ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

MECHANICAL ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2017-2018)

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(Autonomous)
Kukatpally, Hyderabad - 500085
TELANGANA, INDIA

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(Autonomous)
Kukatpally, Hyderabad-500 085

ACADEMIC REGULATIONS 2017
for CBCS Based B.Tech. PROGRAMMES

(Effective for the students admitted into I year from the Academic Year **2017-18** and onwards)

1.0 Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)

JNTUH offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) at its Constituent Autonomous College - JNTUH College of Engineering, Hyderabad, with effect from the Academic Year 2017 - 18 onwards, in the following Branches of Engineering …

S.No.	*Branch*
I.	Civil Engineering
II.	Computer Science and Engineering
III.	Electrical and Electronics Engineering
IV.	Electronics and Communication Engineering
V.	Mechanical Engineering
VI.	Metallurgical Engineering
VII.	Chemical Engineering

2.0 Eligibility for Admission

2.1 Admission to the UGP shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (EAMCET), OR the University, OR on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.

2.2 The medium of instructions for the entire UGP in E&T will be ENGLISH only.

3.0 B.Tech. Programme (UGP) Structure

3.1 The B.Tech. Programmes of JNTUH-CEH are of Semester Pattern, with 8 Semesters constituting 4 Academic Years, each Academic Year having TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 Weeks duration (inclusive of Examinations), with a minimum of 90 Instructional Days per Semester.

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.

3.2.1 Semester Scheme:
Each UGP is of 4 Academic Years (8 Semesters), with the year being divided into two Semesters of 22 weeks (≥ 90 working days) each, 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 Credit Courses:
All Subjects/ Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject/ Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practicals Periods : Credits) Structure, based on the following general pattern ..

- One Credit - for One hour/ Week/ Semester for Theory/ Lecture (L) Courses; and,

- One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses or Tutorials (T).
  Other student activities like NCC, NSS, NSO, Study Tour, Guest Lecture etc., and identified Mandatory Courses will not carry Credits.

3.2.3 Subject/ Course Classification:

All Subjects/ Courses offered for the UGP are broadly classified as : (a) Foundation Courses (FnC), (b) Core Courses (CoC), and (c) Elective Courses (EℓC).

- Foundation Courses (FnC) are further categorized as : (i) HS (Humanities and Social Sciences), (ii) BS (Basic Sciences), and (iii) ES (Engineering Sciences);

- Core Courses (CoC) and Elective Courses (EℓC) are categorized as PS (Professional Subjects), which are further subdivided as – (i) PC (Professional/ Departmental Core) Subjects, (ii) PE (Professional/ Departmental Electives) , (iii) OE (Open Electives); and (iv) Project Works (PW);

- Minor Courses (1 or 2 Credit Courses, belonging to HS/ BS/ ES/ PC 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 UGP E&T (B.Tech. Degree Programmes), is as listed below (along with AICTE specified % Range of Total Credits)…

S. No.	*Broad Course Classification*	*Course Group/ Category*	*Course Description*	*Range of Credits*
1)	**Foundation Courses (FnC)**	**BS – Basic Sciences**	Includes - Mathematics, Physics and Chemistry Subjects	**15% - 20%**
2)		**ES - Engineering Sciences**	Includes fundamental engineering subjects	**15% - 20%**
3)		**HS – Humanities and Social Sciences**	Includes subjects related to Humanities, Social Sciences and Management	**5% - 10%**
4)	**Core Courses (CoC)**	**PC – Professional Core**	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	**30% - 40%**
5)	**Elective Courses (EℓC)**	**PE – Professional Electives**	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	**10% - 15%**
6)		**OE – Open Electives**	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	**5% - 10%**
7)	**Core Courses**	**Project Work**	B.Tech. Project or UG Project or UG Major Project	**10% - 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)		**Minor Courses**	1 or 2 Credit Courses (subset of HS)	**included**
11)		**Mandatory Courses (MC)**	Mandatory Courses (non-credit)	**-**
Total Credits for UGP (B. Tech.) Programme				**192 (100%)**

4.0 Course Work

4.1 A student, after securing admission, shall pursue the B.Tech. UGP 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 Each student shall Register for and Secure the specified number of Credits required for the completion of the UGP and Award of the B.Tech. Degree in respective Branch of Engineering.

4.3 Each Semester is structured to provide typically 24 Credits (24 C), totaling to 192 Credits (192 C) for the entire B.Tech. Programme.

5.0 Course Registration

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

5.2 Academic Section of the College invites 'Registration Forms' from students apriori (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 Examiantions) of the 'PRECEDING SEMESTER'.

5.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of the same being retained with Head of Department, Faculty Advisor and the Student).

5.4 A Student may be permitted to Register for his Subjects/ Course of CHOICE with a typical total of 24 Credits per Semester (Minimum being 20 C and Maximum being 28 C, permitted deviation being ± 17%), 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. However, a MINIMUM of 20 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

5.5 Choice for 'additional Subjects/ Courses' to reach the Maximum Permissible Limit of 28 Credits (above the typical 24 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/ Counselor.

5.6 If the Student submits ambiguous choices or multiple options or erroneous entries - during ON-LINE Registration for the Subject(s) / 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.

w.e.f. 2017-2018 academic year

5.7 Subject/ Course Options exercised through ON-LINE Registration are final and CAN NOT be changed, and CAN NOT be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.8 Dropping of Subjects/ Courses may be permitted, ONLY AFTER obtaining prior approval from the Faculty Advisor (subject to retaining a minimum of 20 C), 'within 15 Days of Time' from the beginning of the current Semester.

5.9 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 Subjects/ Courses to be offered

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

6.2 A Subject/ 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 SUBJECT (Lab./ Practicals may be included with the corresponding Theory Subject in the same Semester) in any Semester. However, selection choice for students will be based on - 'FIRST COME FIRST SERVE Basis and CGPA Criterion' (ie., 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).

6.4 If more entries for Registration of a Subject come into picture, then the concerned Head of Department shall take necessary action, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT .

6.5 In case of options coming from Students of other Departments/ Branches/ Disciplines (not considering OPEN ELECTIVES), PRIORITY shall be given to the student of the 'Parent Department' first.

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 Subjects/ 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 grounds, based on the student's representation with supporting evidence.

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 take their End Examinations of that Semester, they get detained and their registration for that Semester shall stand cancelled. They will not be promoted to the next Semester. They may seek re-registration for all those Subjects registered in that Semester in which he 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 Subjects offered under that category.

w.e.f. 2017-2018 academic year

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 - Industry oriented Mini-Project/ Seminar, if he secures not less than 40% of the total marks (40 marks) to be awarded for each. The student would be treated as failed, if he - (i) does not submit a report on his Industry oriented Mini-Project, or does not make a presentation of the same before the Evaluation Committee as per schedule, or (ii) does not present the Seminar as required in the IV year II Semester, or (iii) secures less than 40% of marks (40 marks) in Industry oriented Mini-Project/ 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 total of minimum 24 Credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student 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 total of minimum 58 Credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student 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 total of minimum 86 Credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

8.6 A Student shall - register for all Subjects covering 192 Credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, put up all the Attendance and Academic requirements for 192 Credits securing a minimum of P Grade (Pass Grade) or above in each Subject, and 'earn ALL 192 Credits securing SGPA $\geq$ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) $\geq$ 5.0' , to successfully complete the UGP.

8.7 After securing the necessary 192 Credits as specified for the successful completion of the entire UGP, an exemption of maximum 8 secured Credits (in terms of two of their corresponding Subjects/Courses) may be permitted for optional drop out from these 192 Credits earned; i.e., the performance of the Student after the deduction of maximum 8 credits shall alone be taken into account for the calculation of 'the final CGPA however, the Student's Performances in the earlier individual Semesters, with the corresponding SGPA and CGPA for which already Grade Cards are given, will not be altered. Further, optional drop out for such 8 secured Credits shall not be allowed for Subjects/ Courses listed as … i) Laboratories/ Practicals, Industrial Training/ Mini-Project, iii) Seminar, iv) Major Project.

8.8 If a Student registers for some more 'extra Subjects' (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totaling to 192 Credits as specified in the Course Structure of his Department, the performances in those 'extra Subjects' (although evaluated and graded using the same procedure as that of the required 192 Credits) will not be taken into account while calculating the SGPA and CGPA. For such 'extra Subjects' registered, % marks and Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in Items 7 and 8.1 – 8.7 above.

w.e.f. 2017-2018 academic year

8.9 Students who fail to earn 192 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.

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

8.11 When a Student is detained due to lack of Credits in any year, he may be readmitted in the next year, after fulfilment of the Academic Requirements, with the Academic Regulations of the Batch into which he gets readmitted.

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

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 Industry oriented Mini-Project or Minor Course, etc; however, the B.Tech. Project Work (Major Project) will be evaluated for 200 Marks. These evaluations shall be based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination), and a Letter Grade corresponding to the % marks obtained shall be given.

9.2 For all Subjects/ Courses as mentioned above, the distribution shall be 30 marks for CIE, and 70 marks for the SEE. The semester end examinations will be conducted for 70 marks consisting of two parts viz. i) **Part-A** for 20 marks (10 x 2 marks), ii) **Part-B** for 50 marks. Part-B consists of five questions carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

9.3 a) For Theory Subjects (inclusive of Minor Courses), during the Semester, there shall be 2 mid-term examinations for 25 marks each. Each mid-term examination consists of one objective paper for 10 marks, plus one subjective paper for 15 marks, with a duration of 120 minutes (20 minutes for objective and 100 minutes for subjective papers). Further, there will be an allocation of 5 marks for Assignment. Objective paper may be set with multiple choice questions, True/ False, fill-in the blanks, matching type questions, etc. Subjective paper shall contain 5 questions, out of which the Student has to answer 3 questions, each for 5 marks.

b) The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

c) First Assignment should be submitted before the conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second mid-term examinations. The Assignments shall be as specified by the concerned subject teacher.

d) The first mid-term examination Marks and first Assignment Marks shall make one set of CIE Marks , and the second mid-term examination Marks and second Assignment Marks shall make second set of CIE Marks; and the better of these two sets of marks shall be taken as the final marks secured by the Student towards Continuous Internal Evaluation in that Theory Subject.

9.4 For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 internal marks, and 70 marks are assigned for Lab./Practical End

w.e.f. 2017-2018 academic year

Semester Examination (SEE). Out of the 30 marks for internals, day-to-day work in the laboratory shall be evaluated for 20 marks; and for the remaining 10 marks - two internal practical tests (each of 10 marks) shall be conducted by the concerned laboratory teacher and the better of these two tests is taken into account. The SEE for Practicals shall be conducted at the end of the Semester by Two Examiners appointed by Head of the Department.

9.5 For the Subjects having Design and/or Drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 30 marks for CIE (20 marks for day-to-day work, and 10 marks for internal tests) and 70 marks for SEE. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests.

9.6 Open Electives: Students are to choose One Open Elective (OE-I) during III Year I Semester, one (OE-II) during III Year II Semester , and one (OE-III) in IV Year II Semester, from the list of Open Electives given. However, Students can not opt for an Open Elective Subject offered by their own (parent) Department, if it is already listed under any category of the Subjects offered by parent Department in any Semester.

9.7 a) There shall be an Industry oriented Mini-Project, in collaboration with an Industry of the relevant specialization, to be registered immediately after III Year II Semester examinations, and taken up during the summer vacation for about eight weeks duration.

b) The Industry oriented Mini-Project shall be submitted in a Report form, and a presentation of the same shall be made before a Committee, which evaluates it for 100 marks. The Committee shall consist of Head of the Department, the supervisor of Mini-Project, and a Senior Faculty Member of the Department. There shall be no internal marks for Industry oriented Mini-Project. The Mini-Project shall be evaluated in the IV Year I Semester.

9.8 There shall be a Seminar Presentation in IV Year II Semester. For the Seminar, the student shall collect the information on a specialized topic, prepare a Technical Report and submit to the Department at the time of Seminar

Presentation. The Seminar Presentation (along with the Technical Report) shall be evaluated by Two Faculty Members assigned by Head of the Department, for 100 marks. There shall be no SEE or external examination for Seminar.

9.9 Each Student shall start the Project Work during the IV Year I Semester, as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of Department. Out of a total 200 marks allotted for the Project Work, 60 marks shall be for CIE (Continuous Internal Evaluation and 140 marks for the SEE (End Semester Viva-voce Examination). The Project Viva-voce shall be conducted by a Committee comprising of an External Examiner, Head of the Department and Project Supervisor. Out of 60 marks allocated for CIE, 30 marks shall be awarded by the Project Supervisor (based on the continuous evaluation of student's performance throughout the Project Work period), and the other 30 marks shall be awarded by a Departmental Committee consisting of Head of the Department and Project Supervisor, based on the work carried out and the presentation made by the Student at the time of Viva-voce Examination.

9.10 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 securing ≥ 65% attendance in such a Course. No marks or Letter Grade shall be allotted for these activities.

10.0 Grading Procedure

10.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Seminar, or Project, or Mini-Project, Minor Course etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 9 above, and a corresponding Letter Grade shall be given.

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

w.e.f. 2017-2018 academic year

% of Marks Secured in a Subject / Course	*Letter Grade As per UGC Guidelines*	*Grade Points*
More than or equal to 90%	**O (Outstanding)**	**10**
80 and less than 90%	**A^+ (Excellent)**	**9**
70 and less than 80%	**A (Very Good)**	**8**
60 and less than 70%	**B^+ (Good)**	**7**
50 less than 60%	**B (Average)**	**6**
40 less than 50%	**C (Pass)**	**5**
Below 40%	**F (Fail)**	**0**
Absent	**Ab**	**0**

10.3 A student obtaining F Grade in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the End Semester Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

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

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

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

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

10.7 The Student passes the Subject/ Course only when he gets GP ≥ 5 (P Grade or above).

10.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

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

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), is the no. of Credits allotted to the ith Subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Subject.

Illustration of calculation of SGPA

Course / Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	32
Course 2	3	O	10	30
Course 3	4	C	5	20
Course 4	4	B	6	24
Course 5	3	A+	9	27
Course 6	2	C	5	10
Course 7	2	B	6	12
Course 8	2	C	5	10
Total	**24**			**165**

SGPA = 165/24 = 6.87

10.9 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

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

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), is the no. of Credits allotted to the jth Subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. 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.

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

10.11 For Calculations listed in Item 10.6 – 10.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/ Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

10.12 Passing Standards:

10.12.1 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 UGP, only when gets a CGPA ≥ 5.00; subject to the condition that he secures a GP ≥ 5 (P Grade or above) in every registered Subject/ Course in each Semester (during the entire UGP) for the Degree Award, as required.

10.12.2 In spite of securing P Grade or above in some (or all) Subjects/ Courses in any Semester, if a Student receives a SGPA < 5.00 and/ or CGPA < 5.00 at the end of such a Semester, then he 'may be allowed' (on the 'specific recommendations' of the Head of the Department and subsequent approval - by the College Academic Committee.

(i) to go into the next subsequent Semester (subject to fulfilling all other attendance and academic requirements as listed under Items 7-8);

(ii) to 'improve his SGPA of such a Semester (and hence CGPA) to 5.00 or above', by reappearing for ONE or MORE (as per Student's choice) of the same Subject(s) / Course(s) in which he has secured P Grade(s) in that Semester, at the Supplementary Examinations to be held in the next subsequent Semester(s). In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

In these considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

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

10.13 After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the Registered Students of that Semester, indicating the Letter Grades and Credits earned. It will show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

11.0 Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 10.6 – 10.10.

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

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 A Student who registers for all the specified Subjects/ 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 (UGP), and secures the required number of 192 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.

12.2 A Student who qualifies for the Award of the Degree as listed in Item 12.1, shall be placed in the following Classes …

12.3 Students with final CGPA (at the end of the UGP) ≥ 8.00 :

(i) Shall be placed in **' First Class with distinction'** if fulfilling the following conditions.

(a) should not fail in any Subjects/Courses and should complete the required credits for the Award of Degree within the first 4 Academic Years (or 8 Sequential Semesters) from the Date of Commencement of his First Academic Year,

(b) 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.

(ii) Shall be placed in **' First Class '** if not fulfilling the above a & b conditions

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

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

12.6 All other Students who qualify for the Award of the Degree (as per Item 12.1), with final CGPA (at the end of the UGP) ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

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

12.8 Students fulfilling the conditions listed under Item 12.3 alone will be eligible candidates for - 'University Rank' and 'Gold Medal' considerations.

13.0 Withholding of Results

13.1 If the student has not paid fees to University/ 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.

14.0 Transitory Regulations

14.1 Student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the Degree Programme, may be considered eligible for readmission to the same Subjects/ Courses (or equivalent Subjects/ Courses, as the case may be), and same Professional Electives/ Open Electives (or from set/category of Electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the Date of Commencement of his I Year I Semester).

15.0 Student Transfers

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

15.2 There shall be no transfer among the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

16.0 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".

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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.

* * * * *

MALPRACTICES RULES

	Nature of Malpractices	Punishment
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining 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 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 in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Chief Superintendent / Assistant –Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the	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 also are debarred and forfeit their seats. In case of outsiders, they will be handed over to

w.e.f. 2017-2018 academic year

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

MECHANICAL ENGINEERING

COURSE STRUCTURE

(Applicable from the batch admitted during 2017-18 and onwards)

I YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathematics - I	4	1	0	4
2	BS	Engineering Physics	3	1	0	3
3	BS	Applied Chemistry	3	1	0	3
4	ES	Computer Programming & Data Structures	4	1	0	4
5	ES	Classical Engineering Mechanics	4	1	0	4
6	BS	Engineering Physics Lab	0	0	3	2
7	BS	Applied Chemistry Lab	0	0	3	2
8	ES	Computer Programming & Data Structures Lab	0	0	3	2
		NSS/NCC/NSO				
		Total Credits				**24**

I YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathematics–II	3	1	0	3
2	ES	Fundamentals of Electrical & Electronics Engineering	3	0	0	3
3	HS	English	3	0	0	3
4	ES	Engineering Graphics	3	0	3	4
5	ES	Environmental Science	3	0	0	3
6	BS	Computational Mathematics	2	0	0	2
7	ES	Engineering Workshop	0	0	3	2
8	HS	English Language Communication Skills Lab	0	0	3	2
9	BS	Computational Mathematics Lab	0	0	3	2
		NSS/NCC/NSO				
		Total Credits				**24**

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

MECHANICAL ENGINEERING

COURSE STRUCTURE

(Applicable from the batch admitted during 2017-18 and onwards)

II YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathematics -III	4	1	0	4
2	PC	Metallurgy & Material Science	3	0	0	3
3	PC	Mechanics of Solids	3	1	0	3
4	PC	Thermodynamics	3	1	0	3
5	PC	Kinematics of Machines	3	1	0	3
6	PC	Machine Drawing practice	2	0	3	3
7	PC	Mechanics of Solids & Metallurgy Lab	0	0	3	1
8	PC	Fuels & lubricants Lab	0	0	3	2
9	HS	Human Values and Professional Ethics	2	0	0	2
		Total Credits				**24**

II YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PC	Fluid Mechanics & Hydraulic Machinery	4	1	0	4
2	PC	Thermal Engineering-I	4	1	0	4
3	PC	Dynamics of Machines	4	1	0	4
4	PC	Production Technology	3	0	0	3
5	PC	Instrumentation & Control Systems	3	0	0	3
6	HS	Gender Sensitization Lab	-	-	-	-
7	PC	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	2
8	PC	Instrumentation & control system Lab	0	0	3	2
9	PC	Production Technology Lab	0	0	3	2
		Total Credits				**24**

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

MECHANICAL ENGINEERING

COURSE STRUCTURE

(Applicable from the batch admitted during 2017-18 and onwards)

III YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	OE-I	Open Elective-I	3	0	0	3
2	HS	Managerial Economics and Financial Analysis	4	0	0	4
3	PC	Design of Machine Members-I	4	1	0	4
4	PC	Thermal Engineering -II	3	1	0	3
5	PC	Machine tools and Metrology	4	0	0	4
6	PC	Thermal Engineering Lab	0	0	3	2
7	PC	Machine tools and Metrology Lab	0	0	3	2
8	HS	Advanced English Language Communication Skills Lab	0	0	3	2
		Total Credits				**24**

III YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	OE-II	Open Elective-II	3	0	0	3
2	PE	Professional Elective -I	4	0	0	4
3	PE	Professional Elective – II	4	0	0	4
4	PC	Design of Machine Members-II	3	1	0	3
5	PC	Heat Transfer	4	1	0	4
6	PC	Kinematics & Dynamics Lab	0	0	3	2
7	PC	Heat Transfer Lab	0	0	3	2
8	PC	Advanced Thermodynamics Lab	0	0	3	2
		Total Credits				**24**

Summer between III & IV Year: Industry Oriented Mini Project

JNTUH COLLEGE OF ENGINEERING HYDERABAD.
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MECHANICAL ENGINEERING

COURSE STRUCTURE

(Applicable from the batch admitted during 2017-18 and onwards)

IV YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PE	Professional Elective – III	4	0	0	4
2	PE	Professional Elective – IV	4	0	0	4
3	PE	Professional Elective – V	4	0	0	4
4	PC	R&AC	4	1	0	4
5	PC	CAD/CAM	4	1	0	4
6	PC	CAD/CAM Lab	0	0	3	2
7	Project	Industry Oriented Mini Project	-	-	-	2
		Total Credits				**24**

IV YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	OE-III	Open Elective – III	3	0	0	3
2	HS	Management Science	4	0	0	4
3	ES	Seminar	0	0	3	1
4	PC	R&A/C Lab	0	0	3	2
4	Project	Major Project	-	-	-	14
		Total Credits				**24**

Professional Elective **-I**
1. Automobile Engineering
2. Computer Graphics
3. Unconventional Machining Process
4. Industrial Engineering Practices

Professional Elective **-II**
1. Operations Research
2. Tribology
3. Power Plant Engineering
4. Fluid Power Systems

Professional Elective **-III**

1. Renewable Energy Systems
2 Finite Element Methods
3 Neural networks & Fuzzy logics
4. Mechatronics

Professional Elective **-IV**

1. Advanced IC Engines
2. Computational Fluid Dynamics
3. Mechanical Vibrations
4. Production Planning and Control

Professional Elective **-V**

1. Robotics
2. Mechanics of Composite Materials
3. CNC Machines
4. Machine Tool Design

OPEN ELECTIVE- I		
S.No.	**Subject**	**Offering Department**
1	Disaster Management	Civil Engineering
2	Non – Conventional Power Generation	Electrical & Electronics Engineering
3	Electrical Engineering Materials	
4	Nano-Technology	
5	Operations Research	Mechanical Engineering
6	Basics of Thermodynamics	
7	Fabrication Processes	
8	Electronic Measuring Instruments	Electronics & Communication Engineering
9	OOPS through JAVA	Computer Science & Engineering
10	Computer Graphics	
11	Engineering Materials	Metallurgical Engineering
12	Metallurgy for Non Metallurgists	
13	Industrial Pollution Control Engineering	Chemical Engineering

OPEN ELECTIVE- II		
S.No.	**Subject**	**Offering Department**
1	Estimation, Quantity Survey & Valuation	Civil Engineering
2	Design Estimation and Costing of Electrical Systems	Electrical & Electronics Engineering
3	Energy Storage Systems	
4	Mechatronics	
5	Jet propulsion and Rocket Engineering	Mechanical Engineering
6	Ergonomics	
7	Mechatronics	
8	Principles of Electronic Communications	Electronics & Communication Engineering
9	Cyber Security	Computer Science & Engineering
10	Database Management Systems	
11	Corrosion Engineering	Metallurgical Engineering
12	Testing of Materials	
13	Solid Waste Management	Chemical Engineering

OPEN ELECTIVE- III		
S.No.	**Subject**	**Offering Department**
1	Environmental Impact Assessment	Civil Engineering
2	Entrepreneur Resource Planning	Electrical & Electronics Engineering
3	Management Information Systems	
4	Organizational Behavior	
5	Fundamentals of Robotics	Mechanical Engineering
6	Non-Conventional Energy Sources	
7	Aspects of Heat Transfer in Electrical/Electronically controlled units	
8	Principles of Computer Communications and Networks	Electronics & Communication Engineering
9	Web technologies	Computer Science & Engineering
10	Simulation & Modeling	
11	Surface Engineering	Metallurgical Engineering
12	Nano Materials	
13	Industrial Safety & Hazard Management	Chemical Engineering

JNTUH COLLEGE OF ENGINEERING HYDERABAD

I Year B.Tech. Mech. Engg. I-Sem

L	T	P	C
4	1	0	4

MATHEMATICS – I
(Common to all Branches)

Pre Requisites: NIL

Objectives:
- To train the students thoroughly in mathematical concepts of ordinary differential equations and their applications.
- To prepare students for lifelong learning and successful careers using mathematical Concepts of differential and integral calculus, ordinary differential equations and vector calculus.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information.

