addressing, memory classification, review of logic device for Interfacing, Memory Interfacing, Overview of 8086 Instruction Set, stacks and Interrupts.

UNIT-II

The 8051 Architecture: 8051 Microcontroller hardware, Program Counter and Data Pointer, A and B CPU registers, Flags and Program Status Word (PSW),Internal Memory : Internal RAM – Stack and Stack Pointer, Special Function Registers, Internal ROM, Input / Output Pins, ports and Circuits, External Memory, Timers and Counters, Serial data Input/ Output, interrupts.

UNIT-III

8051 Instruction set: Assembly Language Programming Process, Addressing Modes, Assembler Directives, Data Transfer, Arithmetic, Logical and Branch Instructions, Decimal Arithmetic, Interrupt Programming, Serial Data Communication.

8051 Programming: Basic Assembly Language Programming, Input/ Output Port Programming, 8051 Timer / Counter Programming, 8051 Serial Communication Programming, 8051 Interrupt Programming.

UNIT-IV

8051 Applications: Introduction, Interfacing Keyboards, Key pads, Interfacing Displays (Seven Segment Displays and LCD's), Interfacing A/D Convertors, Interfacing D/A Convertors, Interfacing Hardware Circuits for Multiple Interrupts, 8051 Interfacing with 8255, Interfacing Eternal Memory with 8051.

UNIT-V

Introduction to Advanced Architectures: ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded System: Bus protocols, I2 bus and Can bus; Internet-Enabled Systems, Design Example-elevator Controller.

Text Books:

1. K.J. Ayala "The 8051 Micro controller, Architecture, Programming 8- Applications "Thomson Delmar Learning
2. RS Gaonkar, "Microprocessors Architecture, Programming and Applications "Penram International.
3. M. A. Mazidi& J.G Mazidi." The 8051 Micro controller 8- Embedded System "Pearson Education.

Reference Books:

1. B. Ram "Fundamentals of Microprocessors and Microcomputers "DhanpatRai and Sons.
2. 'Computers as Components- Principles of Embedded Computing System Design', Wayne Wolf, Elsevier (2nd Edition)

Course Outcomes:

Upon completion of this course, the student will be able to

1. Describe the architecture of 8085 and 8086 microprocessors and 8051 microcontroller.

2. Describe various addressing modes, assembler directives and assembly level instructions of 8051 micro controller.
3. Write assembly language programs for interfacing various I/O devices and memories with 8051 micro controller.
4. Describe architectures of various advanced processors.

(A30255) ENERGY EFFICIENCY IN ELECTRICAL UTILITIES
(Open Elective-III: offered by EEE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

Course Objectives: The objective of this course is to gain knowledge on energy efficient technologies for electrical systems and choose the appropriate energy efficient method for lighting, fanning, and pumping, cooling, compressed air and refrigeration systems.

UNIT I: ELECTRICAL SYSTEMS & ELECTRIC MOTORS

Introduction of Electrical systems, Tariff and economic considerations; T & D losses, Electrical load management; Maximum demand management, Role of Power factor and its improvement- Electric Power systems analysis -Energy Efficient Technologies in Electrical Systems - Motor Types, Characteristics, Efficiency - Energy Efficient Motors - Factors affecting Energy efficiency of a motor - Soft starters, Variable speed drives

UNIT II: COMPRESSED AIR SYSTEMS &HVAC

Introduction, Compressor types and performance; Compressed ai r systems components;
Efficient operation of compressed air systems, Systems capacity assessment -Energy conservation opportunities

UNIT III: REFRIGERATION SYSTEMS.

Introduction: Types of Refrigeration systems; Common Refriger ant and Properties -compressor types and applications -
Performance assessment of Refrigeration plants -
Energy conservation opportunities

UNIT IV: FANS, PUMPING SYSTEMS AND COOLING TOWERS

Types, Performance evaluation, efficient system operation, Capacity selections - Performance assessment of fans and blowers - Energy conservation opportunities

Types, Performance evaluation, efficient system operation - Energy conservation opportunities in pumping systems - Introduction to cooling towers; cooling tower performance, efficient system operation- Energy conservation opportunities in cooling towers.