Outcomes:
At the end of the course, the student will be able to:
- become familiar with the application of differential and integral calculus, ordinary differential equations and vector calculus to engineering problems.
- attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.

UNIT–I: Differential calculus (12 lectures)
Rolle's Mean value Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function.
Curve tracing – Equations given in Cartesian, polar and parametric forms.
Functions of several variables – Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints-Method of Lagrange multipliers.

UNIT–II: Improper Integrals, Multiple Integration (12 lectures)
Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.
Multiple integrals – double and triple integrals – change of order of integration- change of variables (polar, cylindrical and spherical) .

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Finding the area of a region using Double integration and volume of a region in space using triple integration.

UNIT–III: Vector Calculus (12 lectures)
Vector Calculus: Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties, - Laplacian operator, Line integral – Work done – Surface integrals –Volume integral. Green's Theorem, Stoke's theorem and Gauss's Divergence Theorems (Statement & their Verification). Solenoidal and irrotational vectors, Finding potential function.

UNIT–IV: First Order Ordinary Differential Equations (10 lectures)
Linear and exact differential equations
Applications of first order differential equations – Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories and electrical circuits

UNIT-V: Higher Order Ordinary Differential Equations (10 lectures)
Linear, homogeneous and non- homogeneous differential equations of second and higher order with constant coefficients. Non-homogeneous term of the type e^{ax}, Sin ax, Cos ax, and x^n, $e^{ax}V(x)$, $x^n V(x)$. Method of variation of parameters. Applications: Bending of beams, Electrical circuits and simple harmonic motion.

Text books:
1) HIGHER ENGINEERING MATHEMATICS BY B S GREWAL, KHANNA PUBLICATIONS.
2) ENGINEERING MATHEMATICS BY ERWIN KREYSZIG, WIELY PUBLICATIONS.
3) VECTER ANALYSIS BY GHOSG & MAITY, NEW CENTRAL BOOK AGENCY.

References:
1) ENGINEERING MATHEMATICS BY SRIMANTAPAL & SUBODH C. BHUNIA, OXFORD UNIVERSITY PRESS.
2) ADVANCED ENGINEERING MATHEMATICS BY PETER V O'NEIL, CENGAGE LEARNING.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

I Year B.Tech. Mech. Engg. I-Sem	L	T	P	C
	3	1	0	3

ENGINEERING PHYSICS

Prerequisites: Nil

Course Objectives:

The course aims at making students to understand the basic concepts of Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses. Today the need is to stress principles rather than specific procedures, to select areas of contemporary interest rather than of past interest, and to condition the student to the atmosphere of change he will encounter during his carrier. The main purpose of this course is to equip engineering undergraduates with an understanding of the scientific method, so that they may use the training beneficially in their higher pursuits. An earnest attempt is made in framing the course in this direction by blending careful presentation of fundamental concepts and methods of physics. The course begins with a detailed coverage of optics, which includes topics such as interference, diffraction, polarization of Light phenomenon. It then delves into discussion on Characterization of materials in terms of bonding, defects, Structures, X-ray diffraction, dielectric nature, Magnetic behavior, Superconducting nature, Nano size activity etc. The basic principles behind the Acoustics of good structures (Halls) are elucidated for easy understanding of complex concepts.

Outcomes:

The knowledge of Physics relevant to engineering is critical for converting ideas into technology. An understanding of Physics also helps engineers understand the working and limitations of existing devices and techniques, which eventually leads to new innovations and improvements. In the present course, the students can gain knowledge not only about one of the naturally main source of life on the earth planet i.e. sun rays and their phenomenon, but also of other artificial light source behavior and their phenomenon. Similarly, by studying other chapters, the student can gain the knowledge of the relation between the micro level physical properties of the materials and their macro level behavior thereby acquires the idea of making them use effectively in real time situation or in applications of interest.

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UNIT-I

1. **Interference**: Superposition of Waves, Young's double slit experiment, Coherence, Interference in Thin films by Reflection, Newton's Rings.
2. **Diffraction:** Fresnel and Fraunhofer diffractions, Fraunhofer diffraction at a single slit and Double slit, Diffraction Grating, Resolving Power of a Grating.
3. **Polarization:** Introduction to polarization, Double Refraction, Nicol Prism, Quarter and Half wave plates

UNIT-II

4. **Bonding in Solids**: Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander- Waal's Bond and Calculation of Cohesive Energy for Ionic Solids.
5. **Crystallography and Crystal Structures**: Space Lattice, Unit Cell, Lattice parameters, Crystal Systems, Bravais Lattices, Miller Indices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Diamond Structure(Cubic), Structures of NaCl, ZnS, CsCl, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems

UNIT-III

6. **Defects in Crystals:** Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects, Estimation of Frenkel and Schottky Defects, Edge and Screw dislocations (Qualitative Treatment), Burger's Vector.
7. **X-ray Diffraction:** Basic Principles of **X**-ray Diffraction, Bragg's Law, Laue Method, Powder Method, Applications of X-ray Diffraction.

UNIT-IV

8. **Dielectric Properties:** Basic definitions: Electric dipole, Dipole moment, Permittivity, Dielectric constant, Polarizability, Electric susceptibility, Displacement vector; Electronic Polarization, Ionic Polarization (Quantitative treatment) and Orientation Polarization (Qualitative treatment),Internal Fields in Solids, Clausius - Mossotti Equation, Piezo-electricity, Pyro- electricity and Ferro – electricity,Properties of ferro-electric materials.
9. **Magnetic Properties:** Basic definitions: Magnetic dipole, Magnetic moment, Magnetic Induction, Magnetic field intensity, Permeability, relative permeability, Intensity of Magnetization, susceptibility, Relation between χ and μ_r ; Origin of Magnetic Moment-Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment,Domain Theory of Ferro magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials.

10. **Superconductivity:** Introduction of Superconductivity, Properties of Superconductors, Meissner Effect, BCS theory (Qualitative), Type-I and Type II Superconductors, Magnetic Levitation and Applications of Superconductors.

UNIT-V

11. **Acoustics of Buildings:** Basic Requirement of Acoustically Good Hall, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time, Measurement of Absorption Coefficient of a material, Factors Effecting the Architectural Acoustics and their Remedies.
12. **Nanomaterials:** Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-Gel, Precipitation, combustion Methods; Top-Down Fabrication: Chemical Vapor Deposition, Physical Vapor Deposition, Characterization Techniques (XRD, SEM &TEM) and Applications.

Text books:

1. Principles of Physics by Halliday, Resnick, Walker, Wiley India Pvt Ltd, 9th Edition.
2. Introduction to Solid State Physics by Charles Kittel, Wiley India Pvt Ltd, 7th Edition
3. Engineering Physics by R.K.GAUR & S.L.GUPTA, Dhanpat Rai Publications.
4. Solid State Physics by A J Dekker, MACMILLAN INDIA LTD.

References:

1. Modern Engineering Physicsby Dr.K.Vijaya Kumar, Dr.S.Chandralingam, S.CHAND & COMPANY LTD
2. Applied Physics by P.K.Mittal, I K International Publishers
3. Applied Physics by P.K. Palanisamy :Scitech publishers
4. Introduction to Nanotechnology by Charles P.Poole, Jr.Frank J ownes, John Wiley & sons
5. Applied Physics for Engineers by P. Madusudana Rao, Academic Publishing Company
6. Engineering Physics by Sanjay D Jain, Girish G Sahasrbudha: University Press.

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JNTUH COLLEGE OF ENGINEERING HYDERABAD

I Year B.Tech. Mech. Engg. I-Sem

L	T	P	C
3	1	0	3

APPLIED CHEMISTRY

Prerequisites: Nil

Course objectives:

The student is made to understand the basic concepts of chemistry. To explore the economically viable techniques developed for utilizing water resources and to provide the skills for analysis of water and materials. To inculcate the knowledge of corrosion to face thin burning issue of the Globe. The principle of the preparing and utilizing various polymers for varied applications.

Outcomes:

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

- learn the concepts of electrochemistry, batteries. The principles and procedures for making varied polymers for different applications are well understood. The skills pertaining to water treatment and analysis will be inculcated.

Unit-I: Water and its treatment

Introduction – hardness of water – causes of hardness – types of hardness : temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of potable water - Disinfection of potable water by chlorination and Ozonization. Boiler feed water and its treatment – Calgon conditioning – Phosphate conditioning - Colloidal conditioning – External treatment of water –ion-exchange processes. Desalination of water – Reverse osmosis. Numerical problems – Sewage water - COD, BOD definition and their significance. Treatment of sewage- Steps involved.

Unit-II: Electrochemistry and corrosion

Electrochemistry : Conductance and their interrelationship - Specific, equivalent and molar conductance . Ionic mobilities – Relationship between ionic conductance and ionic mobilities. Electro Chemical cells - electrode potential, standard electrode potential, types of electrodes – Standard hydrogen electrode, calomel and glass electrode. Nernst equation - electrochemical series and its applications.– Concept of concentration cell –Numerical problems.

Corrosion- Causes and effects of corrosion – theories of chemical and electrochemical corrosion - mechanism of electrochemical corrosion. Types of corrosion : Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion. Corrosion control methods – Cathodic protection - sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application of metallic coatings – Hot dipping , cementation, electroplating of copper, electro less plating of Nickel - Organic coatings: Paints – their constituents and functions.

Unit-III: High Polymers:
Definition – Classification of polymers with examples – Types of polymerisation – Chain growth (free radical addition mechanism), step growth polymerization, Plastics, fibres and elastomers - definition and characteristics. Plastics – thermoplastic and thermosetting plastics, compounding of plastics . Fibre reinforced plastics. Preparation, properties and applications of PVC, Teflon, Bakelite, Nylon 6:6 and terylene (Dacron); Rubber – Natural rubber , its processing and vulcanization. Elastomers: Preparation, properties and applications of Styrene butadiene, butyl and thiokol rubbers. Conducting polymers – Classification with examples; mechanism of conduction in trans-polyacetylene and applications of conducting polymers. Biodegradable polymers – concept and advantages - Polylactic acid and their applications.

Unit-IV: Chemistry of Energy sources
Fuels :Classification of fuels - characteristics of a good fuel . Solid fuels: Coal – Analysis of coal by proximate and ultimate methods. Liquid fuels-Petroleum and its refining. Characteristics and uses of petrol, diesel and kerosene. Synthetic petrol- Fischer-Tropsch's process. Cracking – thermal cracking and catalytic cracking. Fluid bed catalytic cracking, Knocking - octane and cetane numbers. Gaseous fuels – Composition, properties and uses of Natural gas, LPG and CNG .
Combustion – Definition, calorific value, HCV and LCV. Calculation of air quantity required for combustion of a fuel - Numerical problems.
Alternate Energy sources :Biodiesel - trans-esterification - advantages of biodiesel, fuel cells (H_2-O_2 and Methanol –O_2 fuel cell).

Unit-V: Engineering Materials:
Cement – Types of cements- Portland cement and its composition, Setting and hardening of cement. Special Cements – White cement, Water proof cement, high-alumina cement and high early-strength cement .

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Refractories – Characteristics of a good refractory, classification with examples – refractoriness and refractoriness under load - causes for the failure of refractories.
Abrasives: Characteristics – Classification and applications of Diamond and Carborandum (SIC)
Lubricants – Characteristics of a good lubricant – mechanism of lubrication – thick film, thin film and extreme pressure lubrication. Classification of lubricants with examples. Properties– viscosity, cloud point, pour point, flash point, fire point and mechanical stability (determination and their significance).

Text Books:
1. Engineering Chemistry by P.C.Jain & M.Jain ; Dhanpat Rai Publishing Company (P) Ltd., New Delhi, (15th Edition , 2005).
2. Engineering Chemistry by B.Rama Devi & Ch.Venkata Ramana Reddy ; Cengage Learning , 2012.

Reference Books:
1. A Text Book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co., New Delhi.(3rd Edition, 2003).
2. Engineering Chemistry by Y. Bharathi Kumari and C. Jyotsna, VGS Booklinks, 2012.
3. Text book of Engineering Chemistry by C P Murthy, C V Agarwal and A. Naidu; B.S.Publications, 2006.
4. Engineering Chemistry by M. Thirumala Chary and E. Lakshminarayana, Sci tech. Publications Pvt. Ltd., Chennai 2012.
5. Engineering Chemistry by B.Sivasankar, Tata McGraw-Hill Publishing Company Ltd., New Delhi 2008.
6. A Text Book of Engineering Chemistry by S.S. Dara, S.Chand Publications, (10th Edition, 2007).

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	4	**1**	**0**	**4**

COMPUTER PROGRAMMING & DATA STRUCTURES

Prerequisites:
There are no prerequisites for this course, except that anyone who wants to learn C should have analytical skills and logical reasoning.

Objectives:
1. This course starts from the basics of computers and program development.
2. It covers various concepts of C programming language
3. It introduces searching and sorting algorithms
4. It provides an understanding of data structures such as stacks and queues.

Outcomes:
At the end of the course, the student will be able to:
1. Develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings; and data structures like stacks, queues and linked lists.
2. Implement searching and sorting algorithms

UNIT - I
Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

UNIT – II
Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.
Designing Structured Programs- Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto,

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register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

UNIT – III
Arrays and Strings – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples. Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

UNIT - IV
Derived types – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

Input and Output – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.

UNIT – V
Sorting and Searching selection sort, bubble sort, insertion sort, linear and binary search methods.

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

TEXT BOOKS:
1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES:

1. C & Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
3 Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
4. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
5. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
6. C Programming & Data Structures,E.Balagurusamy,TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S.Chand & Co.

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	4	**1**	**0**	**4**

CLASSICAL ENGINEERING MECHANICS

Pre Requisites: Nil

Objectives:

- To understand the resolving forces and moments for a given force system
- To analyze the types of friction for moving bodies and problems related to friction.
- To determine the centroid and second moment of area

Outcomes:

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

- Resolve forces and moments for a given system.
- Analyse the friction for moving bodies
- Determine centroid and second moment for a given area of a body.

UNIT-I : Introduction to Mechanics : Basic Concepts, system of Forces Coplanar Concurrent Forces -Components in Space -Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

UNIT-II : Friction: Types of friction -Limiting friction -Laws of Friction - static and Dynamic Frictions -Motion of Bodies -Wedge Screw, Screw-jack and differential screw –jack

UNIT-III : Centroid and Center of Gravity: Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity of Bodies – Centroids of Volumes – Center of gravity of composite bodies.

UNIT-IV : Area moments of Inertia: Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration - Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures, Product of Inertia, Transfer Formula for Product of Inertia.

UNIT-V : Mass Moment of Inertia: Introduction - Moment of Inertia of Masses – Radius of gyration - Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies.

TEXT BOOKS:

1. Singer's Engineering Mechanics Statics and Dynamics , K. Vijaya Kumar Reddy, J. Suresh Kumar, BS Publications, 3rd Edition(SI Units)Fifth impression 2013
2. Engg. Mechanics / Timoshenko & Young

REFERENCES:

1. Engg. Mechanics/ Irving Shames, G. Krishna Mohan Rao, Prentice Hall
2. Engg. Mechanics Umesh Regl / Tayal.
3. A text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain, Academic Publishing Company
4. Text Book in Applied Mechanics / Malhotra, Subramanian, Gahlot and Rathore / New Age.
5. Engg. Mechanics / KL Kumar / Tata McGraw Hill.
6. Engg. Mechanics / M.V. Seshagiri Rao & D Rama Durgaiah.
7. Engg. Mechanics / S.S. Bhavikati & K.G. Rajasekharappa

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	0	0	3	2

ENGINEERING PHYSICS LAB

LIST OF EXPERIMENTS

1. Dispersive power of the material of a prism –Spectrometer
2. Determination of wavelengths of a source-Diffraction Grating.
3. Newton's Rings-Radius of curvature of Plano convex lens.
4. Time constant of an R-C Circuit.
5. Magnetic field along the axis of current carrying coil-Stewart and Gee's method.
6. Bending Losses of Fibers & Evaluation of numerical aperture of given fiber.
7. Energy gap of material of PN- junction.
8. Torsional pendulum.
9. Determination of frequency of A.C Mains-Sonometer.
10. Diffraction grating using single slit- Laser source

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	0	**0**	**3**	**2**

APPLIED CHEMISTRY LAB

LIST OF EXPERIMENTS

1) Estimation of ferrous iron by Permanganometry.
2) Estimation of ferric iron by Dichrometry,
3) Estimation of copper by Iodometry
4) Estimation of Fe^{2+} & Fe^{3+} by dichrometry.
5) Estimation of hardness of water by Complexometry using EDTA,
6) Estimation of copper by Complexometry using EDTA.
7) Estimation of alkalinity of water.
8) Estimation of Permanent hardness by EDTA
9) Preparation of Thikol rubber
10) Estimation of iron in cement by Colorimetry; $KMnO_4$
11) Estimation of Mn in $KMnO_4$ by Colorimetry;
12) Estimation of HCl in a given solution by pH - metry.
13) Estimation of HCl in acid mixture by conductometry.
14) Estimation of Fe^{2+} by Potentiometry.

Recommeded Books:

1. Inorganic Quantitative Analysis by A.I.Vogel, ELBS Publications (2007).
2. Laboratory Manual of Engineering Chemistry by Y.Bharathi Kumari & Jyotsna C, VGS Booklinks, Vijayawada, 2009.
3. College Practical Chemistrty by V.K.Ahulwalia., Narosa Publications Ltd., New Delhi (2007)

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	0	**0**	**3**	**2**

COMPUTER PROGRAMMING & DATA STRUCTURES LAB

Week 1:

1. Write a C program to find the sum of individual digits of a positive integer.
2. 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 generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.

Week 2:

5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 3:

9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices
    ii) Multiplication of Two Matrices

Week 4:

11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not

13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.

Week 5:

15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:
    $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$
    For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
    Print x, n, the sum
    Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

Week 6:

18. 2'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.
19. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 7:

20. Write a C program that uses functions to perform the following operations:
    i) Reading a complex number
    ii) Writing a complex number
    iii) Addition of two complex numbers
    iv) Multiplication of two complex numbers
    (Note: represent complex number using a structure.)

Week 8:

21. i) Write a C program which copies one file to another.
    ii) Write a C program to reverse the first n characters in a file.
    (Note: The file name and n are specified on the command line.)
22. i) Write a C program to display the contents of a file.
    ii) 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)

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Week 9:

23. Write a C program that uses functions to perform the following operations on singly linked list.:
    i) Creation ii) Insertion iii) Deletion
    iv) Traversal

Week 10:

24. Write C programs that implement stack (its operations) using
    i) Arrays ii) Pointers
25. Write C programs that implement Queue (its operations) using
    i) Arrays ii) Pointers

Week 11:

26. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
    i) Bubble sort ii) Selection sort

Week 12:

27. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
    i) Linear search ii) Binary search

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L	T	P	C
3	1	0	3

MATHEMATICS – II
(Common to all Branches)

Pre Requisites: NIL

Objectives:

- Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and solution of partial differential equations.

Outcomes:

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

- gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations.

UNIT–I: Linear ODE with variable coefficients and series solutions (8 lectures)

Equations reducible to constant coefficients-Cauchy's and Legendre's differential equations. Motivation for series solutions, Ordinary point and Regular singular point of a differential equation, Transformation of non-zero singular point to zero singular point. Series solutions to differential equations around zero, Frobenius Method about zero.

Unit-II: Special Functions (8 lectures)

Bessel's Differential equation, Bessel functions properties: – Recurrence relations, Orthogonality, Generating function, Trigonometric expansions involving Bessel functions.

UNIT–III: Laplace Transform (8 lectures)

Definition of Integral transform. Domain of the function and Kernel for the Laplace transforms, Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem – Dirac's delta function, Periodic function – Inverse Laplace transform by Partial fractions(Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem-solving differential equations by Laplace transforms

UNIT – IV: Fourier series and Fourier Transforms (8 lectures)

Definition of periodic function. Fourier expansion of periodic functions in a given interval of length, 2π, Determination of Fourier coefficients – Fourier series of even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

Fourier integral theorem – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT-V: Partial Differential Equations (10 lectures)

Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and non-linear equations (Charpit's method).

Method of separation of variables for second order equations. Applications of Partial differential equations- one dimensional wave equation., Heat equation.

Text books:

1) HIGHER ENGINEERING MATHEMATICS BY B S GREWAL, KHANNA PUBLICATIONS.
2) ENGINEERING MATHEMATICS BY ERWIN KREYSZIG, WIELY PUBLICATIONS

References:

1) ENGINEERING MATHEMATICS BY SRIMANTAPAL & SUBODH C. BHUNIA, OXFORD UNIVERSITY PRESS.
2) ADVANCED ENGINEERING MATHEMATICS BY PETER V O'NEIL, CENGAGE LEARNING

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L	T	P	C
3	0	0	3

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Prerequisites: NIL

Objectives:
- To introduce the concept of electrical circuits and its components.
- To introduce the characteristics of various electronic devices.
- To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

Outcomes:
At the end of the course, the student will be able to:
- To analyze and solve electrical circuits using network laws and theorems.
- To design & analyse various circuits using electronic components viz. diodes, transistors & other special purpose devices.

UNIT- I ELECTRICAL and SINGLE PHASE AC CIRCUITS
Electrical Circuits - R-L-C Parameters, Voltage and Current Independent and Dependent Sources, Source Transformation – V–I relationship for Passive elements, Kirchoff's Laws, Network reduction techniques – series, parallel, series parallel, star–to-delta, delta-to-star transformation,
Single Phase AC Circuits - R.M.S. and Average values, Form Factor, steady state analysis of series, Parallel and Series parallel Combinations of R, L and C with Sinusoidal excitation, concept of reactance, Impedance, Susceptance and Admittance – phase and phase difference, Concept of Power Factor, j-notation.

UNIT- II RESONANCE and NETWORK THEOREMS
Resonance – Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.
Network Theorems - Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity theorems for DC and AC excitations.

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UNIT- III P-N JUNCTION DIODE & DIODE CIRCUITS
P-N Junction Diode - Diode equation, Energy Band diagram, Volt-Ampere characteristic, Temperature dependence, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.
Rectifiers and Filters - The P-N junction as a rectifier - A Half Wave Rectifier, Ripple Factor, Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT- IV BIPOLAR JUNCTION TRANSISTOR
Bipolar Junction Transistor (BJT) - Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations.

Transistor Configurations - BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

UNIT- V JUNCTION FIELD EFFECT TRANSISTOR & SPECIAL PURPOSE DEVICES:
Junction Field Effect Transistor - Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and JFET.

Special Purpose Devices - Breakdown Mechanisms in Semi Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With the help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

TEXT BOOKS:
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, Mc Graw Hill Company, 6th edition.

REFERENCES:
1. Introduction to Electronic Devices and Circuits-Rober T. Paynter, Pearson Education.

2. Electronic Devices and Circuits - K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
3. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal – Wiley India Pvt. Ltd. 1/e 2009.
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.

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L	T	P	C
3	0	0	3

ENGLISH

1. INTRODUCTION:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read the topics selected for discussion on their own in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material, etc. *However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.*

2. OBJECTIVES:

a. To improve the language proficiency of the students in English with emphasis on LSRW skills.
b. To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
c. To develop the study skills and communication skills in formal and informal situations.

LEARNING OUTCOMES:

1. Use of English Language - written and spoken.
2. Enrichment of comprehension and fluency
3. Gaining confidence in using language in verbal situations.

SYLLABUS:

Listening Skills:

Objectives

1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them, to distinguish between them, to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students express themselves fluently and appropriately in social and professional contexts.
   - Oral practice
   - Describing objects/situations/people
   - Role play – Individual/Group activities (Using exercises from the five units of the prescribed text: ***Skills Annexe–Functional English for Success)***
   - Just A Minute (JAM) Sessions.

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Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences, etc.
   - Skimming the text
   - Understanding the gist of an argument
   - Identifying the topic sentence
   - Scanning
   - Inferring lexical and contextual meaning
   - Understanding discourse features
   - Recognizing coherence/sequencing of sentences

NOTE: *The students will be trained in reading skills using the prescribed text for detailed study.*
They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:
Objectives

1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.
   - Writing sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness
   - Narration / description
   - Note Making
   - Formal and informal letter writing
   - Describing graphs using expressions of comparison

TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into **Five Units**, are prescribed:

For Detailed study: **First Textbook:** ***"Skills Annexe -Functional English for Success***", Published by Orient Black Swan, Hyderabad

For Non-detailed study
Second Textbook ***"Epitome of Wisdom",*** Published by Maruthi Publications, Hyderabad.

- The course content and study material is divided into **Five Units.**

Unit –I

1. Chapter entitled '***Wit and Humour***' from '**Skills Annexe' - Functional English for Success**, Published by Orient Black Swan, Hyderabad
2. Chapter entitled **'*Mokshagundam Visvesvaraya'*** from ***"Epitome of Wisdom",*** Published by Maruthi Publications, Hyderabad.

   L - Listening for Sounds, Stress and Intonation
   S - Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)
   R - Reading for Subject/ Theme- ***The Palm Islands*** from Epitome of Wisdom is for **Reading Comprehension**
   W - Writing Paragraphs
   G - Types of Nouns and Pronouns
   V - Homonyms, Homophones & Homographs

Unit –II

1. Chapter entitled "***Cyber Age"*** from "***Skills Annexe -Functional English for Success***" Published by Orient Black Swan, Hyderabad.
2. **Report Writing (First & Second Textbooks)**
   L - Listening for themes and facts
   S - Apologizing, interrupting, requesting and making polite conversation
   R- Reading for theme and gist- The 1 Thing Every Business Executive Must Understand about Social Media by Dave Kerpen from Skills Annexe is for **Reading Comprehension**
   W - Describing people, places, objects, events
   G - Verb forms
   V - Noun, Verb, Adjective and Adverb

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Unit –III

1. Chapter entitled **'*Risk Management'*** from **"*Skills Annexe - Functional English for Success*"** Published by Orient Black Swan, Hyderabad
2. Chapter entitled **'*Leela's Friend'*** by R.K. Narayan from ***"Epitome of Wisdom",*** Published by Maruthi Publications, Hyderabad
   L - Listening for main points and sub-points for note taking
   S - Giving instructions and directions; Speaking of hypothetical situations
   R - Reading for details- *Sivakasi: Who to Blame for the Frequent Fire Accidents in India's Largest Fireworks Industry Hub?* by Amrutha Gayathri from Skills Annexe & *Forensic Science* from Epitome of Wisdom are for **Reading Comprehension**
   W - Note-making, Information transfer, Punctuation
   G - Present tense
   V - Synonyms and Antonyms

Unit –IV

1. **Letter Writing – Writing formal letters, letter of application along with curriculum vitae (First & Second Textbooks)**
2. Chapter entitled ***'The Last Leaf'*** from ***"Epitome of Wisdom",*** Published by Maruthi Publications, Hyderabad
   L - Listening for specific details and information
   S - Narrating, expressing opinions and telephone interactions
   R - Reading for specific details and information- *What I Cherish Most* by V. S. Srinivasa Sastri from Skills Annexe & *Choose How to Start Your Day* from Epitome of Wisdom are for **Reading Comprehension**
   W - Writing e-mails
   G - Past and Future tenses
   V - Vocabulary - Idioms and Phrasal verbs

Unit –V

1. Chapter entitled '***Sports and Health'*** from ***"Skills Annexe - Functional English for Success***" Published by Orient Black Swan, Hyderabad
2. Chapter entitled ***'The Convocation Speech'*** by N.R. Narayanmurthy' from ***"Epitome of Wisdom",*** Published by Maruthi Publications, Hyderabad
   L - Critical Listening and Listening for speaker's tone/ attitude
   S - Group discussion and Making presentations
   R - Critical reading, reading for reference - *Benefits of Physical Activity* from Skills Annexe & *What is meant by*

Entrepreneurship? from Epitome of Wisdom are for **Reading Comprehension**

W - Project proposals; Project Reports and Research Papers
G - Adjectives, Prepositions and Concord
V - Collocations and Technical vocabulary, Using words appropriately

- **Exercises from the texts not prescribed shall be used for classroom tasks.**

REFERENCES:

1. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw – Hill.
2. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
3. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
4. Technical Communication, Meenakshi Raman, Oxford University Press
5. Practical English Usage, Michael Swan, Oxford University Press
6. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
7. English Grammar Practice, Raj N Bakshi, Orient Longman.
8. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
9. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.
10. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
11. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO

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JNTUH COLLEGE OF ENGINEERING HYDERABAD

I Year B.Tech. Mech. Engg. II-Sem

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ENGINEERING GRAPHICS

Pre-requisites: Nil

Course objectives:

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

Outcomes:

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

- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT – I

INTRODUCTION TO ENGINEERING DRAWING :

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid,
Involute. Scales – Plain, Diagonal and Vernier Scales.

UNIT- II

ORTHOGRAPHIC PROJECTIONS:

Principles of Orthographic Projections – Conventions – Projections of Points and Lines
Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III

Projections of Regular Solids – Auxiliary Views.

UNIT – IV

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere.
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

UNIT – V

ISOMETRIC PROJECTIONS :

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Auto CAD: Basic principles only

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and Graphics Rane and Shah/ Pearson Edu.

REFERENCE BOOKS:

1. A Text Book of Engineering Drawing / Dhawan R K / S. Chand
2. Engineering Graphics With Auto CAD / James D Bethune / Pearson Edu.
3. Engineering Graphics / K R Mohan / Dhanpat Rai.
4. Text book on Engineering Drawing / KL Narayana/ P Kannaih/ Scitech

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I Year B.Tech. Mech. Engg. II-Sem	**L**	**T**	**P**	**C**
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ENVIRONMENTAL SCIENCE

Prerequisites : NIL

Objectives:

- Creating the awareness about environmental problems among students.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating students to participate in environment protection and environment improvement.

Outcomes:

At the end of the course, it is expected that students will be able to:

- Identify and analyze environmental problems as well as the risks associated with these problems
- Understand what it is to be a steward in the environment
- Studying how to live their lives in a more sustainable manner

UNIT- I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:

Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - II

ECOSYSTEMS : Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - III

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

UNIT - IV

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

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

UNIT - V

SOCIAL ISSUES AND THE ENVIRONMENT : From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its

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problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. - Wasteland reclamation. –Consumerism and waste products. - Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

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

FIELD WORK : Visit to a local area to document environmental assets River /forest grassland/hill/mountain -Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds. -Study of simple cosystemspond,
river, hill slopes, etc.

TEXT BOOK:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.,UniversitiesPress
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE:

1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

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COMPUTATIONAL MATHEMATICS
(Common to all Branches)

Pre Requisites: NIL

Objectives:

- This course aims at providing the student with the concepts of matrices, numerical techniques and curve fitting.

Outcomes:

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

- analyze engineering problems using the concepts of Matrices and Numerical Methods.

UNIT-I: Matrices and Linear Transformations (8 lectures)

Real matrices – Symmetric, skew – symmetric, orthogonal. Complex matrices: Hermitian, Skew-Hermitian and Unitary Matrices. Idempotent matrix, Finding rank of a matrix by reducing to Echelon and Normal forms. Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix.

Cayley-Hamilton Theorem (without Proof) – Verification. Finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors. Linear Transformation – Orthogonal Transformation. Eigen values and Eigen vectors of a matrix. Properties of Eigen values and Eigen vectors of matrices. Diagonolization of matrix – Quadratic forms upto three variables- Reduction of quadratic form to canonical form, Rank – Positive definite, negative definite – semi definite – index – signature of quadratic form.

UNIT–II: Interpolation and Curve fitting (5 lectures)

Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols- Difference Equations – Differences of a polynomial-Newton's formulae for interpolation –Interpolation with unevenly spaced points-Lagrange's Interpolation formula. **Curve fitting**: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

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UNIT–III: Numerical techniques (5 lectures)

Solution of Algebraic and Transcendental Equations and Linear system of equations.

Introduction – Graphical interpretation of solution of equations .The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method .

Solving system of non-homogeneous equations by L-U Decomposition method(Crout's Method)Jacobi's and Gauss-Seidel Iteration method

UNIT- IV: Numerical Differentiation, Integration: (5 lectures)

Numerical differentiation, Numerical integration – Trapezoidal rule, Simpson's $1/3^{rd}$ and 3/8 Rule , Generalized Quadrature.

UNIT – V: Numerical solutions of First order differential equations (5 lectures)

Numerical solution of Ordinary Differential equations: Solution by Taylor's series method –Picard's Method of successive Approximation- single step methods-Euler's Method-Euler's modified method, Runge-Kutta Methods.

Text Books:

1) INTRODUCTORY METHODS OF NUMERICAL ANALYSIS BY SS SASTRY
2) NUMERICAL AND STATISTICAL METHODS WITH PROGRAMMING IN C BY SUJATHA SINHA AND SUBHABRADA DINDA, SCITEC PUBLISHERS.
3) NUMERICAL METHODS, PRINCIPLES, ANALYSIS AND ALGORITHMS BY SRIMANTAPAL & SUBODH C. BHUNIA, OXFORD UNIVERSITY PRESS.

References:

1) ADVANCED ENGINEERING MATHEMATICS BY ALAN JEFFERY
2) APPLIED NUMERICAL METHODS USING MATLAB BY RAO.V.DUKKIPATI, NEW AGE PUBLISHERS
3) NUMERICAL METHODS IN SCIENCE AND ENGINEERING –APRACTICAL APPROACH BY S.RAJASEKHARAN, S.CHAND PUBLICATIONS

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ENGINEERING WORKSHOP

Pre-requisites: **Practical skill**

Objectives:

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

Outcomes:

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

- Better understanding the process of assembly of computer parts and installation of different software's.
- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

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I. TRADES FOR EXERCISES :

(Any **six** trades from the following with minimum of **two** exercises in each trade)

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

II. Trades for Demonstration & Exposure

1. Demonstration of power tools & wiring
2. Welding
3. Machine Shop

III. **IT Workshop I:** Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, simple diagnostic exercises.

IT Workshop II: Installation of operating system windows and linux simple diagnostic exercises.

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ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

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

Objectives

- To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
- To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

Learning Outcomes

- Better Understanding of nuances of language through audio- visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking with clarity and confidence thereby enhancing employability skills of the students

SYLLABUS

English Language Communication Skills Lab shall have two parts:

a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

The following course content is prescribed for the **English Language Communication Skills Lab**

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

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Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

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.
Concord (Subject in agreement with verb) and Words often misspelt-confused/misused

Exercise - III
CALL Lab: Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.
ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.
Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV
CALL Lab: Intonation and Common errors in Pronunciation.
ICS Lab: Extempore- Public Speaking
Active and Passive Voice, –Common Errors in English, Idioms and Phrases

Exercise – V
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Information Transfer- Oral Presentation Skills
Reading Comprehension and Job Application with Resume preparation.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**
   The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.
   System Requirement (Hardware component):
   Computer network with Lan with minimum 60 multimedia systems with the following specifications:
   i) P – IV Processor
      a) Speed – 2.8 GHZ
      b) RAM – 512 MB Minimum
      c) Hard Disk – 80 GB
   ii) Headphones of High quality

2. Interactive Communication Skills (ICS) Lab :

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

Suggested Software:

- **Cambridge Advanced Learners' English Dictionary with CD.**
- **Grammar Made Easy by Darling Kindersley**
- **Punctuation Made Easy by Darling Kindersley**
- Clarity Pronunciation Power – Part I
- Clarity Pronunciation Power – part II
- **Oxford Advanced Learner's Compass, 8th Edition**
- ***DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.***
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge**
- **English Pronunciation in Use** (Elementary, Intermediate, Advanced) Cambridge University Press
- Raman, M & Sharma, S. 2011. Technical Communication, OUP
- Sanjay Kumar & Pushp Lata. 2011. Communication Skills, OUP

SUGGESTED READING:

1. Rama Krishna Rao, A. *et al. English Language Communication Skills – A Reader cum Lab Manual Course Content and Practice.* Chennai: Anuradha Publishers
2. Suresh Kumar, E. & Sreehari, P. 2009. *A Handbook for English Language Laboratories*. New Delhi: Foundation
3. *Speaking English Effectively* 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
4. Sasi Kumar, V & Dhamija, P.V. *How to Prepare for Group Discussion and Interviews*. Tata McGraw Hill
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. *English Pronunciation in Use. (Elementary, Intermediate & Advance).* Cambridge: CUP
7. Chris Redston, Gillie Cunningham, Jan Bell. *Face to Face* (2nd Edition). Cambridge University Press
8. Nambiar, K.C. 2011. *Speaking Accurately. A Course in International Communication.* New Delhi : Foundation

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9. Soundararaj, Francis. 2012. *Basics of Communication in English. New Delhi: Macmillan*
10. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 30 sessional marks and 70 semester-end Examination marks. Of the 30 marks, 20 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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COMPUTATIONAL MATHEMATICS LAB
(Common to all Branches)

UNIT- I: Interpolation
Programming Tasks:

A) Write a program to determine y for a given x, if two arrays of x and y of same size are given (using Newton's interpolation both forward and backward)
B) Write a program to determine y for a given x, if two arrays of x and y of same size are given.(using Lagrange 's interpolation)
C) Write a program to determine y for a given x, if two arrays of x and y of same size are given.(using Gauss interpolation)
(Selection criteria of the interpolation formula are important.)

UNIT- 1I: Curve fitting
Programming Tasks:

A) Write a program to find a line of best fit from the given two arrays of x and y of same size.
B) Write a program to find a curve of the form $y = Ae^{Bx}$ from the given two arrays of x and y of same size.
C) Write a program to find a curve of the form $y = Ax^{B}$ from the given two arrays of x and y of same size.
D) Write a program to find a curve of the form $y = Ax^2 + Bx + C$ from the given two arrays of x and y of same size.

UNIT- 1II: Solution of Algebraic and Transcendental Equations
Programming Tasks:

A) Write a program to find the root of a given equation using bisection method.
(Write this program such that the initial values given to the system are not usable, then the system should ask us to give new set of initial values).
B) Write a program to find the root of a given equation using method of false position(regula false position).
C) Write a program to find the root of a given equation using iteration method.
D) Write a program to find the root of a given equation using Newton Rophson method.

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UNIT- IV: Linear system of equations
Programming Tasks:

A) Write a program to find the solution of given system of linear equations using L- U decomposition method.
B) Write a program to find the solution of given system of linear equations using jacobi's method.
C) Write a program to find the solution of given system of equations using Gauss sidel iteration method.
D) Write a program to find the solution of given system of equations using Gauss Jordan elimination method.

UNIT-V:Numerical Differentiation, Integration and Numerical solutions of First order differential equations
Programming Tasks:

A) Write a program to evaluate definite integral using trapezoidal rule, Simpson's 1/3rd rule and 3/8th rule.
B) Write a program to solve a given differential equation using Taylor's series.
C) Write a program to solve a given differential equation Euler's and modified Eulers method.
D) Write a program to solve a given differential equation using Ruge-Kutta method.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Mech. Engg. I-Sem

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MATHEMATICS – III

Pre Requisites: No Pre Requisites, Foundation Course.

Objectives:
To enable the students to understand the concepts of probability distributions, statistical Inferences, and testing of hypothesis.To enable the students to understand the key concepts of Complex functions and the calculus of complex functions.

Outcomes:
The student achieves the knowledge to testing the hypothesis and form the probability distributions to make inferences. The students can study some problems of engineering using the concepts of residue theorem, Laurent series of functions of complex variables.

UNIT-I: Single Random variables and probability distributions. (12 lectures)

Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution . Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution.

Binomial , Poisson & normal distributions and their properties . Moment generating functions of the above three distributions. and hence finding the mean and variance.

UNIT-II: Multiple Random variables, Correlation & Regression (10 lectures)

Covariance of two random variables, Correlation -Coefficient of correlation, The rank correlation. Regression- Regression Coefficient, The lines of regression.

UNIT-III: Sampling Distributions and Testing of Hypothesis (10 lectures)

Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and varience, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of varience.

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Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, Two sided test,

Large sample tests:

1) Test of Equality of means of two samples equality of sample mean and population mean (cases of known varience & unknown varience, equal and unequal variances)
2) Tests of significance of difference between sample S.D and population S.D.
3) Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

Small sample tests:

1) Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples
2) Chi-square distribution , it's properties, Chi-square test of goodness of fit .

UNIT-IV: Functions of Complex Variables (12 lectures)

Complex functions and its representation on Argand plane, Concepts of limit Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions – Milne – Thompson method.

Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

Radius of convergence– Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point–Isolated singular point– pole of order m– essential singularity.

UNIT – V: Contour Integration (12 lectures)

Residue – Evaluation of residue by formula and by Laurent series – Residue theorem.
Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta,\sin\theta)d\theta$

Conformal mapping.

Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection, Transformations like e^z, log z, z^2, and

Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given .

Text Books:

1) FUNDAMENTALS OF MATHEMATICAL STATISTICS BY S C GUPTA AND V.K.KAPOOR
2) PROBABILITY AND STATISTICS FOR ENGINEERS AND SCIENTISTS BY SHELDON M.ROSS,ACADEMIC PRESS
3) HIGHER ENGINEERING MATHEMATICS BY B S GREWAL.
4) ADVANCED ENGINEERING MATHEMATICS BY PETER V O'NEIL, CENGAGE LEARNING
5) ENGINEERING MATHEMATICS BY ERWIN KREYSZIG,10TH EDITION WIELY PUBLICATIONS

References:

1) ENGINEERING MATHEMATICS BY SRIMANTAPAL & SUBODH C. BHUNIA, OXFORD UNIVERSITY PRESS.
2) ADVANCED ENGINEERING MATHEMATICS BY PETER V O'NEIL, CENGAGE LEARNING.
3) PROBABILITY AND STATISTICS FOR ENGINEERING AND THE SCIENCEC BY JAY L.DEVORE.

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METALLURGY AND MATERIAL SCIENCE

Prerequisites:
Basic idea of bonding nature in solids and different properties of elements

Objectives:
Understand the crystal structure and classification of materials and determining mechanical properties and their suitability for applications. Classify cast irons and study their applications. Interpret the phase diagrams of materials. Select suitable heat-treatment process to achieve desired properties of metals and alloys. Understand the ceramics and composite materials and their properties.

Course outcomes:
The student an able to understand basic idea of the the different material properties and heat treatment process of ferrous and non ferrous alloys with respect to phase diagrams.

UNIT – I
Structure of Metals : Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.
Constitution of Alloys : Necessity of alloying, types of solid solutions,

Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT -II
Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe_3C.