UNIT V: LIGHTING SYSTEMS

Basic terms of lighting systems; Lamp and Luminaries types, recommended illumination level-Methodology of lighting systems energy efficiency study - Cast study, Energy conservation opportunities

Text Books

1. Capehart, Turner, Kennedy. Guide to Energy Management. Fifth Ed. The Fairmount Press, 2006.
2. Thumann, Younger. Handbook of Energy Audit. Sixth Ed. The Fairmount Press, 2003.
3. Thumann, Mehta. Handbook of Energy Engineering. Fif th Ed. The Fairmount Press, 2001

References Books (DRE 201, 202 and 203)

1. General Aspect of Energy Management and Energy Audit, 2010, BEE Guide book
2. Energy Efficiency in Thermal Utilities, 2010, BEE guide book
3. Energy Efficiency in Electrical Utilities, 2010, BEE guide book
4. Turner WC. Energy Management Handbook, 5th Edition, The Fairmont Press, 2005

Course Outcome:

After learning the course the students should be able to:

1. Explain the energy efficient technologies meant for electrical systems
2. Choose the appropriate energy efficient method for lighting, fanning, pumping, cooling, compressed air and refrigeration systems.

(A30253) FUEL CELL TECHNOLOGY
(Open Elective-III: offered by EEE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT I: INTRODUCTION TO FUEL CELLS

Introduction – working and types of fuel cell – low, medium and high temperature fuel cell, liquid and methanol types, proton exchange membrane fuel cell solid oxide, hydrogen fuel cells – thermodynamics and electrochemical kinetics of fuel cells

UNIT II: FUEL CELLS FOR AUTOMOTIVE APPLICATIONS

Fuel cells for automotive applications – technology advances in fuel cell vehicle systems – onboard hydrogen storage – liquid hydrogen and compressed hydrogen – metal hydrides, fuel cell control system – alkaline fuel cell – road map to market.

UNIT III: FUEL CELL COMPONENTS AND THEIR IMPACT ON PERFORMANCE

Fuel cell performance characteristics – current/voltage, voltage efficiency and power density, ohmic resistance, kinetic performance, mass transfer effects – membrane electrode assembly components, fuel cell stack, bi-polar plate, humidifiers and cooling plates.

UNIT IV: HYDROGEN STORAGE TECHNOLOGY

Hydrogen storage technology – pressure cylinders, liquid hydrogen, metal hydrides, carbon fibers – reformer technology – steam reforming, partial oxidation, auto thermal reforming – CO removal, fuel cell technology based on removal like bio-mass.

UNIT V: FUEL CYCLE ANALYSIS

Fuel Cycle Analysis – application to fuel cell and other competing technologies like battery powered vehicles, SI engine fueled by natural gas and hydrogen and hybrid electric vehicle.

Reference:

1. Fuel Cells for automotive applications – professional engineering publishing UK. ISBN 1- 86058 4233, 2004.
2. Fuel Cell Technology Handbook SAE International GregorHoogers CRC Press ISBN 0-8493-0877-1-2003.

Course Outcome:

After learning the course the students should be able to:

1. Demonstrate the working of various types of fuel cells.
2. Make use of the fuel cell for automotive applications.
3. Compare the fuel cell performance characteristics.
4. Explain the concept of hydrogen storage systems
5. Analyze the fuel cycle.

(C30165) BASICS OF INSURANCE & TAXATION
(Open Elective-III: offered by MBA Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

Unit I: Introduction to Life Insurance and General Insurance : Introduction to Life Insurance - Principles of Life Insurance - Life insurance products, pensions and annuities , Introduction to General Insurance. Principles of General Insurance. Types of General Insurance - Personal general insurance products (Fire, Personal Liability, Motors, Miscellaneous Insurance). Terminology, clauses and covers.