UNIT -III

Cast Irons and Steels : Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plan carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – IV

Heat treatment of Alloys : Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering , Hardenability surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – V

Ceramic materials : Crystalline ceramics, glasses, cermaets, abrasive materials, nonomaterials – definition, properties and applications of the above.

Composite materials : Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

TEXT BOOKS :

1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. Material science & Metallurgy / Kodgire

REFERENCE BOOKS :

1. Science of Engineering Materials / Agarwal
2. Materials Science / Vijendra Singh
3. Elements of Material science / V. Rahghavan
4. An introduction to material science / W.g.vinas & HL Mancini
5. Material science & material / C.D.Yesudian & harris Samuel
6. Engineering Materials and Their Applications – R. A Flinn and P K Trojan / Jaico Books.

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MECHANICS OF SOLIDS

Pre-requisites: Basics of Engineering Mechanics

Course Outcomes:

Understand simple stress and strains of problems. Determine the resistance and deformation in member's subjected to axial, flexural and torsional loads. Evaluate the forces in pin joint – plane frames. Determine the deflections of beams using different methods. Analyze and design thin, thick cylinders and springs

UNIT-I

SIMPLE STRESSES AND STRAINS : Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT-II

SHEAR FORCE AND BENDING MOMENT : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilver, simply supported and overhanging beams subjected to point loads , u.d.l, uniformly varying loads and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-III

FLEXURAL STRESSES :

Theory of simple bending – Assumptions Derivation of bending equation : M/I=f/y=E/R Neutral axis – Determination bending stresses – section modules of rectangular and circular sections (Solid and Hollow), I,T,Angle and Channel sections – Design of simple beam sections.

Shear Stresses : Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT-IV

ANALYSIS OF PIN-JOINTED PLANE FRAMES : Determination of Forces in members of plane, pin-joined, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses – by method of joints, method of sections and tension coefficient methods.

DEFLECTION OF BEAMS : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

UNIT-V

THIN CYLINDERS : Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

Thick Cylinders – lame's equation – cylinders subjected to inside and out side pressures – compound cylinders.

TEXT BOOKS :

1. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman
2. Strength of Materials by Jondar : Galgotia Publications

REFERENCES :

1. Strength of Materials by Bansal, Lakshmi Publications
2. Strenght of Mateirals by S. Tumoshenko
3. Strength of Materials by R.S. Khurmi; S. Chand & Co. 2005

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THERMODYNAMICS

Pre-requisite: Engineering Chemistry and Physics

Course Objective:

To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications

Course Outcomes:

At the end of the course, the student should be able to Understand and differentiate between different thermodynamic systems and processes. Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis. Understand and analyze the Thermodynamic cycles and evaluate performance parameters.

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables

UNIT – I

Introduction: Basic Concepts:

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

UNIT II

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

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump , Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality,

Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT – III

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

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes

UNIT - IV

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables

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

UNIT - V

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

Refrigeration Cycles:

Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS :

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Thermodynamics / C.P.Arora.

REFERENCE BOOKS:

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1. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
2. Fundamentals of Classical Thermodynamics – G. Van Wylan & R.E. Sonntag – John Wiley Pub.
3. Thermodynamics – J.P.Holman / McGrawHill
4. Engineering Thermodynamics – Jones & Dugan
5. An introduction to Thermodynamics / YVC Rao / New Age
6. Thermodynamics & Heat Engines – Yadav – Central Book Depot, Allahabad.
7. Thermodynamics – Achutan – PHI.
8. Thermodynamics – G.C. Gupta – Pearson Publications.

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KINEMATICS OF MACHINES

Prerequisites: Basic principles of mechanics

Course Objectives:
The objective is to study the relative motion, velocity and accelerations of the various elements in a mechanism. In mechanical Engineering we come across number of mechanisms such as four bar/slider crank/double slider crank/straight line motion mechanism etc. Mechanism deals with only relative motions. Once we make a study considering for us also there it is called kinetics. The first course deals with mechanisms, their inversions straight line motion mechanisms steering mechanisms etc. Also study of cams/gears& gear trains & belts is also introduced.

Course out Comes:
The main purpose is to give an idea about the relative motions obtained in all the above type of components used in mechanical Engineering.

UNIT – I
Mechanisms : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained .
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.
Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration
Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

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

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 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. Theory of Machines /S.S.Rattan – Tata McGraw Hill Publishers.
2. Kinematics & Dynamics Of machinery/Norton/TMH

REFERENCE BOOKS:
1. Theory of Machines / Thomas Bevan/CBS
2. Theory of Machines / Sadhu Singh / Pearson.
3. Theory of Machines / Shigley / Oxford
4. Mechanism and Machine Theory / JS Rao and RV Duggipati / New Age
5. Theory of Machines by / R.K. Bansal (Lakshmi Publications).

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MACHINE DRAWING PRACTICE

Pre-requisites: Engineering Drawing

Course objectives:
To familiarize with the standard conventions for different materials and machine parts in working drawings. To make part drawings including sectional views for various machine elements. To prepare assembly drawings given the details of part drawings.

Course Outcomes:
Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.

Question Paper Pattern:
Question paper has two parts. Part one has five questions out of which answer three (each 10 marks). Part two has one question (assembly with three views) and it is to be answered compulsorily (it carries 50 marks)

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
5. Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts
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, cottered joints and knuckle joint.
8. Rivetted joints for plates
9. Shaft coupling, spigot and socket pipe joint.

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

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 - Screws jacks, 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 BOOK :
1. Machine Drawing –K.L.Narayana/ Wiley Eastern.

REFERENCE BOOKS :
1. Machine Drawing – P.S.Gill.
2. Machine Drawing – Junnarkar N.D./ Pearson Edu.

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MECHANICS OF SOLIDS AND METALLURGY LAB

Pre-requisites: Chemistry & Physics

Course Outcomes:
At the end of the course, the student will be able to Conduct tension test on steel, aluminium, copper and brass. Perform compression tests on spring and wood.Determine elastic constants using flexural and torsion tests. Determine hardness of metals

MECHANICS OF SOLIDS LAB

List of Experiments:

1. To study the stress -strain characteristics of (a) Mild Steel and (b) Tor steel by conducting tension test on U.T.M
2. To study the stress - strain characteristics of (a) Copper and (b) Aluminium by conducting tension test on Hounsfield Tensometer
3. To find the Compressive strength of wood and punching shear strength of G.I. sheet by conducting relevent tests on Housfield Tensometer
4. To find the Brinnell's and Vicker's hardness numbers of (a) Steel (b) Brass (c) Aluminium (d) Copper by conducting hardness test.
5. To determine the Modulus of rigidity by conducting Torsion test on (a) Solid shaft (b) Hollow shaft
6. To find the Modulus of rigidity of the material of a spring by conducting Compression test.
7. To determine the Young's modulus of the material by conducting deflection test on a simply supported beam.
8. To determine the Modulus of elasticity of the material by conducting deflection test on a Propped Cantilever beam.

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9. To determine the Modulus of elasticity of the material by conducting deflection test on a continuous beam
10. Ductility test for steel
11. Shear test on Mild Steel rods

METALLURGY LAB

1. Preparation and study of Crystal models.
2. Study of: Specimen cutting machine Specimen mounting press Grinding and polishing equipment
3. Study of various Metallurgical Microscopes and use of leveling press
4. Metallographic preparation of ferrous specimen for Microscopic examination
5. Preparation of non-ferrous specimen for Metallographic examination
6. Preparation and Metallographic study of pure metals like Iron, Copper and Aluminium.
7. Measurement of lattice parameters of various crystal structures and calculation of packing factors and size of vacancies.
8. Identification of Microstructures of steels.
9. Estimation of Carbon content of steels using metallurgical microscope and Spark test.Thermal analysis.

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FUELS AND LUBRICANTS LAB

Prerequisite: Chemistry

Objectives: To Understand the fuel and lubricants properties

1. Determination of Flash and Fire points of Liquid fuels/Lubricants.
2. Carbon residue test: Liquid fuels.
3. Determination of Viscosity: Liquid lubricants.
4. Determination of Calorific value: Solid/Liquid/Gaseous fuels.
5. Greese penetration test.
6. Viscosity determination by Redwood & Saybolt methods.
7. Bomb/ Junkers Gas Calorimeter.

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HUMAN VALUES AND PROFESSIONAL ETHICS

Unit I

Human Values: Morals, values, ethics – integrity – work ethics –service learning –civic virtue – respect for others- living peacefully - Caring – sharing –honesty – courage –valuing time – cooperation – commitment – empathy – self-confidence –spirituality – character- Mini-Cases

Unit II

Professional Ethics: Profession- and professionalism - Two models of professionalism –Professional etiquette -Three types of Ethics or morality Responsibility in Engineering – Engineering standards –Engineering Ethics – Positive and Negative Faces. Professional Codes and Code of conduct (as given by ASME, ASCE, IEEE, IETE, Institute of Engineers as Guidelines for ethical conduct). Mini-cases.

Unit III

Professional Responsibilities: Ethical standards Vs Professional Conduct – Zero Tolerance for Culpable Mistakes – Hazards and Risks- Risk benefit analysis– congeniality, collegiality and loyalty. Respect for authority – conflicts of interest – occupational crime —Mini-Cases.

Unit IV

Professional Rights: professional rights and employee rights communicating risk and public policy – Whistle blowing - collective bargaining. Professionals /engineers as managers, advisors, experts, witnesses and consultants – moral leadership- Regulatory compliances, Monitoring and control- Mini-Cases

Unit V

Ethics in global context: Global issues in MNCs- Problems of bribery, extortion, and grease payments – Problem of nepotism, excessive gifts – paternalism – different business practices – negotiating taxes. Mini-Cases.

Mini-projects

Project 1: The student of this course should invariably attend (or watch on internet/any TV channel/youtube/social media) two speeches of 30 minutes duration each dealing with spiritual discourse and submit a report on the contents of the lecture proceedings.

Project 2: Visit any organization (including shops/ hotels or shopping malls in your region) of your choice and observe how the professionals perform the given job with a focus on professional ethics and human values.

References

1. Aryasri, *Human Values and Professional Ethics*, Maruthi Publications.
2. S B George, *Human Values and Professional Ethics,* Vikas Publishing.
3. KR Govindan & Saenthil Kumar:Professional *Ethics and Human Values*, Anuradha Publications.
4. S K Chakraborthy & D.Chakraborthy: *Human Values and Ethics*, Himalaya.
5. M. Govindarajan, S. Natarajan, & V.S. Senthilkumar: *Engineering Ethics(Includes Human Values),* HI Learning Pvt. Ltd., New Delhi – 110001

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FLUID MECHANICS & HYDRAULIC MACHINERY

Pre-requisites: None

Course Outcomes:
Understand the basic static, kinematic and dynamic principles and conservation laws to fluid flow problems in engineering applications. Design experimental procedure for physical model studies. Design the working proportions of hydraulic machines. Compute drag and lift coefficients using the theory of boundary layer flows. Analyze of free surface and pipe flows. Formulate and solve one dimensional compressible fluid flow problems. Study of different types of pumps and turbines.

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

REFERENCES:

1. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
2. Fluid mechanics and machinery by D. Rama Durgaiah, New age international.
3. Hydraulic machines by Banga and Sharma, Khanna publishers

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THERMAL ENGINEERING – I

Pre-requisite: Thermodynamics

Course Objective:

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

Course Outcomes:

At the end of the course, the student should be able to Evaluate the performance of IC engines and compressors under the given operating conditions.Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles.Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance

UNIT – I

I.C. Engines:

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

UNIT – II

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

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

UNIT III

Testing and Performance:

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

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

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

UNIT – IV

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

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

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

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- Vapour absorption system – mechanical details – working principle, Use of p-h charts for calculations

Air-Conditioning: Concepts of Psychrometry – Properties of moist air – Usage of Psychrometric Chart – Calculation of moist air properties.

Types of air –conditioning systems – Requirements –– schematic layout of a typical plant.

TEXT BOOKS:

1. I.C. Engines / V. Ganesan- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.
3. Thermal Engineering / P.K.Nag

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REFERENCE BOOKS:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy - TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot., Allahabad
5. I.C. Engines / Heywood /McGrawHIll.
6. Thermal Engineering – R.S. Khurmi & J.K.Gupta – S.Chand

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DYNAMICS OF MACHINES

Pre-requisite: Kinematics of machines

Course Outcomes:
At the end of course the student is able to design various machine members like shafts, bearings, gears, belts & chains and various I.C. Engine Components & Machine tool parts.

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.-.

UNIT – III
Friction: pivots and collars – uniform pressure, uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – film lubrication. 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
Governors: Types of governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs.

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Sensitiveness, isochronisms and hunting **–** stability – effort and power of the governors.

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

UNIT – V
Vibrations: Free Vibration of mass attached to vertical spring – 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.

TEXT BOOKS:
1. Theory of Machines, S.S.Rattan.
2. Theory of Machines, R.S.Khurmi

REFERENCE BOOKS:
1. Theory of Machines, Shigley, Mc Graw Hill Publishers
2. Theory of Machines, Thomas Bevan, CBS Publishers
3. Theory of Machines, R.K.Bansal (Lakshmi publications)
4. Mechanism and Machine Theory, JS Rao and RV Duggipati, New Age

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PRODUCTION TECHNOLOGY

Pre-requisites: Basic Mechanical Engineering

Course Outcomes:
Understand the idea for selecting materials for patterns. Types and allowances of patterns used in casting and analyze the components of moulds. Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes. Develop process-maps for metal forming processes using plasticity principles.Identify the effect of process variables to manufacture defect free products.

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

UNIT – II
Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III
Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

w.e.f. 2017-2018 academic year

UNIT – IV
Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth.
Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements
Stamping, forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.
Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – V
Extrusion of Metals : Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion
Forging Processes : Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

TEXT BOOKS :
1. Manufacturing Technology / P.N. Rao/TMH

REFERENCE BOOKS :
1. Production Technology / R.K. Jain
2. Metal Casting / T.V Ramana Rao / New Age
3. Principles of Metal Castings / Rosenthal.
4. Welding Process / Parmar /
5. Production Technology /Sarma P C /
6. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Mech. Engg. II-Sem

L	T	P	C
3	0	0	3

INSTRUMENTATION AND CONTROL SYSTEMS

Prerequisite: Mathematics-I, Thermodynamics, Basic of Electrical and electronic Engineering.

Course Objectives: Understanding the basic characteristic of a typical instrument. Identifying errors and their types that would occur in a instrument. Identifying properties used for evaluating the thermal systems. The concept of transducer and Various types and their characters.

Course Outcome: To identify various elements and their purpose in typical instruments, to identify various errors that would occur in instruments. Analysis of errors so as to determine correction factors for each an instrument. To understand static and dynamic characteristics of instrument and should be able to determine loading response time. For given range of displacement should be able to specify transducer, it accurate and loading time of that transducer.

UNIT – I

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional description of measuring instruments – examples. Static and Dynamic performance characteristics – sources of errors, Classification and elimination of errors.

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT – II

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

Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge. Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, Mcleod pressure gauge.

w.e.f. 2017-2018 academic year

UNIT – III

Measurement of Level: Direct methods – Indirect methods – Capacitive, Radioactive, Ultrasonic, Magnetic, Cryogenic Fuel level indicators – Bubbler level indicators.

Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed : Mechanical Tachometers, Electrical tachometers, Non- contact type-Stroboscope

Measurement of Acceleration and Vibration : Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

UNIT – IV

Stress-Strain measurements : Various types of stress and strain measurements –Selection and installation of metallic strain gauges- electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – Temperature compensation techniques, Use of strain gauges for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, Sling Psychrometer, Absorption Psychrometer, Dew point meter.

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

UNIT – V

Elements of Control Systems:

Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems- Transfer functions- First and Second order mechanical systems

TEXT BOOKS:

1. Principles of Industrial Instrumentation & Control Systems, Alavala, Cengage Learning
2. Instrumentation, Measurement & Analysis, B.C.Nakra & K.K.Choudhary, TMH
3. Mechanical Measurements & Controls by D.S. Kumar

REFERENCE BOOKS:

1. Measurement Systems: Applications & design, E.O.Doebelin, TMH
2. Experimental Methods for Engineers / Holman
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age International.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. II Semester **L T/P/D C**

(Common to All Branches)

(Code no.) GENDER SENSITIZATION LAB
(An Activity-based Course)

Objectives of the Course:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- 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.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- 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.

w.e.f. 2017-2018 academic year

Unit-I: UNDERSTANDING GENDER

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

Unit – II: GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many? Struggles with Discrimination.

Unit – III: GENDER AND LABOUR

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

Unit – IV: ISSUES OF VIOLENCE

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

Unit – V: GENDER : CO-EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

Essential Reading: All the Units in the Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender*" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

Reference Books:

1. Sen, Amartya. "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. '*We Were Making History…' Life Stories of Women in the Telangana People's Struggle*. New Delhi: Kali for Women, 1989.

2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." *Women's Studies Journal* (14 November 2012) Available online at: http:// blogs.wsj.com/ India real time/2012/11/14/by –the-numbers-where-Indan-women-work/>

3. K. Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada http://harpercollins.co.in/BookDetail.asp?Book_Code=3732

4. Vimala. "Vantillu (The Kitchen)*". Women Writing in India: 600 BC to the Present. Volume II*: The 20th Century. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 599-601.

5. Shatrughna, Veena et al. *Women's Work and its Impact on Child Health and Nutrition*, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.

6. Stree Shakti Sanghatana. *"We Were Making History ….' Life Stories of Women in the Telangana People's Struggle*. New Delhi: Kali for Women, 1989.

7. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012

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8. Jayaprabha, A. "Chupulu (Stares)". *Women Writing in India: 600BC to the Present. Volume II*: The 20th Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.

9. Javeed, Shayan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical Analysis." *International Journal of Humanities and Social Science Invention* 2.4(2013)

10. Gautam, Liela and Gita Ramaswamy. "A 'conversation' between a Daughter and a Mother." *Broadsheet on Contemporary Politics*. Special Issue on *Sexuality and Harassment: Gender Politics on Campus Today*. Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad: Anveshi Research Center for Women's Studies, 2014.

11. Abdulali Sohaila. "*I Fought For My Life…and Won*."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

12. Jeganathan Pradeep, Partha Chatterjee (Ed). "*Community, Gender and Violence Subaltern Studies XI*". Permanent Black and Ravi Dayal Publishers, New Delhi, 2000

13. K. Kapadia. The *Violence of Development: The Politics of Identity, Gender and Social Inequalities in India.* London: Zed Books, 2002

14. S. Benhabib. *Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics,* London: Routledge, 1992

15. Virginia Woolf. *A Room of One's Own.* Oxford: Black Swan. 1992.

T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a Human Face,* Karachi: Oxford University Press, 1997

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Mech. Engg. II-Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

Pre-requisites: None

Course Outcomes:
Develop procedure for standardization of experiments. Calibrate flow discharge measuring device used in pipes channels and tanks. Determine fluid and flow properties. Characterize laminar and turbulent flows. Compute drag coefficients. Test the performance of pumps and turbines.

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. Performance test on single stage centrifugal pump
8. Performance test on reciprocating pump
9. Impact of jet on vanes
10. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
11. Performance and specific speed test on Francis Turbine
12. Performance and specific speed test on Kaplan Turbine
13. Performance test on multi stage pump
14. Suitability test on centrifugal pump
15. Drag and Lift Coefficients of an Aerofoil model.

Any ten of the above experiments are to be covered.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Mech. Engg. II-Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

INSTRUMENTATION & CONTROLSYSTEMS LAB

Pre-requisites: Basic principles of Instrumentation and control systems

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

1. Calibration of transducer for temperature measurement.
2. Study and calibration of LVDT transducer for displacement measurement.
3. Calibration of strain gauge for temperature measurement.
4. Calibration of thermocouple for temperature measurement.
5. Calibration of capacitive transducer for angular displacement.
6. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
7. Calibration of resistance temperature detector for temperature measurement.
8. Study and calibration of a rotometer for flow measurement.
9. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
10. Study and calibration of McLeod gauge for low pressure.

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II Year B.Tech. Mech. Engg. II-Sem

L	T	P	C
0	0	3	2

PRODUCTION TECHNOLOGY LAB

Pre-requisites: Manufacturing Technology

Course Outcomes:
Understanding the properties of moulding sands and pattern making.Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints. Basic idea of press working tools and perform moulding studies on plastics.

Metals 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

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3

III Year B.Tech. Mech. Engg. I-Sem

L	T	P	C
4	0	0	4

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Prerequisites: Economics

Objectives:
1. To enable the student to understand the importance of the business operations like demand and supply, production function, cost analysis, markets.
2. To understand the importance of certain basic issues like forms of business organizations, capital budgeting , financial accounting and financial analysis.

Outcomes:
At the end of the course, the student will,
- Understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures.
- Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis.
- Develop an understanding of
- Analyse how capital budgeting decisions are carried out.
- Understanding the framework for both manual and computerised accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.

Unit I : Introduction & Demand Analysis: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. *Elasticity of Demand*: Definition, Types, Measurement and Significance of Elasticity of Demand. *Demand Forecasting,* Factors governing demand forecasting, methods of demand forecasting.

Unit II : Production & Cost Analysis: *Production Function* – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. *Cost Analysis***:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III : Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing*: Objectives and Policies of Pricing.

Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, *New Economic Environment*: Changing Business Environment in Post-liberalization scenario.

Unit IV : Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital Trading Forecast Capital Budget, Cost Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

Unit V : Introduction to Financial Accounting & Financial Analysis: Accounting concepts and Conventions Introduction IFRS Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis***:** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
2. Vijay Kumar & Appa Rao Managerial Ecoconomics & Financial Analysis, Cengage 2011.
3. J. V. Prabhakar Rao & P.V. Rao Managerial Ecoconomics & Financial Analysis, Maruthi Publishers, 2011.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2009
4. Domnick Salvatore: Managerial Economics In a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Kasi Reddy Sraswathi, MEFA PHI Learning, 2012.
10. Shailaja & Usha : MEFA, University Press, 2012.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Mech. Engg. I-Sem

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DESIGN OF MACHINE MEMBERS - I

NOTE:
Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

Pre- requisites:
Engineering mechanics, mechanics of solids, manufacturing processes, metallurgy and material science.

Course objectives:
- To understand the general design procedures and principles in the design of machine elements.
- To study different materials of construction and their properties and factors determining the selection of material for various applications.
- To determine stresses under different loading conditions.
- To learn the design procedure of different fasteners, joints, shafts and couplings.

Outcomes:
- The student acquires the knowledge about the principles of design, material selection, component behavior subjected to loads, and criteria of failure.
- Understands the concepts of principal stresses, stress concentration in machine members and fatigue loading.
- Design on the basis of strength and rigidity and analyze the stresses and strains induced in a machine element.

UNIT – I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design. Tolerances and fits –BIS codes of steels.

DESIGN FOR STATIC STRENGTH: Simple stresses – Combined stresses – Torsional and Bending stresses – Impact stresses – Stress strain relation – Various theories of failure – Factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

UNIT – II

DESIGN FOR FATIGUE STRENGTH: Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor- Notch Sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Gerber's curve– Modified Goodman's line– Soderberg's line.

UNIT – III
RIVETED, WELDED AND BOLTED JOINTS:
Riveted joints- methods of failure of riveted joints-strength equations-efficiency of riveted joints-eccentrically loaded riveted joints.
Welded joints-Design of fillet welds-axial loads-circular fillet welds under bending, torsion. Welded joints under eccentric loading.
Bolted joints – Design of bolts with pre-stresses – Design of joints under eccentric loading – locking devices – bolts of uniform strength.

UNIT – IV
KEYS, COTTERS AND KNUCKLE JOINTS: Design of keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

UNIT – V
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).

SHAFT COUPLINGS : Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – Flange coupling (Modified).

TEXT BOOKS:
1. Machine design by Khurmi
2. Machine design/pandya & shah
3. Machine Design/ V. Bhandari/ TMH Publishers

REFERENCE BOOKS:
1. Design of Machine Elements/V.M. Faires
2. Machine design/ Schaum Series.
3. Mechanical Engineering Design/JE Shigley

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III Year B.Tech. Mech. Engg. I-Sem	**L**	**T**	**P**	**C**
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THERMAL ENGINEERING - II

Pre-requisite: Thermodynamics

Course Objective:
To apply the laws of Thermodynamics to analyse steam and gas turbine cycles and to perform analysis of the major components of steam and gas turbine plants and their applications.

Course Outcomes:
At the end of the course, the student should be able to
- Develop state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants
- Apply the laws of Thermodynamics to analyze thermodynamic cycles
- Differentiate between vapour power cycles and gas power cycles
- Infer from property charts and tables and to apply the data for the evaluation of performance parameters of the steam and gas turbine plants
- Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components

UNIT – I
Steam Power Plant: Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.
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.

UNIT – III

Steam Turbines: Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency. De-Laval Turbine - its features- 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

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.

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits- Combustion chambers and turbines of Gas Turbine Plant- Brief Concepts.

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. Thermal Engineering / Rajput / Lakshmi Publications
2. Gas Turbines – V.Ganesan /TMH
3. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
4. Thermal Engineering / Ajoy Kumar/ Narosa

REFERENCE BOOKS:

1. Gas Turbines and Propulsive Systems – P.Khajuria & S.P.Dubey - /Dhanpatrai Pub
2. Thermal Engineering – Ballaney / Khanna Pub.
3. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman
4. Thermal Engineering – R.S. Khurmi & J.S.Gupta / S.Chand Pub.

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III Year B.Tech. Mech. Engg. I-Sem

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4	0	0	4

MACHINE TOOLS AND METROLOGY

Course Outcomes:

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

- Identify techniques to minimize the errors in measurement.
- Identify methods and devices for measurement of length, angle, gear & thread parameters, surface roughness and geometric features of parts.
- Understand working of lathe, shaper, planer, drilling, milling and grinding machines.
- Comprehend speed and feed mechanisms of machine tools.
- Estimate machining times for machining operations on machine tools.

UNIT – I

Metal cutting: Introduction, elements of cutting process – Geometry of single point tools. Chip formation and types of chips.

Engine lathe – Principle of working, types of lathe, specifications.Taper turning,– Lathe attachments. Capstan and Turret lathe – Single spindle and multi-spindle automatic lathes – tool layouts.

UNIT – II

Drilling and Boring Machines – Principles of working, specifications, types, operations performed; twist drill. Types of Boring machines and applications. Shaping, slotting and planing machines - Principles of working – machining time calculations.

UNIT – III

Milling machines – Principles of working – Types of milling machines – Geometry of milling cutters – methods of indexing.

Grinding – theory of grinding – classification of grinding machines. Types of abrasives, bonds. Selection of a grinding wheel. Lapping, honing and broaching machines, comparison and Constructional features, machining time calculations

UNIT – IV

Limits, fits and tolerances- Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly.

Limit Gauges : Taylor's principle, Design of GO and NO GO gauges

Measurement of angles, Bevel protractor, Sine bar.
Measurement of flat surfaces, straight edges, surface plates, optical flat and auto collimator.

UNIT – IV

Surface Roughness Measurement: Roughness, Waviness. CLA, RMS, Rz Values. Methods of measurement of surface finish, Talysurf.
Screw thread measurement, Gear measurement; Machine Tool Alignment Tests on lathe, milling and drilling machines.
Coordinate Measuring Machines: Types and Applications of CMM.

TEXT BOOKS:

1. Engineering Metrology / I C Gupta./ Danpath Rai
2. Engineering Metrology / R.K. Jain / Khanna Publishers
3. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.
4. Production Technology by R.K. Jain and S.C. Gupta.

REFERENCE BOOKS:

1. Production Technology by H.M.T. (Hindustan Machine Tools)
2. BIS Standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
3. Fundamentals of Dimensional Metrology 4e / Connie Dotson / Thomson
4. Workshop Technology – Vol.-II, B.S. Raghui Vamsi
5. Elements of Work Shop Technology – Vol. II, Hajra Choudry, Media Promoters.
6. Fundamentals of Metal Machining and Machine Tools, Geofrey Boothroyd, McGraw Hill

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THERMAL ENGINEERING LAB

Pre-Requisite: Thermodynamics & Thermal Engineering - I

Objective:
To understand the working principles of IC Engines, Compressors, Refrigeration and Air Conditioning Systems.

Tables/Codes: Refrigeration Tables, Psychrometric Chart

Syllabus

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

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MACHINE TOOLS AND METROLOGY LAB

Objectives:
1. To import practical exposure to the metrology equipment & Machine tools
2. To conduct experiments and understand the working of the same.

Prerequisites:
Theoritical exposure to Metrology and machine tools.

1. Step turning and taper turning on lathe machine (2 exercises)
2. Thread cutting and knurling on lathe machine (2 exercises)
3. Measurement of cutting forces on lathe
4. Machining of holes using Drilling and boring machines.
5. Gear cutting on the Milling machine
6. Grinding of Tool angles using Cylindrical / Surface Grinding
7. Measurement of lengths, heights, diameters by vernier calipers, micrometers.
8. Measurement of bores by internal micrometers and dial bore indicators.
9. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.
10. Angle and taper measurements by bevel protractor and sine bars.
11. Thread measurement by 2-wire and 3-wire methods.
12. Surface roughness measurement by Tally Surf.
13. Use of mechanical comparator

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ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

1. Introduction

The introduction of the Advanced Communication Skills 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.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media 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.
- To prepare all the students for their placements.

Learning Outcomes

- Accomplishment of sound vocabulary and its proper use contextually.
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. Minimum Requirement:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system

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- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. Prescribed Lab Manual: A book titled ***A Course Book of Advanced Communication Skills (ACS) Lab*** published by Universities Press, Hyderabad.

6. Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 8th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - **Preparing for being Interviewed**
  - **Positive Thinking**
  - **Interviewing Skills**
  - **Telephone Skills**
  - **Time Management**

7. Books Recommended:

1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
3. **Advanced Communication Skills Laboratory Manual** by Sudha Rani, D, Pearson Education 2011.
4. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. **Business and Professional Communication:** Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
6. **The Basics of Communication: A Relational Perspective**. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
7. **English Vocabulary in Use** series, Cambridge University Press 2008.

8. **Management Shapers Series** by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
9. **Handbook for Technical Communication** by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
10. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
11. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
12. **Job Hunting** by Colm Downes, Cambridge University Press 2008.
13. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.
14. **English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.**
15. Books on **TOEFL/GRE/GMAT/CAT/ IELTS** by Barron's/DELTA/Cambridge University Press.
16. **International English for Call Centres** by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

***Advanced Communication Skills Lab Practicals**:*

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

1. **Seminar/ Professional Presentation**
2. **A Report on the same has to be prepared and presented.**

* ***Teachers may use their discretion to choose topics relevant and suitable to the needs of students.***
* ***Not more than two students to work on each mini project.***
* ***Students may be assessed by their performance both in oral presentation and written report.***

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AUTOMOBILE ENGINEERING

Professional Elective **- I**

Pre-requisites:Thermodynamics& Thermal Engineering -1

Course Outcomes:

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

- Understand the basic lay-out of an automobile.
- Understand the operation of engine cooling, lubrication, ignition, electrical and air conditioning systems.
- Understand the principles of transmission, suspension, steering and braking systems.
- Understand automotive electronics. Study latest developments in automobiles.

UNIT – I

Introduction : Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarburization, Nitriding of crank shaft..

Emission from Automobiles – Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

UNIT – II

Fuel System : S.I. Engine : Fuel supply systems, Mechanical and electrical fuel pumps – carburetor – types – air filters – petrol injection.
C.I. Engines : Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection,Classification,Properties, Hybrid vehicles injection timing, testing of fuel, pumps.

UNIT – III

Cooling System : Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

Ignition System : Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

UNIT – IV

Electrical System : Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

Transmission System : Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box , over drive torque converter.
Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.

UNIT – V

Steering System : Steering geometry – camber, castor, king pin rake, combined angle toe in, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.
Suspension System : Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.
Braking System : Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

TEXT BOOKS :

1. Automobile Engineering ,Vol. 1 & Vol. 2/ Kripal Singh
2. Automobile Engineering , Vol. 1 & Vol. 2 ,by K.M Gupta,Umesh publication

REFERENCE BOOKS :

1. A System approach to Automotive Technology by Jack Erjavec YesDee publishing pvt Ltd.
2. Automobile Engineering / William Crouse
3. Automotive Mechanics / Heitner
4. Alternative fuels of Automobiles by P.RamiReddy,Frontline publications.

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COMPUTER GRAPHICS

Professional Elective **- I**

Objectives:

- To make students understand about fundamentals of Graphics to enable them to design animated scenes for virtual object creations.
- To make the student present the content graphically.

Outcomes:

- Will be able work in computer aided design for content presentation..
- Better analogy data with pictorial representation.

UNIT-I:

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices
Output primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms.Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms

UNIT-II:

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems
2-D viewing : The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland – Hodgeman polygon clipping algorithm

UNIT-III:

3-D object representation : Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.
3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.3-D viewing : Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-IV:

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods

UNIT-V:

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Text Books:

1. "Computer Graphics *C version*", Donald Hearn and M.Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

References:

1. Computer Graphics", second Edition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education.
2. Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition.
3. rocedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
4. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
5. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
6. Computer Graphics, Steven Harrington, TMH

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UNCONVENTIONAL MACHINING PROCESSES

Professional Elective **-I**

Prerequisites: Theory of metal cutting, machine tools

Course Objectives:

1. To understand the need for the development of UnConventional machining processes.
2. To know various methods of material removal processes.
3. To know the principles and applications of Non-Conventional machining processes.

Outcomes:

1. Student will identify the problem faced in traditional metal cutting and come to an understanding of the need for the development of Unconventional machining processes.
2. Gain the knowledge of basic mechanism of various Unconventional maching processes and related equipment, variables, advantages, disadvantages, applications.
3. Given a set of physical, electrical and other parameters. Student can identify a suitable Unconventional machining process.

UNIT – I

INTRODUCTION – Need for non-convention machining methods, Classification of non -conventional machining processes, considerations in process selection, materials, general characteristics and applications of un-conventional machining processes.

UNIT – II

MECHANICAL MATERIAL REMOVAL PROCESSES: Ultrasonic machining, Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining – basic principles, components, process variables, advantages and disadvantages, applications.

UNIT – III

THERMAL MATERIAL REMOVAL PROCESSES: Electro Discharge Machining, Wire EDM, Laser Machining, Electron Beam Machining, Ion Beam Machining - basic principles, components, process variables, advantages and disadvantages, applications.

UNIT – IV

CHEMICAL MATERIAL REMOVAL PROCESSES: Electro Chemical Machining, Electro Chemical Grinding, Electro Chemical Honing, and Electro Chemical Deburring - basic principles, components, process variables, advantages and disadvantages, applications.

UNIT-V

MICRO MACHINING: Bulk micromachining, surface micromachining and LIGA process – General description, basic principles, components, process variables, advantages and disadvantages, applications.

TEXT BOOKS:

1. Non-Traditional Machining/ P.K.Mishra (New Age)
2. Advanced machining processes/ VK Jain/ Allied publishers

REFERENCE BOOKS:

1. MEMS & Microsystems – Design and Manufacture by Tai-Ran Hsu, Tata McGraw Hill
2. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH
3. New Technology / Bhattacharya A/ The Institution of Engineers, India 1984.

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INDUSTRIAL ENGINEERING PRACTICES

Professional Elective **-I**

Prerequisites: None

Course Outcomes:

At the end of the course the student should be able to perform time study, work measurement, work place design, job evaluation, costing and estimation of industrial processes.

Unit I:

Work Study:Introduction – definition – objectives – steps in work study – Method study – definition – objectives – steps in method study.

Work Measurement – purpose – types of study – stop watch methods – steps – key rating – allowances – standard time calculations – work sampling.

Unit II:

Work Place Design: Anthropometry, structural body dimensions, use of anthropometry data, work space dimensions – work space for personnel when seated – minimum requirement for restricted spaces, work surfaces, horizontal work surfaces, work surfaces when seated, standing science of seating, principles of seat design.

Unit III:

Nature of Man-Machine system – fundamental man-machine system assumptions – types of systems – database of human factors – human performance – types of human errors in system tasks – task data – empirical task data – judgemental task data

Visual Displays – process of seeing – types of visual activity – conditions that effect visual discriminations – quantitative visual display – basic design of dynamic quantitative visual displays – specific features of quantitative scales – quantitative visual display – strategy indicators – signal and warning lights.

Unit IV:

Job evaluation – methods of job evaluation – simple routing objective systems – classification methods – factor comparision method – point method – benefits of job evaluation and limitations

Merit Rating – job evaluation vs merit rating – objectives of merit rating – method for merit rating – ranking method – paid company method – checklist method.

Unit V:
Estimating and costing, Estimation: Importance – Aims – Functions – Qualities of estimator, Cost – definition – aims – standard cost – difference between estimating and costing – costing methods – elements of costs – menstruation. Estimating of material cost – machine shop – sheet metal shop – forging – welding shop.

Textbooks:
1. Motion and Time Study by Ralph M Barnes/ John Wiley & Sons
2. Industrial Engineering Management by RaviShankar/Galgotia
3. Mechanical Estimating and Costing by T.R.banga, S.C.Sharma/Khanna

Reference Books:

1. Work Study by ILO
2. Human Factors in Engineering and Design by Ernest J McCormick/ TMH
3. Production and Operation Management by Paneer Selvam/PHI
4. Industrial Engineering Handbook by Maynard.

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OPERATIONS RESEARCH
Professional Elective **-II**

Prerequisites: None

Objectives:
Understanding the mathematical importance of development of model in a particular optimization model for the issue and solving it.

Outcome:
Understanding the problem, identifying variables & constants, formulas of optimization model and applying appropriate optimization

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
THEORY OF GAMES: 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 BOOK :

1. Operation Research /J.K.Sharma/MacMilan.
2. Operations Research / ACS Kumar/ Yesdee

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).

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TRIBOLOGY

Professional Elective **-II**

Pre-requisites: Fluid mechanics, Design of machine members-II

Course objectives:

- To expose the student to different types of bearings, bearing materials,
- To understand friction characteristics and power losses in journal bearings.
- To learn theory and concepts about different types of lubrication.

Outcomes:

- Understanding friction characteristics in journal bearings.
- Knowledge about different theories of lubrication to reduce friction and wear.

UNIT – I

Study of various parameters: Viscosity, flow of fluids, viscosity and its variation, absolute and kinematic viscosity, temperature variation, viscosity index, determination of viscosity, different viscometers used. Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

UNIT – II

Hydrodynamic theory of lubrication: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro-dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti -friction bearing.

UNIT – III

Friction and power losses in journal bearings :Calibration of friction loss, friction in concentric bearings, bearing modulus, Sommer-field number, heat balance, practical consideration of journal bearing design considerations.

UNIT – IV

Air lubricated bearing: Advantages and disadvantages, application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect.Study of current concepts of boundary friction and dry friction.

UNIT-V

Types of bearing oil pads: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed bearing, partial bearings -externally pressurized bearings.

Bearing materials : General requirements of bearing materials, types of bearing materials.

TEXT BOOK :

1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI
2. Tribology in Industry : Sushil Kumar Srivatsava, S. Chand &Co.

REFERENCE :

1. Tribology – B.C. Majumdar

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POWER PLANT ENGINEERING

Professional Elective **- II**

Objectives:

The goal of this course is to become prepared for professional engineering design of conventional and alternative power-generation plants. The learning objectives include

1. Analysis and preliminary design of the major systems of conventional fossil-fuel steam-cycle power plants.
2. A working knowledge of the basic design principles of nuclear, gas turbine, combined cycle, hydro, wind, geothermal, solar, and alternate power plants.
3. Awareness of the economic, environmental, and regulatory issues related to power generation.

UNIT – I

Introduction to the Sources of Energy – Resources and Development of Power in India.**Steam Power Plant :** Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT – IIInternal Combustion Engine Plant:

DIESEL POWER PLANT: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.**Gas Turbine Plant:** Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparision.**Direct Energy Conversion:** Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT – III

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.**Hydro Projects And Plant:** Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.**Power From Non-Conventional**

Sources: Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

UNIT – IV

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.**Types of Reactors:** Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT – V

Power Plant Economics And Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOK:

1. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub
2. A Course in Power Plant Engineering: / Arora and S. Domkundwar.

REFERENCES :

1. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications
2. Power plant Engineering/ Ramalingam/ Scietech Publishers
3. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
4. An Introduction to Power Plant Technology / G.D. Rai.
5. Power plant Engg - Elanchezhian- I.K. International Pub

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Fluid Power systems

Professional Elective **- II**

Prequiests: Fluid Mechanics and Hydraulics Machinery

Course outcomes:

After doing this, student should be able to

- Understand the Properties of fluids, Fluids for hydraulic systems, governing laws. distribution of fluid power,
- Design and analysis of typical hydraulic circuits.
- Know accessories used in fluid power system, Filtration systems and maintenance of system.

Unit-I

Introduction to oil hydraulics and pneumatics, their structure, advantages and limitations. ISO symbols, energy losses in hydraulic systems. Applications, Basic types and constructions of Hydraulic pumps and motors. Pump and motor analysis. Performan curves and parameters.

Unit-II

Hydraulic actuators, types and constructional details, lever systems, control elements – direction, pressure and flow control valves. Valve configurations, General valve analysis, valve lap, flow forces and lateral forces on spool valves. Series and parallel pressure compensation flow control valves. Flapper valve Analysis and Design.

Unit-III

Proportional control valves and servo valves. Nonlinearities in control systems (backlash, hysteresis, dead band and friction nonlinearities). Design and analysis of typical hydraulic circuits. Regenerative circuits, high low circuits, Synchronization circuits, and accumulator sizing.

Unit-IV

Intensifier circuits Meter-in, Meter-out and Bleed-off circuits; Fail Safe and Counter balancing circuits, accessories used in fluid power system, Filtration systems and maintenance of system.

Components of pneumatic systems; Direction, flow and pressure control valves in pneumatic systems. Development of single and multiple actuator circuits. Valves for logic functions; Time delay valve; Exhaust and supply air throttling;

Unit-V

Examples of typical circuits using Displacement – Time and Travel-Step diagrams. Will-dependent control, Travel-dependent control and Time-dependent control, combined control, Program Control, Electro-pneumatic control and air-hydraulic control, Ladder diagrams. Applications in Assembly, Feeding, Metalworking, materials handling and plastics working.

Testbooks

1. John Watton: Fundamentals of Fluid Power Control. 1 st Ed. Cambridge University Press, 2009 Prerequisit
2. Blackburn,J. F.,G.Reethof, and J. L.Shearer, Fluid Power Control, New York: Technology Press of M. I.T. and Wiley.
3. Anthony Esposito,"Fluid Power with applications",Pearson Education.
4. Ernst, W., Oil Hydraulic Power and its IndustrialApplications, New York: McGraw Hill.
5. Lewis,E.E., and H.Stern, Design of Hydraulic Control Systems, New York: McGraw Hill.
6. Morse,A. C.,Electro hydraulic Servomechanism,New York: McGraw Hill.
7. Pippenger, J.J., and R.M.Koff, Fluid Power Control systems, New York: McGraw Hill.
8. Fitch, Jr.,E.C., Fluid Power Control Systems, New York: McGraw Hill.
9. Khaimovitch,"Hydraulic and Pneumatic Control of Machine Tools"
10. John Watton,"Fluid Power Systems: modeling, simulation and microcomputer control",Prentice Hall International.
11. Herbert E. Merritt: Hydraulic control systems, John Wiley and Sons Inc.

References:

1. Ian Mencal, Hydraulic operation and control of Machine tools Ronald Press
2. Sterwart Hydraulic and Pneumatic power for production-Industrial Press.
3. Hasebrink J.P., and Kobler R.,"Fundamentals of Pneumatics/electropeumatics", FESTO Didactic publication No. 7301,Esslingen Germany, 1979.
4. Werner Deppert and Kurt Stoll,"Pneumatic Control-An introduction to the principles", Vogel-Verlag.
5. Blaine W.Andersen,"The analysis and Design of Pneumatic Systems", John Wiley

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III Year B.Tech. Mech. Engg. II-Sem

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3	1	0	3

DESIGN OF MACHINE MEMBERS-II

NOTE: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

Pre-requisites:

Study of engineering mechanics, design of machine members-I and theory of machines.

Course objectives:

- To gain knowledge about designing the commonly used important machine members such as bearings, engine parts, springs , belts, gears etc.
- To design the components using the data available in design data books.

Outcomes:

- Knowledge about journal bearing design using different empirical relations.
- Estimation of life of rolling element bearings and their selection for given service conditions.
- Acquaintance with design of the components as per the standard, recommended procedures which is essential in design and development of machinery in industry.

UNIT – I

Sliding contact bearings : Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design.

UNIT – II

Rolling contact bearings: Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

UNIT – III

Engine Parts :

Connecting Rod : Thrust in connecting rod – stress due to whipping action on connecting rod ends –Pistons, Forces acting on piston – Construction, Design and proportions of piston.