Unit II: Claim Management & Re-Insurance : Claim Management - Claim Settlement - Legal Framework - Third party Administration, Insurance ombudsman - Consumer Protection Act - Re-Insurance in Life Insurance - Retention Limits - Methods of Re-insurance.

Unit III: General Perspectives and Income Tax rate Structure: Historical background of Taxation Laws in India, Fundamental Principles of Income Tax and concepts, Government Financial Policies regarding Taxation. Tax structure and its Role in Indian Economy, Residential Status, Non Resident persons & Non Ordinary Resident, Previous year and Assessment year Tax: Fees and cess, Capital Expenditure and Capital Income. Revenue Expenditure and Revenue Income, Tax Evasion and Tax Avoidance, Direct and Indirect Taxes.

Unit IV:
Heads and Sources of Income and Exemptions & Deductions under the Income Tax: Salary and Fringe Benefit Tax, Income from House Property, Income from Business; Profession or

Vocation, Capital Gains, Income from other sources. (Theory only), Exemptions & Deductions under the Income Tax Act, Income exempt u/s 10 of the I.T. Act, Permissible deductions under Chapter VI of I.T. Act, Relief, Double Taxation Relief.

Unit V:

Assessment Procedures: PAN AND TAN, Filing of return and e-filling, Advance payment of Tax, Tax deduction at source, Tax Collection at Source, Refund of Tax, and Types of Assessment. Computation of Income in Individuals

Reference:

1. Mishra M.N: Insurance Principles and Practice; S.Chand and Co. New Delhi.
2. Principles of Life Insurance: Dr. Shrikrishan Laxman Karve, Himalaya
3. Insurance: Theory & Practice: Tripathy & Pal, PHI
4. Taxation: H.Prem raja - Sri Hamsrala publications
5. Direct Taxes & Practice : Dr. V K Singhania, Taxman Publications.
6. Gour and Narang - Income Tax Law and Practice, Kalyani Publication
7. Practicals in Taxation: H.Prem raja - Sri Hamsrala publications.
8. Income Tax: B.B. Lal, Pearson Education
9. Taxation: R.G. Saha, Himalaya Publishing House Pvt. Ltd
10. Income Tax: Johar, McGraw Hill Education
11. Taxation Law and Practice: Balachandran & Thothadri, PHI Learning

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Explain the basic legal concepts and general principles of Insurance & Tax .

2. Implement claim management and settlement.
3. Prepare tax assessments, computation of individual Incomes
4. Analyse tax exemptions and deductions of income tax.
5. Explain the procedure for filing e-filing Tax, ITDS, PAN & TAN.

(C30166) BUSINESS ETHICS & CORPORATE GOVERNANCE
(Open Elective-III offered by MBA)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

(Students must read text book & References. Faculty are free to choose any other cases)

Course Aim: The aim of this subject is to inculcate the need for business ethics to ensure sustained business stability.

Learning outcome: The learning outcome developing business ethics and professional ethics. They will also be able to understand ethical and psychological dimensions to contain cybercrimes and also will be able grasp the important issues related to corporate governance.

Unit I

Business Ethics The Changing Environment: Business Ethics-why does it matter?; Levels of Business Ethics-Five Myths about Business Ethics- Can Business Ethics be Taught and Trained?; stages of Moral development, Kohlberg's study- Carol Gilligan's Theory-Principles of Ethics.

Unit II

Professional Ethics. Introduction to Professional Ethics- Ethics in Production and Product Management-Ethics of Marketing Professionals-Ethics in HRM-Ethics of Finance and Accounting Professionals-Ethics of Advertisement-Ethics of Media Reporting-Ethics of Healthcare Services. Ethical Dilemma. Introduction, Dilemma and Ethical Dilemma-Mounting Scandals-Ethical Issues-Preparatory Ethics: Proactive steps-The software challenge.