UNIT – IV

Mechanical Springs : Stresses and deflections of helical springs – Extension and compression springs – Design of springs for fatigue loading – natural frequency of helical springs – Energy storage capacity – helical torsion springs – Design of co-axial springs, Design of leaf springs.

Belts & Pulleys : Transmission of power by Belt and Rope ways, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives.

UNIT – V

Gears : Spur gears& Helical gears- Brief introduction involving important concepts – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

TEXT BOOKS:

1. Machine Design / Pandya & Shah / Charotar
2. Machine tool design / V. Bhandari TMH

REFERENCE BOOKS :

1. Machine Design / P.Kannaiah / Scitech
2. Machine Design Volume II / S.Md.Jalaludeen
3. Design Data Book / PV Ramana Murti & M .Vidyasagar/ BS Publications

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HEAT TRANSFER

Pre-requisite: Thermodynamics

Course Objectives:

To provide knowledge about application of conduction, convection and radiation heat transfer concepts to different practical applications

Outcomes:

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

- Understand the basic modes of heat transfer
- Compute one dimensional steady state heat transfer with and without heat generation
- Understand and analyze heat transfer through extended surfaces
- Understand one dimensional transient conduction heat transfer
- Understand concepts of continuity, momentum and energy equations
- Interpret and analyze forced and free convective heat transfer
- Understand the principles of boiling, condensation and radiation heat transfer
- Design of heat exchangers using LMTD and NTU methods

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

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

UNIT – II

One Dimensional Steady State Conduction Heat Transfer: Variable Thermal conductivity – systems with heat sources or Heat generation- Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Infinite bodies- Chart solutions of transient conduction systems- Concept of Semi infinite body.

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 Π 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: External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders.

UNIT – IV

Internal Flows: Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical relations for Horizontal Pipe Flow and annulus flow.

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

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.

UNIT V

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.

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 –

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Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

TEXT BOOK :

1. Fundamentals of Heat Transfer –Incropera& Dewitt/John wiley
2. Fundamentals of Enggineering,Heat & Man Transfer-R.C.Sachdeva/NewAge.
3. Heat& Man 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 –Ghoshdastidar/Oxford University press.

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KINEMATICS AND DYNAMICS LABORATORY

(A Minimum of 10 experiments are to be conducted)

Prerequisites by Topics:
Prerequisites for the graduate-level course are Kinematics, Dynamics, differential equations, motion simulation, displacement, velocity, acceleration, force, torque, power, Newton's motion laws, vibration, Gyroscopic Effect, Cams, Bearings.

Objectives:
The objective of the lab is to Understand the kinematics and dynamics of mechanical elements such as linkages, gears, cams and learn to design such elements to accomplish desired motions or tasks.

Outcomes:
Upon successful completion of this lab, students should be able to:

- Understand types of motion
- Analyze forces and torques of components in linkages
- Understand static and dynamic balance
- Understand forward and inverse kinematics of open-loop mechanisms

Experiments:

1. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils.
2. Determination of steady state amplitude of a forced vibratory system.
3. Static balancing using steel balls.
4. Determination of the magnitude and orientation of the balancing mass in dynamic balancing.
5. Field balancing of the thin rotors using vibration pickups.
6. Determination of the magnitude of gyroscopic couple, angular velocity of precession and representation of vectors.
7. Determination of natural frequency of given structure using FFT analyzer.
8. Diagnosis of a machine using FFT analyzer.
9. Direct Kinematic analysis of a robot.
10. Inverse Kinematic analysis of a robot.
11. Trajectory planning of a robot in joint space scheme.
12. Palletizing operation using Robot programming.

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HEAT TRANSFER LAB

Pre-requisite: Thermodynamics

Course Objectives:
To enable the student to apply conduction, convection and radiation heat transfer concepts to practical applications

Outcome:
At the end of the lab sessions, the student will be able to

- Perform steady state conduction experiments to estimate thermal conductivity of different materials
- Perform transient heat conduction experiment
- Estimate heat transfer coefficients in forced convection, free convection , condensation and correlate with theoretical values
- Obtain variation of temperature along the length of the pin fin under forced and free convection
- Perform radiation experiments: Determine surface emissivity of a test plate and Stefan- Boltzmann's constant and compare with theoretical value

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.

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ADVANCED THERMODYNAMICS LAB

Prerequisites: Advanced Thermodynamics

Course outcomes:
At the end of course student is able to determine the dryness fraction of steam, T-P relationship of steam, Calibration of temperature measurement apparatus.

1. Dryness fraction estimation of steam.
2. Determination of Temperature – Pressure relationship of steam using Marcet Boiler
3. Calibration of temperature measurement apparatus
4. Performance study in a cooling tower
5. Performance of a nozzle using Nozzle performance Test unit
6. Performance study of Impulse turbine
7. Performance study of Reaction Turbine
8. Simulation of fluid flow and thermal networks for design and optimization (5 experiments)

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RENEWABLE ENERGY SYSTEMS

Professional Elective **-III**

Prerequisites: None

OBJECTIVES:

- To explain the concepts of Non-renewable and renewable energy systems
- To outline utilization of renewable energy sources for both domestic and industrial applications
- To analyse the environmental and cost economics of renewable energy sources in comparison with fossil fuels.

OUTCOMES:

- Understanding of renewable energy sources
- Knowledge of working principle of various energy systems
- Capability to carry out basic design of renewable energy systems

UNIT-I: Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO_2 reduction potential of renewable energy- concept of Hybrid systems.

UNIT-II: Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

UNIT-III: Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

UNIT-IV : Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

UNIT-V: Ocean Energy: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.

a. **Small hydro Power Plant:** Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.
b. **Geothermal Energy**: Geothermal power plants, various types, hot springs and steam ejection.

Reference:

1. Power plant technology by J Wakhil
2. Non-Conventional Energy Sources by G.D Rai
3. Solar Energy - Principles of thermal collection and storage S. P. Sukhatme
4. Solar Engineering of Thermal Processes J. A. Duffie and W. A. Beckman
5. Biomass Regenerable Energy D. D. Hall and R. P. Grover.
6. Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.
7. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi, 2012
8. Peter Gevorkian, Sustainable Energy Systems Engineering, McGraw Hill,2007
9. Kreith, F and Kreider, J. F., Principles of Solar Engineering, McGraw-Hill, 1978.
10. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996.
11. Veziroglu, T.N., Alternative Energy Sources, Vol 5 and 6, McGraw-Hill, 1990
12. Anthony San Pietro, Biochemical and Photosynthetic aspects of Energy Production, Academic Press, 1980.
13. Bridgurater, A.V., Thermochemical processing of Biomass, Academic Press, 1981.
14. Bent Sorensen , Renewable Energy, Elsevier, Academic Press, 2011

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FINITE ELEMENT METHODS

Professional Elective **-III**

Pre-requisites: Mechanics of Solids

Course Outcomes:
At the end of the course, the student will be able to, Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer. Formulate and solve problems in one dimensional structures including trusses, beams and frames. Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric and plate bending problems. Implement and solve the finite element formulations using MATLAB.

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.
Analysis of a uniform shaft subjected to torsion.

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.

Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation. techniques such as semi automatic and fully Automatic use of soft wares such as ANSYS, NISA ,NASTRAN, etc.

TEXT BOOKS :

1. Introduction to Finite Elements in Engineering, Chandrupatla, 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 Fininte element analysis- S.Md.Jalaludeen,Anuradha Publications, print-2012
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

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NEURAL NETWORKS AND FUZZY LOGICS

Professional Elective **-III**

Prerequisites: None

Course objectives:

Understand the concept of neural networks and Fuzzy logics

Course outcomes:

one should be able to develop neural networks and fuzzy logics to a system and analyze.

Unit – I

Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

Unit–II

Single Layer Feed Forward Neural Networks

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

Multilayer Feed forward Neural Networks

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

Unit-III

Associative Memories

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix

Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

Unit IV

Classical & Fuzzy Sets

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzy Logic System Components

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Unit V

Applications: Neural network applications: Process identification, control, fault diagnosis and load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

Mechanical Applications: Washing machines, Chemical Plants Refrigeration systems, Weather Control Systems.

TEXT BOOK:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

REFERENCE BOOKS:

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Fuzzy Logic and Neural Networks, Alavala, New Age International
3. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002.
4. Neural Networks – Simon Hykins , Pearson Education

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MECHATRONICS

Professional Elective **-III**

Pre-requisites: Basic Electronics Engineering

Course Outcomes:

At the end of the course, the student will be able to, Model, analyze and control engineering systems. Identify sensors, transducers and actuators to monitor and control the behavior of a process or product. Develop PLC programs for a given task. Evaluate the performance of mechatronic systems.

UNIT – I

INTRODUCTION: Definition – Trends - Control Methods: Standalone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

SIGNAL CONDITIONING : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution, Filtering Noise using passive components – Registors, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass , high pass , notch filtering

UNIT – II

PRECISION MECHANICAL SYSTEMS :

Modern CNC Machines – Design aspects in machine structures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.

ELECTRONIC INTERFACE SUBSYSTEMS : TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resetable fuses , thermal dissipation - Power Supply - Bipolar transistors / mosfets

UNIT – III

ELECTROMECHANICAL DRIVES : Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.

MICROCONTROLLERS OVERVIEW : 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming –Assembly, C (LED Blinking , Voltage measurement using ADC).

UNIT – IV

PROGRAMMABLE LOGIC CONTROLLERS : Basic Structure - Programming : Ladder diagram -Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling -Analog input / output - PLC Selection - Application.

UNIT – V

PROGRAMMABLE MOTION CONTROLLERS : Introduction - System Transfer Function – Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , GOTO Position - Applications : SPM, Robotics.

TEXT BOOKS :

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

REFERENCE:

1. “Designing Intelligent Machines”. open University, London.
2. Michel B. Histand and David G. Alciatore,”
3. Introduction to Mechatronics and Measurement systems, “Tata MC Graw hill
4. I. C.W. Desi ha, “Control sensors and actuators,” Prentice Hall.
5. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
6. Mechatronics – N. Shanmugam / Anuradha Agencies Publisers.
7. Mechatronics System Design / Devdas shetty/Richard/Thomson.

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ADVANCED IC ENGINES

Professional Elective **-IV**

Pre-requisites: Thermodynamics, Internal Combustion Engines

Course Outcomes:

At the end of the course, the student will be able to, Classify combustion chambers of IC engines and understand combustion phenomena in IC engines. Understand the working of stratified charge engine, low heat rejection engine and rotary combustion engine. Analyze exhaust emissions, methods to control the pollutants and list the emission standards. Study the design and development of viable engines working with alternate fuels. Understand advanced combustion processes including HCCI, PCCI and RCCI engines.

UNIT - I: Introduction– Historical Review – Engine Types – Design and operating Parameters.
Cycle Analysis: Thermo-chemistry of Fuel – Air mixtures, properties – Ideal Models of Engine cycles – Real Engine cycles - differences and Factors responsible for – Computer Modeling.

UNIT - II: Gas Exchange Processes: Volumetric Efficiency – Flow through ports – Supercharging and Turbo charging.
Charge Motion: Mean velocity and Turbulent characteristics – Swirl, Squish – Pre-chamber Engine flows.

UNIT - III: Engine Combustion in S.I engines: Combustion and Speed – Cyclic Variations – Ignition – Abnormal combustion Fuel factors, MPFI, SI engine testing.
Combustion in CI engines: Essential Features – Types off Cycle. Pr. Data – Fuel
Spray Behavior – Ignition Delay – Mixing Formation and control, Common rail fuel injection system

UNIT - IV: Pollutant Formation and Control: Nature and extent of problems – Nitrogen Oxides, Carbon monoxide, unburnt Hydrocarbon and particulate – Emissions – Measurement – Exhaust Gas Treatment, Catalytic converter, SCR, Particulate Traps, Lean, NOx, Catalysts.

UNIT - V:

Fuel supply systems for S.I. and C.I engines to use gaseous fuels like LPG, CNG and Hydrogen.

Modern Trends in IC Engines

- Lean Burning and Adiabatic concepts
- Rotary Engines.
- Modification in I.C engines to suit Bio - fuels.
- HCCI and GDI concepts

REFERENCES BOOKS:

1. I.C. Engines Fundamentals/Heywood/Mc Graw Hill
2. The I.C. Engine in theory and Practice Vol.I / Teylor / IT Prof. And Vol.II
3. I.C. Engines: Obert/Int – Text Book Co.
4. I.C. Engines: Maleev
5. Combustion Engine Processes: Lichty
6. I.C. Engines: Ferguson
7. Scavenging of Two – stroke Cycle Engines – Switzer.
8. I.C.Engines by V.Ganesan

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IV Year B.Tech. Mech. Engg. I-Sem

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COMPUTATIONAL FLUID DYNAMICS

Professional Elective **-IV**

Pre-requisite: Heat Transfer and Fluid Mechanics

Course Objective:

To apply the principles of Heat Transfer and Fluid Mechanics to formulate governing equations for physical problems and to solve those using different numerical techniques

Course Outcomes:

At the end of the course, the student should be able to, Differentiate between different types of Partial Differential Equations and to know and understand appropriate numerical techniques. Solve the simple heat transfer and fluid flow problems using different numerical techniques, viz., FDM. Understand and to appreciate the need for validation of numerical solution.

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, 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.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Mech. Engg. I-Sem

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Mechanical Vibrations

Professional Elective **-IV**

Pre-requisites: Dynamics of Machines

Course objectives:

Understand various levels of vibrations and remedies for each of them.

Course Outcomes:

At the end of the course, the student will be able to, Understand the causes and effects of vibration in mechanical systems. Develop schematic models for physical systems and formulate governing equations of motion. Understand the role of damping, stiffness and inertia in mechanical systems Analyze rotating and reciprocating systems and compute critical speeds. Analyze and design machine supporting structures, vibration isolators and absorbers.

UNIT- I:

Single degree of Freedom systems - I: Undamped and damped free vibrations; forced vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility.

UNIT- II:

Single degree of Freedom systems - II: Response to Non Periodic Excitations: unit impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

UNIT- III:

Two degree freedom systems: Principal modes- undaped and damped free and forced vibrations; undamped vibration absorbers;

Multi degree freedom systems: Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi- rotor systems and geared systems; Discrete- Time systems.

UNIT- IV:

Continuous system: Free vibration of strings – longitudinal oscillations of bars- traverse vibrations of beams- Torsional vibrations of shafts.

Critical speeds of shafts: Critical speeds without and with damping, secondary critical speed.
Numerical Methods: Rayliegh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.
Vibration measuring instruments: Vibrometers, velocity meters & accelerometers

UNIT- V:
Sound level and subjective response to sound: Subjective response to sound, frequency dependent human response to sound, sound-pressure dependent human response, the decibel scale, relationship among sound power, sound intensity and sound pressure level, relationship between sound power level and sound intensity, relationship between sound intensity level and sound pressure level, sound measuring instruments.

TEXT BOOKS:
1. Elements of Vibration Analysis by Meirovitch, TMH, 2001
2. Mechanical Vibrations and sound engineering, A.G.Ambekar, PHI

REFERENCE BOOKS:
1. Mechanical Vibrations by SS Rao, Pearson, 2009, Ed 4,
2. Mechanical Vibration – Rao V.Dukkipati & J Srinivas, PHI, 2010.
3. Mechanical Vibratins – V. Ram Murthy.
4. Vibration problems in Engineering by S.P. Timoshenko.
5. Mechanical Vibrations- S Graham Kellyk, Schaum's Outilines, TMH

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PRODUCTION PLANNING CONTROL
Professional Elective **-IV**

Pre-requisites: Management Science.
Course Objectives:
Understand the importance of Production planning & control. Learning way of carrying out various functions so as to produce right product, right quanity at right time with minimum cost.

Course Outcomes:
At the end of the course, the student will be able to, Understand production systems and their characteristics. Evaluate MRP and JIT systems against traditional inventory control systems. Understand basics of variability and its role in the performance of a production system. Analyze aggregate planning strategies. Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems.

UNIT – I
Introduction: Definition – Objectives of Production Planning and Control – Functions of production planning and control - Types of production systems - Organization of production planning and control department.
Forecasting – Definition- uses of forecast- factors affecting the forecast- types of forecasting- their uses - general principle of forecasting. Forecasting techniques- quantitative and qualitative techniques. Measures of forecasting errors.

UNIT – II
Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – Basic EOQ model- Inventory control systems –continuous review systems and periodic review systems, MRP I, MRP II, ERP, JIT Systems - Basic Treatment only.
Aggregate planning – Definition – aggregate-planning strategies – aggregate planning methods – transportation model.

UNIT –III
Line Balancing: Terminology, Methods of Line Balancing, RPW method, Largest Candidate method and Heuristic method.
Routing – Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

UNIT – IV

Scheduling –Definition – Scheduling Policies – types of scheduling methods – differences with loading – flow shop scheduling **–** job shop scheduling, line of balance (LOB) – objectives - steps involved.

UNIT – V

Dispatching : Definition – activities of dispatcher – dispatching procedures – various forms used in dispatching.

Follow up : definition – types of follow up – expediting – definition – expediting procedures-Applications of computers in planning and control.

TEXT BOOKS:

1. Production Planning and Control – M.Mahajan- Dhanpati rai & Co
2. Production Planning and Control- Jain & Jain – Khanna publications

REFRENCE BOOKS:

1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI.
2. Production and operations Management – R.Panneer Selvam – PHI
3. Operations Management by Chase/PHI
4. Management Science – A R Aryasri- 4e –TMH
5. Operations management – Heizer- Pearson.

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IV Year B.Tech. Mech. Engg. I-Sem

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ROBOTICS

Professional Elective **-V**

Pre-requisites: Basic principles of Kinematics and mechanics

Course Outcomes:

At the end of the course, the student will be able to understand the basic components of robots. Differentiate types of robots and robot grippers. Model forward and inverse kinematics of robot manipulators. Analyze forces in links and joints of a robot. Programme a robot to perform tasks in industrial applications. Design intelligent robots using sensors.

UNIT – I

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications.

Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems.

Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

UNIT – III

Differential transformation of manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems. Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion.

UNIT IV

Robot actuators and Feedback components:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparision of Actuators, Feedback components: position sensors –

potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

UNIT V

Robot Application in Manufacturing:

Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics / Fu K S/ McGraw Hill.
3. Theory of Applied Robotics (kinematics,Dynamics and Control-Jazar,Springer.

REFERENCE BOOKS:

1. Robotics and Control / Mittal R K & Nagrath I J / TMH.
2. Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley
3. Robot Analysis and control Asada and Slotine / Wiley Inter-Science
4. Introduction to Robotics / John J Craig / Pearson Education

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	4	**0**	**0**	**4**

Mechanics of Composite Materials

Professional Elective **-V**

Pre-requisites:

To learn the importance and use of materials and mechanics of solids.

Course objectives:

Provides the concepts of composite materials. To analyze macro and micro mechanical behavior of a lamina.

Course Outcomes:

At the end of course students will be able to understand the design and failure analysis of composites in aero space and automobile applications.

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 .

UNIT-II

Reinforcements: Fibers- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibers. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

UNIT-III

Macro mechanical Analysis of a Lamina: Introduction, Definitions Stress, Strain, Elastic Moduli, Strain Energy. Hooke's Law for Different Types of Materials, Hooke's Law for a Two-Dimensional Unidirectional Lamina, Plane Stress Assumption, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina.

UNIT-IV

Macro mechanical Analysis of Laminates: Introduction, Laminate Code, Stress–Strain Relations for a Laminate, In-Plane and Flexural Modulus.

UNIT-V

Failure Analysis of Laminates: Introduction, Special Cases of Laminates, Applications, Failure Criterion for a Laminate.

Text Books:

1. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.
2. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press, 1994.

References:

1. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley- Interscience, New York, 1980.
2. Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw, Publisher: CRC
3. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.

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CNC Machines

Professional Elective **-V**

Prerequisites: None

Course objectives:

Importance of CNC machines. Understand the fundamentals of it. Learning various methods of tooling with the CNC machines. Various controlling methods, Learning the part programming

Course outcomes:

At the end course, one should be able to select tooling method, control mechanism and do part programming for a given product.

UNIT I

Features of NC machines: fundamentals of numerical control, advantage of NC systems, classification of NC system, classification of NC systems, point to point, NC and CNC, incremental and absolute, open and closed loop systems, features of N/C Machine tools, design consideration of NC machine tool, methods of improving machine accuracy.

CNC Machine elements: machine structures-Guide ways-feed drives-spindles- spindle bearings-measuring systems- tool mentoring systems.

UNIT II

Tooling for CNC machines: interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, and quick change tooling system, automatic head changers.

NC part programming: manual programming-Basic concepts, point to point contour programming, canned cycles, parametric programming.

UNIT III

Computer-Aided Programming: General information, APT programming, Examples Apt programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors. Introduction to CAD/CAM software, Automatic Tool Path generation.

Unit-IV

DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages and disadvantages of DNC, adaptive control with

optimization, adaptive control with constraints, Adaptive control of machining processes like turning, grinding.

UNIT V

Micro Controllers: Introduction, Hardware components, I/O pins, ports, external memory, counters, timers and serial data I/O interrupts selection of Micro Controllers, Embedded Controllers, Applications and Programming of Micro Controllers.

Programming Logic Controllers (PLC'S): Introduction, Hardware components of PLC, system, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC'S in CNC Machines.

Text books:

1. Computer Control of Manufacturing Systems/ Yoram Koren/ Mc Graw Hill Int. 1983
2. CAD/CAM – Michel P. Groover, TMH

Reference books:

1. Machining Tools Hand Book Vol 3,(Automation & Control)/ Manfred Weck /John Wiley and Sons, 1984.
2. Mechatronics- HMT, TMH.

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L	T	P	C
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Machine Tool Design

Professional Elective **-V**

Pre-requisites:

Machine Design, Machine Tools and Metrology, Machining Science

Course Outcomes:

At the end of the course, the student will be able to, Understand basic motions involved in a machine tool. Design machine tool structures. Design and analyze systems for specified speeds and feeds. Select subsystems for achieving high accuracy in machining. Understand control strategies for machine tool operations. Apply appropriate quality tests for quality assurance.

Unit-I

Introduction to Machine Tool Drives and Mechanisms: Introduction to the course, Working and Auxiliary Motions in Machine Tools, Kinematics of Machine Tools, Motion Transmission.