Unit III

Cyber crimes and cyber Terrorism-social,Political, ethical and psycological , dimensitional , Intellectual properrty in the cyberspace,Ethical dimenstions of cyber crimes-the psycology, mindset & Skills of Hackers & Other cyber criminals, Sociology of cyber criminals, inforamtion Warfare.

Unit IV

Corporate Governance I: Does Good Governance Really matters to Corporations?-Importance of corporate Governance – Corporate Governance in India-Board Structures Processes and Evaluation-Director Independence –Board committees, Indian model of Corporate Governance.

Unit V

Corporate Governance-II: Information communication and Disclosure-Irani Committee Report-OECD Principles of Corporate Governance –Risk, Internal Control and Assurance-Banks and Corporate Governance.

References:

1. SK Mandal: Ethics in Business and Corporate Governance, TMH, 2/e, 2012. Journal of Human Values: IIM Calcutta. SAGE.
2. Archie. B Carroll, Business Ethics-Brief Readings on Vital Topics, Routledge, 2013.
3. A.C.Fernando: Corporate Governance, Principles, Policies and Practices, Pearson, 2012.
4. C.S.V.Murthy: Business Ethics, Himalaya Publishing House, 2012.
5. N.Balasubramanian : Corporate Governance and Stewardship, TMH,2012.
6. Nina Godbole & Sunit Belapure “ Cyber Security” wiley india 2012.
7. Joseph W.Weiss : Business Ethics, Thomson, 2006.

8. Geethika,RK Mishra, Corporate Governance Theory and Practice,Excel,2011.
9. Dr.S.S.Khanka, Business Ethics and Corporate Governance, S.Chand, 2013.
10. K.Praveen Parboteeach, Business Ethics, Routledge, 2013.
11. Praveen B Malla, Corporate Governance, Routledge 2010.
12. H.C.Mruthyunjaya, Business Ethics and Value Systems, PHI, 2013
13. V Balachandram, V Chandrasekaran, Corporate Governance, Ethics and Social Responsibility, PHI, 2011
14. Khanka, Business Ethics and Corporate Governance, S.Chand, 2013

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Identify the concept and principles of Business ethics
2. Analyze the importance of Professional Ethics and relate Ethical Dilemma to Business Practices
3. Outline the factors of Cybercrime and Cyber Terrorism.
4. Predict stakeholder’s roles in corporate Governance.
5. Review committee Reports on development of Corporate Governance.

(A30166) ENVIRONMENTAL PROTECTION AND MANAGEMENT
(Open Elective-IV: Offered by CE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT – I

Environmental Management Standards: Unique Characteristics of Environmental Problems – Systems approach to Corporate environmental management - Classification of Environmental Impact Reduction Efforts - Business Charter for Sustainable Production and Consumption – Tools, Business strategy drivers and Barriers - Evolution of Environmental Stewardship. Environmental Management Principles - National policies on environment, abatement of pollution and conservation of resources - Charter on Corporate responsibility for Environmental protection.

UNIT – II

Environmental Management Objectives: Environmental quality objectives – Rationale of Environmental standards: Concentration and Mass standards, Effluent and stream standards, Emission and ambient standards, Minimum national standards, environmental performance evaluation: Indicators, benchmarking. Pollution control Vs Pollution Prevention - Opportunities and Barriers – Cleaner production and Clean technology, closing the loops, zero discharge technologies.

UNIT – III

Environmental Management System: EMAS, ISO 14000 - EMS as per ISO 14001– benefits and barriers of EMS – Concept of continual improvement and pollution prevention - environmental policy – initial environmental review – environmental aspect and impact analysis – legal and other requirements- objectives and targets – environmental management programs – structure and responsibility – training awareness and competence- communication – documentation and document control – operational control – monitoring and measurement – management review.

UNIT – IV

Environmental Audit: Environmental management system audits as per ISO 19011- – Roles and qualifications of auditors - Environmental performance indicators and their evaluation – Non conformance – Corrective and preventive actions - compliance audits – waste audits and waste minimization planning – Environmental statement (form V) - Due diligence audit.

UNIT – V

Applications: Applications of EMS, Waste Audits and Pollution Prevention Control: Textile, Sugar, Pulp & Paper, Electroplating, , Tanning industry. Hazardous Wastes - Classification, characteristics Treatment and Disposal Methods, Transboundary movement, disposal.

Reference Books:

1. Christopher Sheldon and Mark Yoxon, "Installing Environmental management Systems – a step by step guide" Earthscan Publications Ltd, London, 1999.
2. ISO 14001/14004: Environmental management systems – Requirements and Guidelines – International Organisation for Standardisation, 2004
3. ISO 19011: 2002, "Guidelines for quality and/or Environmental Management System auditing, Bureau of Indian Standards, New Delhi, 2002
4. Paul L Bishop „Pollution Prevention: Fundamentals and Practice, McGraw- Hill International, Boston, 2000.

5. Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, Michigan, January 2001.

Course outcomes: After studying this course, students will be able to:

1. Appreciate the elements of Corporate Environmental Management systems complying to international environmental management system standards.
2. Lead pollution prevention assessment team and implement waste minimization options.
3. Develop, Implement, maintain and Audit Environmental Management systems for Organizations.

(A30167) ALTERNATE BUILDING MATERIALS
(Open Elective-IV: Offered by CE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT – I

Introduction: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Green concepts in buildings, Green building ratings – IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions.

UNIT – II

Elements of Structural Masonry : Elements of Structural Masonry, Masonry materials, requirements of masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks and Stabilized mud block. Manufacture of stabilized blocks.

Structural Masonry Mortars: Mortars, cementations materials, sand, natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar. Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load.

UNIT – III

Alternate Building Materials: Lime, Pozzolana cements, Raw materials, Manufacturing process, Properties and uses. Fibers-metal and synthetic, Properties and applications. Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties and applications. Building materials from agro and industrial wastes ,Types of agro wastes, Types of industrial and mine wastes, Properties and applications. Masonry blocks using industrial wastes. Construction and demolition wastes.

UNIT – IV

Alternate Building Technologies: Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique. Alternate Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes.

UNIT – V

Equipment for Production of Alternate Materials: Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.

Course Outcomes: After studying this course, students will be able to:

1. Solve the problems of Environmental issues concerned to building materials and cost effective building technologies;
2. Select appropriate type of masonry unit and mortar for civil engineering constructions; also they are able to Design Structural Masonry Elements under Axial Compression.

3. Analyse different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material.
4. Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material.

Textbooks:

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, “Alternative Building Materials andTechnologies”, New Age International pub.
2. Arnold W Hendry, “Structural Masonry”, Macmillan Publishers.

Reference Books:

1. RJS Spence and DJ Cook, “Building Materials in Developing Countries”, Wiley pub.
2. LEED India, Green Building Rating System, IGBC pub.
3. IGBC Green Homes Rating System, CII pub.
4. Relevant IS Codes.

(A30538) DEEP LEARNING
(Open Elective-IV: Offered by CSE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT -I

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT –II

Regularization for Deep Learning Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT –III

Optimization for Training Deep Models:

How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT –IV

Convolutional Networks

The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The

Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.

UNIT –V

Applications: Large-Scale Deep Learning, Computer Vision, Speech recognition, Natural Language Processing, Other Applications.

Text Books:

1. Deep Learning, Ian Goodfellow, Yoshua Bengio and Aaron Courville, In Preparation for MIT Press.
2. Artificial Neural Networks. Yegnanarayana, Prentice- Hall of India, 1999

Reference Books:

1. Neural Networks and Learning Machines. Haykin, Prentice Hall of India, 2010
2. Pattern Recognition and Machine Learning, C.M. Bishop, Springer, 2006

Course Outcomes

The students shall be able to

1.Explain Deep Feed-forward networks, Gradient-Based learning,
2.Describe regularization techniques for Deep learning
3.Differentiate learning and optimization in Deep learning.
4.State the significance of Convolutional Networks
5.State the applications of Deep Learning.