Unit-II

Regulation of Speeds and Feeds: Aim of Speed and Feed Regulation, Stepped Regulation of Speeds, Multiple Speed Motors, Ray Diagrams and Design Considerations, Design of Speed Gear Boxes, Feed Drives, Feed Box Design.

Unit-III

Design of Machine Tool Structures: Functions of Machine Tool Structures and their Requirements, Design for Strength, Design for Rigidity, Materials for Machine Tool Structures, Machine Tool Constructional Features, Beds and Housings, Columns and Tables, Saddles and Carriages.

Unit-IV:

Design of Guideways, Power Screws and Spindles: Functions and Types of Guideways, Design of Guideways, Design of Aerostatic Slideways, Design of Anti-Friction Guideways, Combination Guideways, Design of Power Screws.

Design of Spindles and Spindle Supports: Functions of Spindles and Requirements, Effect of Machine Tool Compliance on Machining Accuracy, Design of Spindles, Antifriction Bearings.

Unit-V:
Dynamics of Machine Tools: Machine Tool Elastic System, Static and Dynamic Stiffness Acceptance Tests

Text Books:

1. N.K. Mehta, Machine Tool Design and Numerical Control, TMH, New Delhi, 2010
2. G.C. Sen and A. Bhattacharya**,** Principles of Machine Tools, New Central Book Agency, 2009.
3. D. K Pal, S. K. Basu, "Design of Machine Tools", 5th Edition. Oxford IBH, 2008
4. N. S. Acherkhan, "Machine Tool Design", Vol. I, II, III and IV, MIR publications, 1968

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IV Year B.Tech. Mech. Engg. I-Sem

L	T	P	C
4	1	0	4

REFRIGERATION &AIR CONDITIONING

Pre-requisite: Thermodynamics

Course Objective:
To apply the principles of Thermodynamics to analyse different types of refrigeration and air conditioning systems and to understand the functionality of the major components.

Course Outcomes:
At the end of the course, the student should be able to Differentiate between different types of refrigeration systems with respect to application as well as conventional and unconventional refrigeration systems. Thermodynamically analyse refrigeration and air conditioning systems and evaluate performance parameters. Apply the principles of Psychometrics to design the air conditioning loads for the industrial applications.

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:
Vapor 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. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai
2. Refrigeration and Air Conditioning/ Manohar Prasad/ New Age

REFERENCE BOOKS:
1. Refrigeration and Air Conditioning / CP Arora / TMH.
2. Principles of Refrigeration - Dossat / Pearson Education
3. Basic Refrigeration and Air-Conditioning – Ananthanarayanan / TMH

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	4	**1**	**0**	**4**

CAD/CAM

Pre-requisites: Nil

Course objectives:
To provide an overview of how computers are being used in design, development of manufacturing plans and manufacture. To understand the need for integration of CAD and CAM

Course Outcomes:
Understand geometric transformation techniques in CAD. Develop mathematical models to represent curves and surfaces .Model engineering components using solid modeling techniques. Develop programs for CNC to manufacture industrial components .To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.

UNIT – I
Fundamentals of CAD,CAM, Automation , design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD ,Design workstation, Graphic terminal, CAD software- definition of system software and application software ,CAD database and structure.

Geometric Modeling: 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, and definitions of cubic spline, Bezier, and B-spline.

UNIT-II
Surface modeling: Algebraic and geometric form, Parametric space of surface, Blending functions,parametrization of surface patch, Subdividing, Cylindrical surface, Ruled surface, Surface of revolution Spherical surface, Composite surface, Bezier surface. B-spline surface, Regenerative surface and pathological conditions.

Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT – III

NC Control Production Systems: Numerical control, Elements of NC system, NC part programming: Methods of NC part programming, manual part programming, Computer assisted part programming, Post Processor, Computerized part program, SPPL (A Simple Programming Language). CNC, DNC and Adaptive Control Systems.

UNIT – IV

Group Technology: Part families, Parts classification and coding. Production flow analysis, Machine cell design.

Computer aided process planning: Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.

Computer aided manufacturing resource planning: Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning

UNIT – V

Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.

Computer aided quality control: Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines, Machine vision.

Computer Integrated Manufacturing: CIM system, Benefits of CIM

TEXT BOOKS:

1. CAD/CAM Principles and Applications, P.N.Rao, TMH
2. CAD/CAM Concepts and Applications, Alavala, PHI

REFERENCE BOOKS:

1. CAD/CAM /Groover M.P., Pearson education
2. CAD / CAM Theory and Practice,/ Ibrahim Zeid,TMH
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, New Age
4. Principles of Computer Aided Design and Manufacturing, Farid Amirouche, Pearson
5. Computer Numerical Control Concepts and programming, Warren S Seames, Thomson.

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IV Year B.Tech. Mech. Engg. I-Sem	**L**	**T**	**P**	**C**
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CAD/CAM LAB

Pre-requisites: CAD/ CAM .

Course objectives:

To be able to understand and handle design problems in a systematic manner. To be able to apply CAD in real life applications. To be understand the basic principles of different types of analysis.

Course out comes:

To understand the analysis of various aspects in of manufacturing design

Note: conduct any TEN excercises from the list gien below:

1. Drafting: Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances.
2. Part Modeling: Generation of various 3D Models through Protrusion, revolve, sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling and Assembly Modeling. Study of various standard Translators. Design of simple components.
3. Determination of deflection and stresses in 2D and 3D trusses and beams.
4. Determination of deflections, principal and Von-mises stresses in plane stress, plane strain and Axi-symmetric components.
5. Determination of stresses in 3D and shell structures (at least one example in each case)
6. Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
7. Study state heat transfer analysis of plane and axi-symmetric components.
8. Development of process sheets for various components based on Tooling and Machines.
9. Development of manufacturing defects and tool management systems.
10. Study of various post processors used in NC Machines.
11. Development of NC code for free form and sculptured surfaces using CAM software.
12. Machining of simple components on NC lathe and Mill by transferring NC Code / from CAM software.
13. Quality Control and inspection.

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	0	**0**	**0**	**2**

INDUSTRY ORIENTED MINI PROJECT

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Mech. Engg. II-Sem	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

MANAGEMENT SCIENCE

Pre-requisites: None

Course Objectives: To understand

- The various phylospies of Management of different gurus, and their differences**.**
- Operations Management techniques
- Marketing, Human Resource, Project, Stragic Management Techniques

Course Outcomes:

Understand the evolutionary development of management nature importance and general principles of management. Apply principles of marketing operations and concepts and tools for successful launch of a product. Understand the concepts of human resources management and role of administration in streamlining a production system. Apply project management tools to manage projects. Apply the inventory management tools in managing inventory. Apply quality engineering tools to the design of products and process controls.

Unit I

Introduction to Management & Organisation: Concepts of Management and organization- nature, importance and Functions of Management, Systems Approach to Management - Taylor's Scientific Management Theory – Fayol's Principles of Management – Maslow's theory of Hierarchy of Human Needs – Douglas McGregor's Theory X and Theory Y – Hertzberg Two Factor Theory of Motivation - Leadership Styles, Social responsibilities of Management. Designing Organisational Structures: Basic concepts related to Organisation - Departmentation and Decentralisation, Types and Evaluation of mechanistic and organic structures of organisation and suitability.

Unit II

Operations & Marketing Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement – Business Process Reengineering Statistical Quality Control: control charts for Variables and Attributes, (simple Problems) and Acceptance Sampling, TQM, Six Sigma, Deming's contribution to quality. Objectives of Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records – JIT System,

Supply Chain Management Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

Unit III

Human Resources Management (HRM): Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating – Capability Maturity Model (CMM) Levels – Performance Management System.

Unit IV

Project Management *(PERT/CPM)*: Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing (simple problems).

Unit V

Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

TEXT BOOKS:

1. Aryasri: *Management Science*, McGraw Hill, 2012.
2. Vijay Kumar and Appa Rao *Management Science*, Cengage, 2012.

REFERENCES:

1. Kotler Philip & Keller Kevin Lane: Marketing Management, Pearson, 2012.
2. Koontz & Weihrich: *Essentials of Management*, McGraw Hill, 2012.
3. Thomas N.Duening & John M.Ivancevich *Management—Principles and Guidelines,* Biztantra, 2012.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2012.
5. Samuel C.Certo: *Modern Management*, 2012.
6. Schermerhorn, Capling, Poole & Wiesner: *Management*, Wiley, 2012.
7. Parnell: *Strategic Management*, Cengage, 2012.
8. Lawrence R Jauch, R.Gupta &William F.Glueck: *Business Policy and Strategic*

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SEMINAR

Prerequisites:
Open electives I & II of other branches, department electives

Course objectives:
Students should select a research paper in specialization of mechanical. The same is to be understood and report has to be made and presented.

Course Outcomes:
At the end of the course, the student will be able to Identify and compare technical and practical issues related to the area of course specialization. Summarize annotated bibliography of research demonstrating academic skills. Prepare a well organized report employing elements of technical writing and critical thinking. Demonstrate the ability to describe, interpret and analyze technical issues and develop proficiency in presenting.

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REFRIGERATION AND AIR CONDITIONING LAB

Prerequisites: R & A.C theory
Basic Principles of thermodynamics

Course Outcomes:
At the end of the course, the student will be able to determine the parameters of vapour compression system, heat pump and air conditioning unit. Evaluate the COP of different refrigeration systems. Understand the simulation of refrigeration systems

1. Determination of performance parameters of Vapor Compression Refrigeration System
2. Experimental Evaluation of performance parameters of Mechanical Heat Pump
3. Determination of performance parameters of using Air conditioning Lab unit
4. Determination of COP of Vapor Absorption Refrigeration system
5. Determination of COP of Vortex Tube Refrigerator
6. Simulation of refrigeration system for different operating conditions and working fluids using Refrigeration simulation software
7. Visit to any refrigeration or air conditioning plant.

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	0	**0**	**0**	**14**

MAJOR PROJECT

Pre-requisites: None

Course Objectives:
The student should be able to identify a topic in advanced areas of Mechanical Engineering. Review literature to identify gaps and define objectives & scope of the work. Generate and implement innovative ideas for social benefit. Develop a prototypes/models, experimental set-up and software systems necessary to meet the objectives.

Course Outcomes:
At the end of course, the student will be able to identify methods and materials to carry out experiments/develop code. Reorganize the procedures with a concern for society, environment and ethics. Analyze and discuss the results to draw valid conclusions. Prepare a report as per recommended format and defend the work. Explore the possibility of publishing papers in peer reviewed journals/conference proceedings.

OPEN ELECTIVE- I

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Civil Engg

L	T	P	C
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OPEN ELECTIVE-I
DISASTER MANAGEMENT

Pre Requisites: NIL

Course Objectives:
The subject provide different disasters, tools and methods for disaster management

Course Outcomes:
Estimate, perform quantity survey & valuate various engineering works

UNIT 1 : Understanding Disaster
Concept of Disaster
Different approaches
Concept of Risk
Levels of Disasters
Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerability
Natural and man-made hazards; response time, frequency and forewarning levels of different hazards
Characteristics and damage potential or natural hazards; hazard assessment
Dimensions of vulnerability factors; vulnerability assessment
Vulnerability and disaster risk
Vulnerabilities to flood and earthquake hazards

UNIT 2 : Disaster Management Mechanism
Concepts of risk management and crisis managements
Disaster Management Cycle
Response and Recovery
Development, Prevention, Mitigation and Preparedness
Planning for Relief

UNIT 3: Capacity Building
Capacity Building: Concept
Structural and Nonstructural Measures
Capacity Assessment; Strengthening Capacity for Reducing Risk
Counter-Disaster Resources and their utility in Disaster Management
Legislative Support at the state and national levels

UNIT 4: Coping with Disaster
Coping Strategies; alternative adjustment processes
Changing Concepts of disaster management
Industrial Safety Plan; Safety norms and survival kits
Mass media and disaster management

UNIT 5: Planning for disaster management
Strategies for disaster management planning
Steps for formulating a disaster risk reduction plan
Disaster management Act and Policy in India
Organizational structure for disaster management in India
Preparation of state and district disaster management plans

Text Books

1. Alexander, D. Natural Disasters, ULC press Ltd, London, 1993.
2. Carter, W.N. Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok, 1991.
3. Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.

References

1. Abarquez I. & Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.
2. Goudie, A. Geomorphological Techniques, Unwin Hyman, London 1990.
3. Goswami, S.C Remote Sensing Application in North East India, Purbanchal Prakesh, Guwahati, 1997.
4. Chakrabarty, U.K. Industrial Disaster Management and Emergency Response, Asian Book Pvt. Ltd., New Delhi 2007.
5. Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
6. National Policy on Disaster Management, NDMA, New Delhi, 2009
7. Disaster Management Act. (2005), Ministry of Home Affairs, Government of India, New Delhi, 2005.
8. District Disaster Management Plan-Model Template, NIDM, New Delhi, 2005.
9. Disaster Management, Future challenge and opportunities, Edited by Jagbir singh, I.K. International publishing home Pvt, Ltd.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. EEE **L T P C**
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OPEN ELECTIVE-I
NON CONVENTIONAL POWER GENERATION

Pre-requisite: Nil.
OBJECTIVES:

- To introduce various types of renewable technologies available.
- The technologies of energy conversion from these resources and their quantitative analysis.

UNIT - I

Fundamentals of Solar Energy-Solar spectrum- Solar Radiation on Earth's surface-Solar radiation geometry-Solar radiation measurements- Solar radiation data- Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion- Flat plate collectors-concentrated collectors- construction and thermal analysis- Solar applications- Solar ponds- Heliostat systems-water heater-air heater-solar still.

UNIT - II

Solar-Electric Power generation- Photovoltaic cells- Equivalent circuit- V-I Characteristics- Photovoltaic modules – constructional details- design considerations- Tracking- Maximum power point tracking - Solar Thermo electric conversion.

UNIT - III

Wind Energy- Fundamentals of wind energy-power available in wind- Betz Limit-Aerodynamics of wind turbine- Wind turbines-Horizontal and vertical axis turbines –their configurations- Wind Energy conversion systems.

UNIT - IV

Energy from Bio Mass- Various fuels- Sources-Conversion technologies-Wet Processes – Dry Processes- Bio Gas generation – Aerobic and anaerobic digestion - Factors affecting generation of bio gas - Classification of bio gas plants-Different Indian digesters-Digester design considerations - Gasification process - Gasifiers – Applications. Geothermal Energy - sources- Hydrothermal convective - Geo-pressure resources - Petro-thermal systems (HDR) - Magma Resources-Prime Movers.

UNIT - V

OTEC Systems- Principle of operation - Open and closed cycles, Energy from Tides - Principle of Tidal Power - Components of tidal Power plants - Operation Methods - Estimation of Energy in Single and double basin systems - Energy and Power from Waves-Wave energy conversion devices - Fuel Cells - Design and Principle of operation - Types of Fuel Cells - Advantages and disadvantages - Types of Electrodes – Applications - Basics of Batteries - Constructional details of Lead acid batteries - Ni-Cd Batteries.

OUTCOMES:

- The student will be able analyse solar thermal and photovoltaic systems and related technologies for energy conversion.
- Wind energy conversion and devices available for it.
- Biomass conversion technologies.
- Geo thermal resources and energy conversion principles and technologies.
- Power from oceans (thermal, wave, tidal) and conversion and devices.
- Fundamentals of fuel cells and commercial batteries.

TEXT BOOKS

1. John Twidell & Wier, Renewable Energy Resouces, CRC Press, 2009.
2. G.D.Rai – Non Conventional Energy sources, Khanna publishers.

REFERENCE BOOKS

1. D.P .Kothari, Singal,Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.
2. F.C.Treble, Generating Electricity from Sun.
3. C.S.Solanki, Solar Photo volatics- Fundamentals- Principles and Applications, PHI 2009
4. S.P.Sukhatme, Solar Energy Principles and Application - TMH

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. EEE

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OPEN ELECTIVE-I
ELECTRICAL ENGINEERING MATERIALS

Pre-requisites: Nil

Objectives: To understand the importance of various materials used in electrical engineering and obtain a qualitative analysis of their behavior and applications.

UNIT- I

DIELECTRIC MATERIALS: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT – II

MAGNETIC MATERIALS: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. factors effecting permeability and hysteresis

UNIT – III

SEMICONDUCTOR MATERIALS: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI)

UNIT – IV

MATERIALS FOR ELECTRICAL APPLICATIONS: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

UNIT – V

SPECIAL PURPOSE MATERIALS: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI

OUTCOMES: Will be able to

- Understand various types of dielectric materials, their properties in various conditions.
- Evaluate magnetic materials and their behavior.
- Evaluate semiconductor materials and technologies.
- Materials used in electrical engineering and applications.

TEXT BOOKS

1. R K Rajput: A course in Electrical Engineering Materials, Laxmi Publications. 2009
2. T K BasaK: A course in Electrical Engineering Materials:, New Age Science Publications 2009
3. TTTI Madras: Electrical Engineering Materials
4. Adrianus J.Dekker: Electrical Engineering Materials, THM Publication.

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B.Tech. EEE

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OPEN ELECTIVE-I
NANO-TECHNOLOGY

Pre-requisites: Nil

OBJECTIVES: To enable the student to understand fundamentals of nano materials and technologies for these materials and their manufacturing, applications in various fields.

UNIT - I

Background of Nanotechnology: Scientific Revolutions, Nanotechnology and Nanomachines - The Periodic Table, Atomic Structure, Molecules and Phases, Energy, Molecular and Atomic size, Surfaces and Dimensional Space, Top down and Bottom up approach.

UNIT - II

Molecular Nanotechnology: Atoms by inference, Electron Microscopes, Scanning electron microscope, Modern transmission electron microscope, Scanning probe microscope-atomic force microscope, scanning, tunneling microscope, Self Assembly.

UNIT - III

Nanopowders and Nanomaterials: Preparation, Plasma arcing, chemical vapor deposition, Sol-gels, Electrodeposition, Ball milling, using natural nanoparticles, Applications of nanomaterials.

UNIT - IV

Nanoelectronics: Approaches to nanoelectronics, Fabrication of integrated circuits, MEMS, NEMS, Nano circuits, Quantum wire, Quantum well, DNA-directed assembly and application in electronics.

UNIT - V

Applications: MEMS, NEMS, Coatings, Optoelectronic Devices, Environmental Applications, Nanomedicine.

OUTCOMES:

- To evaluate electronic structural studies of nano materials and different synthesis methods to obtain nano structures.
- Understand characterization techniques through various measurements to study electrical, mechanical,thermal properties of nano materials.
- Applications of nano materials for specific purposes like MEMS, NEMS, nano electronics, energy storage.

TEXT BOOKS

1. Introduction to Nanoscience and Nanotechnology Gabor L. Hornyak, **NanoThread, Inc., Golden, Colorado, USA**; H.F. Tibbals, **University of Texas Southwestern Medical Center, Dallas, USA**; Joydeep Dutta, **Asian Institute of Technology, Pathumthani, Thailand**; John J. Moore, **Colorado School of Mines, Golden, USA**
2. Introduction to Nanotechnology by Charles P. Poole Jr and Frank J.Owens Wiley India Pvt Ltd.
3. Introduction to Nanoscience and Nanotechnology, Chatopadhyaya.K.K, and Banerjee A.N,
4. Introduction to nano tech by phani kumar
5. Introduction to Nano Technology by Charles P. Poole Jr and Frank J. Owens. Wiley India Pvt Ltd.
6. Introduction to Nanoscience and Nanotechnology, Chatopadhyaya.K.K, and Banerjee A.N,

NANOTECHNOLOGY Basic Science and EmergingTsechnologies by Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse**-** CHAPMAN & HALL/CRC PRESS 2002.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.

L	T	P	C
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OPERATIONS RESEARCH
OPEN ELECTIVE-I

Prerequisites: None

Objectives:
Understanding the mathematical importance of development of model in a particular optimization model for the issue and solving it.

Outcomes:
Understanding the problem, identifying variables & constants, formulas of optimization model and applying appropriate optimization Techniques

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-graphical model
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
THEORY OF GAMES: 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 BOOK :

1. Operation Research /J.K.Sharma/ MacMilan.
2. Operations Research/A.C.S.Kumar/Yesdee

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).
5. Introduction to O.R /Taha/PHI

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.

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BASICS OF THERMODYNAMICS
OPEN ELECTIVE-I

Pre-requisite: Engineering Chemistry and Physics

Course Objective: To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications

Course Outcomes:

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

- Understand and differentiate between different thermodynamic systems and processes
- Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes
- Understand and analyze the Thermodynamic cycles

UNIT – I

Introduction: Basic Concepts:

System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle, Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility

UNIT II

Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT – III

First and Second Laws of Thermodynamics: First Law: Cycle and Process, Specific Heats (cp and cv), Heat interactions in a Closed System for various processes, Limitations of First Law, Concept of Heat Engine (H.E.) and Reversed H.E. (Heat Pump and Refrigerator), Efficiency/COP, Second Law: Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, Statement of Clausius Inequality, Property of Entropy, T-S and P-V Diagrams

UNIT IV

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const.

Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, , Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation ,Psychrometric chart.

UNIT - V

Power Cycles : Otto, Diesel cycles - Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis

Refrigeration Cycles:

Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS :

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Thermodynamics / C.P.Arora.

REFERENCE BOOKS:

1. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
2. Fundamentals of Classical Thermodynamics – G. Van Wylan & R.E. Sonntag – John Wiley Pub.
3. Thermodynamics – J.P.Holman / McGrawHill
4. Engineering Thermodynamics – Jones & Dugan
5. Thermodynamics & Heat Engines – Yadav – Central Book Depot, Allahabad.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
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FABRICATION PROCESSES
OPEN ELECTIVE-I

Prerequisites: Nil

Objectives:

Understand the philosphipies of various Manufacturing process.

Outcomes:

For given product, one should be able identify the manufacturing process.

UNIT – I

Casting : Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands.

Methods of Melting - Crucible melting and cupola operation – Defects in castings;

Casting processes – Types – Sand moulding, Centrifugal casting, die-casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.

Inert Gas Welding _ TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT – III

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth.

Stamping, forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.

Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – IV

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

UNIT – V

Forging Processes : Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

TEXT BOOKS :

1. Manufacturing Technology / P.N. Rao/TMH

REFERENCE BOOKS :

1. Production Technology / R.K. Jain
2. Metal Casting / T.V Ramana Rao / New Age
3. Principles of Metal Castings / Rosenthal.
4. Welding Process / Parmar /
5. Production Technology /Sarma P C /
6. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. ECE. **L T P C**
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ELECTRONIC MEASURING INSTRUMENTS
OPEN ELECTIVE-I

Note: No detailed mathematical treatment is required.
Prerequisite : Nil
Course Objectives:

- It provides an understanding of various measuring systems functioning and metrics for performance analysis.
- Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:

On completion of this course student can be able to

- Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

Unit-I:

Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

Unit-II:

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications.