(A30556) CYBER SECURITY
(Open Elective-IV: Offered by CSE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Cybercrime: Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Cyber offenses: How criminals Plan Them Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT–II

Cybercrime: Mobile and Wireless Devices Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT–III

Cybercrimes and Cyber security: the Legal Perspectives Introduction Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment ,Cyber law, Technology and Students: Indian Scenario

UNIT-IV

Understanding Computer Forensics: Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing

UNIT–V

Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. Introduction to Cyber Security, Chwan-Hwa(john)Wu,J.David Irwin.CRC Press T&F Group

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

Course Outcomes

Students shall be able to

1. Explain cyber-crimes and how they are planned
2. Describe vulnerabilities of mobile and wireless devices
3. Illustrate the crimes in mobile and wireless devices
4. Be able to use cyber security, information assurance, and cyber/computer forensics software/tools.
5. Identify various crimes.

(A30477) FUNDAMENTALS OF EMBEDDED SYSTEMS
(Open Elective-IV: offered by ECE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

Unit- I: Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems

Unit- II: Typical Embedded System

Core of the Embedded System: General Purpose and Domain Specific Processors, Memory, ROM, RAM, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: On-board and External Communication Interfaces.

Unit –III: Embedded Firmware

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Unit – IV: RTOS Based Embedded System Design

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Unit – V: Task Communication

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization issues, Task Synchronization Techniques, Device Drivers

Text Books:

1. Introduction to Embedded Systems – Shibu K.V. McGraw Hill
2. Embedded Systems – Raj Kamal, TMH

Reference Books:

1. Embedded System Design – Frank Vahid, Tony Givargis, John Wiley.
2. Embedded Systems – Lyla, Pearson, 2013
3. An Embedded Software Primer- David E Simon, Pearson Education

Course outcomes:

At the end of the course the student will be able to:

1. Understand the basics of embedded systems and its types.
2. Study the various types of memories, sensors and Input / Output devices.
3. Discuss the embedded firmware for various applications.
4. Interpret the characteristics of Real time operating Systems.

(A30478) SENSORS & TRANSDUCERS
(Open Elective-IV: offered by ECE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

Unit – I: Introduction: Definition, principle of sensing & transduction, classification.
Mechanical and Electromechanical sensor: Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. Inductive sensor: common types- Reluctance change type, Mutual inductance change type, Magnetostrictive type, material, construction and input output variable, Ferromagnetic plunger type, short analysis.

Unit – II: Capacitive sensors: variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity, Proximity sensor. Stretched diaphragm type: microphone, response characteristics. Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.

Unit – III: Thermal sensors: Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermistor material, shape, ranges and accuracy specification. Thermoemf sensor: types, thermoelectric power, general consideration, Junction semiconductor type IC and PTAT type. Radiation sensors: types, characteristics and comparison, Pyro electric type.

Unit – IV: Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive celltypes, materials, construction, response. Geiger counters, Scintillation detectors.

Unit – V: Film Sensors: Thick film and thin film types, Electroanalytic sensors – Electrochemical cell, Polarization types, and membrane electrode types.
Biosensors, Smart/Intelligent sensors, Nano-sensors, Nano-tube sensors, molecular and quantum sensors.

TEXT BOOKS:

1. Sensor & transducers, D. Patranabis, 2nd edition, PHI
2. Instrument transducers, H.K.P. Neubert, Oxford University press.
3. Measurement systems: application & design, E.A.Doebelin, McGraw Hill.

REFERENCE BOOKS:

1. Sensor and Transducers, Third Edition, Ian Sinclair, Newnes.
2. Sensor Technology, Hand Book, JON S. Wilson, Newnes.ELSEVIER.
3. Sensor and Transducers, Characteristics, Applications, Instrumentation, Interfacing, Second Edition, M.J.Usher and D.A.Keating, MACMILLAN Press Ltd.

COURSE OUTCOMES:

At the end of the course the student will be able to:

1. Understand the basic concepts of mechanical and electromechanical sensors, their electrical characteristics.
2. Understand/Analyze various capacitor sensors, ultrasonic sensors their electrical characteristics.
3. Analyze various thermal sensors, principle of operation.
4. Distinguish various magnetic sensors based on their operations, radiation sensors and their operation.
5. Analyze various film sensors and operation of different nano sensors and their applications.

(A30256) ENERGY AUDIT & CONSERVATION
(Open Elective-IV: offered by EEE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT I: Basic Principles of Energy Audit

Energy audit- definitions, concept , types of audit, energy index, cost index,pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT II: Energy Management

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manger, Qualities and functions, language, Questionnaire – check list for top management.

UNIT III: Energy Efficient Motors

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed, variable duty cycle systems, RMS hp- voltage variation- voltage unbalance- over motoring- motor energy audit

UNIT IV: Power Factor Improvement, Lighting and Energy Instruments

Power factor – methods of improvement, location of capacitors, pf with non-linear loads, effect of harmonics on power factor, power factor motor controllers – Good lighting system design and practice, lighting control, lighting energy audit – Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers ,application of PLC’s.

UNIT V: Economic Aspects and Analysis

Economics Analysis-Depreciation Methods, time value of money, rate of return , present worth method , replacement analysis, life cycle costing analysis- Energy efficient motors- calculation of simple payback method, net present worth method- Power factor correction, lighting – Applications of life cycle costing analysis, return on investment .

TEXT BOOKS:

1. Energy management by W.R. Murphy AND G. Mckay Butter worth, Heinemann publications.
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998

REFERENCES:

1. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995-
2. Energy management hand book by W.C.Turner, John wiley and sons
3. Energy management and good lighting practice : fuel efficiency- booklet 12-EEO

Course Outcomes

On completion of the course, students will be able to

1. Explain the various methods of energy audit.
2. Illustrate the energy management strategies.
3. Relate the energy conservation with the improvement in energy efficiency and power factor.
4. Analyze the economic aspects to be considered in energy usage

(A30257) NANO TECHNOLOGY
(Open Elective-IV: Offered by EEE Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT I: NTRODUCTION

History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT II: UNIQUE PROPERTIES OF NANOMATERIALS

Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic nano crystalline alloy, Permanent magnetic nano-crystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT III: SYNTHESIS ROUTES

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Self-assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing, Spark plasma sintering.

UNIT IV: TOOLS TO CHARACTERIZE NANO MATERIALS

X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT V: APPLICATIONS OF NANOMATERIALS

Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, WaterTreatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Défense and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T. Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000

4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press

Course Outcomes

On completion of the course, students will be able to

1. Illustrate the characteristics and properties of nano-materials.
2. Identify the synthesis routes of nano-materials
3. Make use of the tools to characterize the nano-materials.
4. Utilize the nano-materials for various applications.

(C30167) MARKETING MANAGEMENT
(Open Elective-IV offered by MBA)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	**0**	**0**	**3**

Unit I

Understanding Marketing Management: Concepts of Marketing, Marketing Strategies & Plans, Creating long term Loyalty relationships, Marketing mix, Product Life Cycle.

Unit II

Connecting with Customers & Building Strong Brands: Analyzing Competitors, Conducting Marketing Research, Consumer Behaviour, Identifying market segments and targets, crafting Brand Positioning.

Unit III

New Product and Promotions: Introducing New Market Offering, Developing Pricing Strategies & Programmes, Designing & Managing Integrated Marketing Communications, Advertising & Sales Promotions, Managing Digital Communication – Online, Social Media & Mobile, Personal Selling.

Unit IV

Delivering Value: Managing Retailing, Wholesaling and logistics, Designing and Managing Integrated Marketing Channels.

Unit V

Sales Management: Nature and Importance of Sales Management, Skills of Sales Manager, Sales objectives, Concepts of Sales organization, Type of Sales organization.

Text books:

- Marketing Management, Philip Kotler, Kevin Lane Keller, Pearson

References:

- Marketing, A south Asian prospective, Lamb, Hair, Sharma, Mcdaniel, Cenage
- Marketing Asian Edition Paul Baines Chris Fill Kelly Page, Oxford
- Marketing Management 22e, Arun Kumar, Menakshi, Vikas Publishing

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Analyze the scope, concepts of Marketing and forecasting techniques in present Global Market Environment.
2. Develop conceptual knowledge on consumer behavior, Marketing Mix and Product Mix
3. Outline Segmentation, targeting and Positioning Goods and Services in Market.
4. Illustrate marketing channels of distribution and Promotional mix
5. Identify Pricing Decisions and importance of digital Marketing.

(C30168) INTELLECTUAL PROPERTY RIGHTS
(Open Elective-IV: offered by MBA Department)

B. Tech. (ME) VIII - Semester

L	T	P	C
3	0	0	3

UNIT-I: INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international Organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II: TRADE MARKS: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, Selecting and evaluating trade mark, trade mark registration processes.

UNIT-III: LAW OF COPY RIGHTS: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right owner ship issues, copy right registration, notice of copy right , international copy right law.

Law of Patents: Foundation of patent law, patent searching process, owner rights and transfer.

UNIT-IV: TRADE SECRETS: Trade secret law, determination of trade secrete status' liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

UNFAIR COMPETITION: Misappropriation right of publicity, false advertising

UNIT-V: NEW DEVELOPMENT OF INTELLECTUAL PROPERTY: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international-trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc Graw Hill Publishing Company Ltd.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Skill to understand the concept of intellectual property rights.
2. Develops procedural knowledge to Legal System and solving the problem relating Patents.
3. Gain knowledge on development and owning of Trade Marks, Copy Rights, and Patents.
4. Develops conceptual exposure on legal aspects related to IPR
5. Knowledge on different types of competition and ethical and unethical practices of advertising.

(A30395) Technical Seminar-II

B. Tech. (ME) VIII - Semester

L	T	P	C
2	0	0	2

- For the Technical Seminar-II, the student shall collect the information on a specialized topic related to his branch other than the Mini projects-I & II/ Internships-I & II/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department.
- The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar-II supervisor and a senior faculty member from the department.
- The Technical Seminar-II will be evaluated for 100 marks. There shall be no SEE or external examination for the Technical Seminar-II.

(A30398) Project Phase-II

B. Tech. (ME) VIII - Semester

L	T	P	C
0	**0**	**6**	**3**

Each student shall start the Project Work during the VII Semester as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of the Department.

a) The Project Work shall be divided and carried out in 2 phases : Phase – I (Project-I) during VII Semester, and Phase – II (Project-II) during VIII Semester, and the student has to prepare two independent Project Work Reports – one each during each phase. First Report shall include the Project Work carried out under Phase – I, and the Second Report (Final Report) shall include the Project Work carried out under Phase – I and Phase – II put together. Phase – I and Phase – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each Phase of the Project Work, 40 marks shall be for the Continuous Internal Evaluation(CIE), and 60 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both Phases of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance during the two Project Work Phases/periods); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee/ Board (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Phase - I, the Viva-voce shall be conducted at the end of the VII Semester, before the commencement of the semester End Examinations, at the Department Level by a Committee comprising of the HoD or One Professor and Supervisor (no external examiner), and the Project Phase – II Viva-voce (or Final Project Viva-voce) shall be conducted by a Committee comprising of an External Examiner, the Head of the Department and the Project Supervisor at the end of the VIII Semester, before the commencement of the semester End Examinations. The External Examiner shall be nominated by the CoE from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

d) If a student does not appear for any of the two Viva-Voce examinations at the scheduled times as specified above, he may be permitted to reappear for Project Phase-I and/or Project Phase-II Viva-voce examinations, as and when they are scheduled in that semester; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester(s), as and when they are scheduled, as supplementary candidate. For the registration of Project Phase-II the student must have passed Project Phase-I.