Unit-III:

Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS

Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

Unit-IV:

Recorders: X-Y Plotter, Curve tracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

Unit-V:

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

TEXT BOOKS:

1. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

REFERENCES:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. CSE

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OPEN ELECTIVE-I

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Prerequisites

1. A course on “Computer Programming & Data Structures”

Objectives

1. Introduces object oriented programming concepts using the Java language.
2. Introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
3. Introduces the implementation of packages and interfaces
4. Introduces exception handling, event handling and multithreading
5. Introduces the design of Graphical User Interface using applets and swings

Outcomes

1. Develop applications for a range of problems using object-oriented programming techniques
2. Design simple Graphical User Interface applications

UNIT I:

Object oriented thinking and Java Basics- Need for OOP paradigm, summary of OOP concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT II:

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying

interfaces, variables in interface and extending interfaces, Exploring java.io.

UNIT III:

Exception handling and Multithreading– Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

String handling,Exploring java.util.Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter-thread communication, thread groups, daemon threads, Enumerations, auto boxing, annotations, generics.

UNIT IV:

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menu bar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT V:

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java the complete reference, 7th editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

REFERENCES:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & Sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. An introduction to Java programming and object oriented application development,
R.A. Johnson- Thomson.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. CSE

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OPEN ELECTIVE-I
COMPUTER GRAPHICS

Prerequisites

1. Familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.
2. A course on “Computer Programming and Data Structures”

Objectives

1. The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
2. Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

Outcomes

1. Acquire familiarity with the relevant mathematics of computer graphics.
2. Be able to design basic graphics application programs, including animation
3. Be able to design applications that display graphic images to given specifications

UNIT-I:

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms (Bresenham’s and DDA Algorithm), mid-point circle and ellipse algorithms

Filled area primitives: Scan-line polygon fills algorithm, boundary-fill and flood-fill algorithms

UNIT-II:

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions,

Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland – Hodgeman polygon clipping algorithm, Polygon Filling

UNIT-III:

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

UNIT-IV:

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-V:

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods

Text Books:

1. "Computer Graphics *C version*", Donald Hearn and M.Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

References:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Met. Engg.

L	T	P	C
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ENGINEERING MATERIALS
OPEN ELECTIVE-I

Pre requisites: Nil

Course Objectives:

1. To gain an knowledge about the uses and application of various ferrous metals and alloys.
2. To gain an knowledge about the uses and application of various non ferrous alloys.
3. To gain an knowledge about the uses and application of various ceramics, polymers and composites for different engineering applications.

Course Outcomes:

At the end of the course, student would be able to recommend

1. Ferrous metals and alloys for a given engineering applications and service condition.
2. Non ferrous alloys for a given engineering applications and service condition.
3. Ceramics, Polymers and composites for a given engineering applications and service condition.

UNIT-I

FERROUS ALLOYS: Introduction, Designations and classifications for steels, Simple Heat Treatments, Effect of Alloying Elements.

UNIT-II

NONFERROUS ALLOYS: Introduction, properties and applications, Aluminum Alloys, Magnesium Alloys, Copper Alloys and Titanium Alloys.

UNIT-III

CERAMIC MATERIALS: Introduction, Properties and Applications of Ceramics, Glasses and Refractories.

UNIT-IV

POLYMERS: Introduction, Classification of Polymers, Polymerization, Degree of Polymerization,
Typical Thermoplastics and Thermosets.

UNIT-V

COMPOSITES: Introduction, Classification, Properties and Applications of Polymer matrix, Metal Matrix Ceramic Matrix and Laminar composites.

TEXT / REFERENCE BOOKS:

1. Donald R. Askland, Pradeep P. Phule, The Science and Engineering of Materials (4th Edition), Thomson Publishers, 2003.
2. William D. Callister Introduction to Material Science and Engineering, John Wiley and Sons, 2007.
3. W.F.Smith, Principles of Materials Science and Engineering, Mc Graw Hill, New York, 1994.

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B.Tech. Met. Engg.

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METALLURGY FOR NON METALLURGIST
OPEN ELECTIVE-I

Pre requisites: Nil

Course Objectives:

1. To describe the basic principles of metallurgy and the importance of metallurgy in various discipline of engineering.
2. Gain a thorough knowledge about heat treatment of steels.
3. Gain a knowledge about properties and uses of cast irons and non ferrous metals.
4. Gain a working knowledge of basic testing methods for metals.

Course Outcomes:

At the end of the course Student would be able

1. To use and apply metallurgy in his own branch of engineering.
2. The student will be able to justify the various testing methods adopted for metals.

UNIT-I

Introduction: Crystal structure and defects, Crystal structure of metals, Classification of steels, Carbon steels

UNIT-II

Heat Treatment of Steels: The Iron carbon systems, Common phases in steels, Annealing, Normalizing, Hardening and tempering

UNIT-III

Cast irons: Properties and applications of Ductile irons, Malleable irons, Compacted graphite iron.

UNIT-IV

Non Ferrous Metals: Properties and applications of Light Metals (Al , Be, Mg, Ti), Super alloys

UNIT-V

Testing of Metals: Hardness testing, Tensile Testing, Impact Testing, Fatigue Testing.

TEXT BOOKS

1. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007
2. Introduction to Physical Metallurgy – SH Avner, TATA Mc GRAW HILL ,1997
3. Metallurgy for Engineers- Clark and Varney
4. Mechanical Metallurgy – G. E. Dieter

REFERENCE BOOKS

1. Engineering Physical Metallurgy and Heat treatment – Y Lakhtin
2. C. Suryanarayana, Experimental Techniques in Mechanics and Materials, John Wiley, John Wiley, NJ, USA,2006

Foundations of Materials Science and Engineering – WF Smith

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Chemical**. Engg.**

L	T	P	C
3	1	0	3

OPEN ELECTIVE-I
INDUSTRIAL POLLUTION CONTROL ENGINEERING

Objective:

To expose the students to various types of industrial pollutions and controlling techniques.

UNIT-I

Introduction to industrial pollution and types of pollution from chemical industries, Effects of pollution as environment and ecosystems-global warming-green house effect; Environmental legislatures-standards and guidelines.

UNIT –II

Air pollution- Meteorological aspects of pollution dispersion-adiabatic lapse rate-Environmental lapse rate-Turbulence and stability of atmosphere, Richardson number-Plume raise-plume behavior and characteristics, effective stack height. Major air pollutants and their sources, measurement of air pollutants

UNIT -III

General methods of control air pollutants removal of sulphur dioxide, oxides of nitrogen and organic vapors from gaseous effluents; Removal of particulate matter – principle and working of setting chambers, cyclone separators, fabric and fibre filters – electro static precipitators, Treatment of gaseous effluents.

UNIT -IV

Introduction to water pollution – water pollutants classification – characteristics of liquid effluents from fertilizer, pulp & paper and petroleum industries, estimation of oxygen demands – DO, BOD, COD, TOC – BOD curves, oxygen sag curve – modeling of BOD curves

Biological treatment of waste waters – aerobic and anaerobic methods – suspended and attached growth processes – bacteria – Reproduction in bacterial – Bacterial growth crushes, conventional activated sludge process – Trickling filters, Aerated lagoons – stabilization ponds – fluidized bed contractors.

UNIT -V

Physical Treatment methods : Principle and working of screening – sedimentation – flotation – filtration – flocculation, Tertiary Treatment methods – carbon adsorption – Ion exchange – Reverse Osmosis, Boralin Chlorinating – Ultra filtration, Sludge treatment and disposal , removal of chromium and phenol from liquid effluents.

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Text books:

1. Pollution control in process industries by S.P. Mahajan TMH.,1985
2. Waste water treatment by M.Narayana Rao and A.K.Datta,Oxford and IHB publ. New Delhi

References:

1. Environmental pollution and control engineering by Rao C. S. – Wiley Eastern Limited, India, 1993.
2. Air pollution control by P.Prathap mouli and N.Venkata subbayya. Divya Jyothi Prakashan, Jodhpur.

OUTCOME: The student will be able learn the sources of air, water pollution and also their treatment methods

w.e.f. 2017-2018 academic year

OPEN ELECTIVE- II

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B.Tech. Civil Engg.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

OPEN ELECTIVE -II
ESTIMATION, QUANTITY SURVEY & VALUATION

Pre Requisites:
Concrete Technology, RC Design, Desgin of Steel Structure

Course Objectives:
The subject provide process of estimations required for various work in construction. To have knowledge of using SOR & SSR for analysis of rates on various works .

Course Outcomes:
Able to provide control steps for disaster mitigation steps

UNIT – I
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

UNIT – II
Detailed Estimates of Buildings - Reinforcement bar bending and bar requirement schedules

UNIT – III
Earthwork for roads and canals.

UNIT – IV
Rate Analysis – Working out data for various items of work over head and contigent charges.

UNIT-V
Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation -Standard specifications for different items of building construction.

NOTE : NUMBER OF EXERCISES PROPOSED :
1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

w.e.f. 2017-2018 academic year

Text Books:
1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie

Reference books:
1. Standard Schedule of rates and standard data book by public works department.
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. EEE

L	T	P	C
3	0	0	3

OPEN ELECTIVE-II

DESIGN ESTIMATION AND COSTING OF ELECTRICAL SYSTEMS

Pre-requisite: Power systems-I and Power Systems-II

Objectives: Objectives of this course are

- To emphasize the estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost viability.
- To design and estimation of wiring,
- To design overhead and underground distribution lines, substations and illumination design.

UNIT - I

DESIGN CONSIDERATIONS OF ELECTRICAL INSTALLATIONS: Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections , Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT - II

ELECTRICAL INSTALLATION FOR DIFFERENT TYPES OF BUILDINGS AND SMALL INDUSTRIES: Electrical installations for residential buildings – estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

UNIT - III

OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES: Introduction, Supports for transmission lines, Distribution lines – Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

w.e.f. 2017-2018 academic year

UNIT - IV

SUBSTATIONS: Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substations – Floor mounted type.

UNIT – V

DESIGN OF ILLUMINATION SCHEMES: Introduction, Terminology in illumination, laws of illumination, various types of light sources, Practical lighting schemes LED, CFL and OCFL differences.

OUTCOMES: Students are in a position to Understand the design considerations of electrical installations.

- To design electrical installation for buildings and small industries.
- To identify and design the various types of light sources for different applications.

TEXT BOOKS

1. Electrical Design Estimating and Costing, K. B. Raina, S. K. BhattAcharya, New Age International Publisher.
2. Design of Electrical Installations, Er. V. K. Jain, Er. Amitabh Bajaj, University Science Press.

REFERENCE BOOKS

1. Code of practice for Electrical wiring installations,(System voltage not exceeding 650 volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS: 4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032.
4. Code of Practice for selection, Installation of Maintenance of fuse (voltage not exceeding 650V), Indian Standard Institution, IS: 3106-1966.
5. Code of Practice for earthling, Indian Standard Institution, IS:3043-1966.
6. Code of Practice for Installation and Maintenance of induction motors, Indian Standard Institution, IS: 900-1965.
7. Code of Practice for electrical wiring, Installations (system voltage not exceeding 650 Volts), Indian Standard Institution, IS: 2274-1963.
8. Electrical Installation, estimating and costing, Gupta J. B., Katson, Ludhiana.

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B.Tech. EEE

L	T	P	C
3	0	0	3

OPEN ELECTIVE-II
ENERGY STORAGE SYSTEMS

Pre-requisite: None

Objectives: Objectives of this course are

- To enable the student to understand the need for energy storage, devices and technologies available and their applications,

UNIT - I

Electrical Energy Storage Technologies: Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

UNIT - II

Needs for Electrical Energy Storage: Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT - III

Features of Energy Storage Systems: Classification of EES systems , Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

UNIT - IV

Types of Electrical Energy Storage systems: Electrical storage systems, Double-layer capacitors (DLC) ,Superconducting magnetic energy storage (SMES),Thermal storage systems ,Standards for EES, Technical comparison of EES technologies.

UNIT - V

Applications: Present status of applications, Utility use (conventional power generation, grid operation & service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA– aggregation of many dispersed batteries.

OUTCOMES: After this course, the student

- Can analyze the characteristics of energy from various sources and need for storage
- Can classify various types of energy storage and various devices used for the purpose
- Can apply the same concepts to real time problems.

TEXT BOOKS

1. Energy Storage Benefits and Market Analysis' by James M. Eyer, Joseph J. Iannucci and Garth P. Corey.
2. The Electrical Energy Storage by IEC Market Strategy Board.

REFERENCE BOOKS:

1. Jim Eyer, Garth Corey: Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. EEE

L	T	P	C
3	0	0	3

OPEN ELECTIVE-II
MECHATRONICS

UNIT – I

INTRODUCTION: Definition – Trends - Control Methods: Standalone , PC Based (Real Time Operating Systems, Graphical User Interface , Simulation) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

SIGNAL CONDITIONING : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution, Filtering Noise using passive components – Registors, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass , high pass , notch filtering

UNIT – II

PRECISION MECHANICAL SYSTEMS: Modern CNC Machines – Design aspects in machine structures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.

ELECTRONIC INTERFACE SUBSYSTEMS: TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers, over current sensing, resetable fuses, thermal dissipation - Power Supply - Bipolar transistors / MOSFETs

UNIT – III

ELECTROMECHANICAL DRIVES: Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.

MICROCONTROLLERS OVERVIEW: 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming – Assembly, C (LED Blinking , Voltage measurement using ADC).

UNIT – IV

PROGRAMMABLE LOGIC CONTROLLERS: Basic Structure - Programming : Ladder diagram -Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling -Analog input/output - PLC Selection - Application.

UNIT – V

PROGRAMMABLE MOTION CONTROLLERS: Introduction - System Transfer Function – Laplace transform and its application in analyzing differential equation of a control system - Feedback Devices: Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive, Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , GOTO Position - Applications : SPM, Robotics.

TEXT BOOKS

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics by M.D.Singh, J.G.Joshi PHI.
3. Mechatronics HMT

REFERENCE BOOKS

1. "Designing Intelligent Machines". open University, London.
2. Michel B. Histand and David G. Alciatore,"
3. Introduction to Mechatronics and Measurement systems, "Tata MC Graw Hill
4. I. C.W. Desi ha, "Control sensors and actuators," Prentice Hall.
5. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
6. Mechatronics – N. Shanmugam / Anuradha Agencies Publisers.
7. Mechatronics System Design / Devdas shetty /Richard / Thomson.

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B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

JET PROPULSION & ROCKET ENGINEERING
OPEN ELECTIVE-II

Prerequites: None

Course outcomes:
After doing this course, student should be in position to
1. Understand Turbo Jet Propulsion System
2. Analyze the flight performance
3. Understand Principles of Jet Propulsion and Rocketry & Nozzle Theory and Characteristics
4. Learn the Aero thermo chemistry of the combustion products
5. Understand the physics of Solid propellant rocket engine, Liquid Rocket Propulsion System & Ramjet and Integral Rocket Ramjet Propulsion System**:**

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, A_c / A_t 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.

w.e.f. 2017-2018 academic year

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 formation – 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 pub.
2. Gas Dynamics & Space Propulsion M.C.Ramaswamy / Jaico Publishing House.

REFERENCE BOOKS:
1. Rocket propulsion –Sutton
2. Gas Turbines /Cohen, Rogers & Sarvana Muttoo/Addision Wesley & Longman.
3. Gas Turbines-V.Ganesan /TMH.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

ERGONOMICS
OPEN ELECTIVE-II

Prerequists: None

Objectives:
Provide a broad based introduction to ergonomic principles and their application in the design of work, equipment and the workplace. Consideration is given to musculo-skeletal disorders, manual handling, ergonomic aspects of the environment as well as to the social and legal aspects.

Course Outcomes:
On completing this course successfully the student will be able to:
- understand and apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace;
- understand ergonomic risk assessments and appropriate control measures;
- understand the causes of upper limb disorders and how to reduce them;
- appreciate workplace layout and equipment design;
- appreciate environmental aspects of good ergonomic design.

UNIT I
Introduction to Ergonomics, Human, Machine Systems, Basic Work Systems, Human Relations and Occupational Psychology, Hawthrone Experiments, Participation, Occupational Medicine, Human Performance Psychology, FMJ versus FJM, Human Factors and Ergonomics. Modern Work Systems and Neo, Taylorism, Attempts to Humanize Work, Generic Tools in Ergonomics, Effectiveness and Cost Effectiveness of Ergonomics in General.

UNIT II
Design and Evaluation of Manual Handing Tasks, Anatomy and Biomechanics of Manual Handling, Prevention of Manual Handling Injuries in the Workplace, Design of Manual Handling Tasks.
Body Mechanics at Work: Risk Assessment and Design, Low Back Pain, Biomechanics of Spinal Loading, Ergonomics and Musculoskeletal System in General, Effectiveness and Cost Effectiveness.

w.e.f. 2017-2018 academic year

UNIT III
Physically Demanding Work: Stress and Fatigue, Physically and Psychologically Demanding Work, Muscles, Structure and Function, and Capacity, Physical work capacity.
User, Cantered Workspace Design Anthropometric Data, Statistical Essentials, Types of Anthropometric Data, Applications Of Anthropometry in Design, Multiple Workspace Configurations, Status of Anthropometry in Ergonomics.

UNIT IV
Human Error, Accidents, and Safety, Micro ergonomics, Human Error, and Accidents, Prevention of Error in Human, Machine Interaction, Macroergonomices: Performance Shaping Factors.

UNIT V
Visual Environment: Measurements and Design, Vision and the Eye, Measurement of Light, Lighting Design Considerations, Visual figure, Eyestrain, and Near Work, Status of Methods in Risk Assessment and Task design.
Hearing, Sound, Noise and Vibration, Measurement of Sound, Hearing Protection, Design of Acoustic Environment.

Text books
1. Introduction to Ergonomics(Third Edition)/ R.S.Bridger/CRC Press , Taylor & Francis Group

References
1. Human factors in Engineering and Design/E.J.McCormick/ TMH Edison
2. Motion and Time Design and Measurement of work/ Barnes Ralph., / John Wiley & sons Newyork, 2002

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

MECHATRONICS
OPEN ELECTIVE-II

Pre-requisites: None.

Course objectives:
- They should be able to link up mechanical and electronics.

Outcomes:
- Develop a relationship between mechanical elements and electronics elements for proper functioning of mechanical systems.

UNIT – I
INTRODUCTION: Definition – Trends - Control Methods: Standalone , PC Based (Real Time Operating Systems, Graphical User Interface , Simulation) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

SIGNAL CONDITIONING : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution, Filtering Noise using passive components – Registors, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass , high pass , notch filtering

UNIT – II
PRECISION MECHANICAL SYSTEMS :
Modern CNC Machines – Design aspects in machine structures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.
Note: (text book: Mechatronics HMT – chapter 5)

ELECTRONIC INTERFACE SUBSYSTEMS : TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resetable fuses , thermal dissipation - Power Supply - Bipolar transistors / mosfets

UNIT – III
ELECTROMECHANICAL DRIVES : Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors -

4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.
MICROCONTROLLERS OVERVIEW : 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming –Assembly, C (LED Blinking , Voltage measurement using ADC).

UNIT – IV
PROGRAMMABLE LOGIC CONTROLLERS : Basic Structure - Programming : Ladder diagram -Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling -Analog input / output - PLC Selection - Application.

UNIT – V
PROGRAMMABLE MOTION CONTROLLERS : Introduction - System Transfer Function – Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , GOTO Position - Applications : SPM, Robotics.

TEXT BOOKS :
1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

REFERENCE:
1 "Designing Intelligent Machines". open University, London.
2 Michel B. Histand and David G. Alciatore,"
3 Introduction to Mechatronics and Measurement systems, "Tata MC Graw hill
4 I. C.W. Desi ha, "Control sensors and actuators," Prentice Hall.
5 Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
6 Mechatronics – N. Shanmugam / Anuradha Agencies Publisers.
Mechatronics System Design / Devdas shetty/Richard/Thomson.

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B.Tech. ECE.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRINCIPLES OF ELECTRONIC COMMUNICATIONS
OPEN ELECTIVE-II

Prerequsite : Nil

Course Objectives:
The objective of this subject is to:
- Introduce the students to modulation and various analog and digital modulation schemes.
- They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.

Course Outcomes:
By completing this subject, the student can
- Work on various types of modulations.
- Should be able to use these communication modules in implementation.
- Will have a basic understanding of various wireless and cellular, mobile and telephone communication systems.

Unit 1:
Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

Unit 2:
Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

Unit 3:
Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

Unit 4:
Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.

w.e.f. 2017-2018 academic year

Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

Unit 5:
Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, WCDMA.
Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:
1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. Kennady, Davis, Electronic Communications systems, 4e, TMH, 1999

Reference Books:
1. Tarmo Anttalainen, Introduction to Telecommunications Network Engineering, Artech House Telecommunications Library.
2. Theodore Rappaport, Wireless Communications-Principles and practice, Printice Hall, 2002.
3. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
4. Wayne Tomasi, Introduction to data communications and networking, Pearson Education, 2005.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. CSE	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

OPEN ELECTIVE-II
DATABASE MANAGEMENT SYSTEMS

Prerequisites

1. A course on “Advanced Data Structures”

Objectives

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Outcomes

1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiarity with database storage structures and access techniques

UNIT I:

Database System Applications: database system Vs. file system, view of data, data abstraction, instances and schemas, data models, the ER model, relational model, other models, database languages, DDL, DML, database access for application programs, database users and administrator, transaction management, database system structure, storage manager, the query processor, history of data base systems, data base design and ER diagrams, beyond ER design entities, attributes and entity sets, relationships and relationship sets, additional features of ER model, concept design with the ER Model, conceptual design for large enterprises.

UNIT II:

Introduction to the Relational Model: integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views, form of basic SQL query, examples of basic SQL queries, introduction to nested queries, correlated nested queries, set comparison operators, aggregation operators, NULL values, comparison using null values, logical connectivity’s, AND, OR and NOT, impact on SQL constructs, outer joins, disallowing NULL values, complex integrity constraints in SQL, triggers and active data bases, Oracle, SQL Server, DB2.

UNIT III:

Relational Algebra: Selection and projection, set operations, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus, Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

Schema refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, dependency preserving decomposition, schema refinement in database design, multi valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT IV:

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity. Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with loss of nonvolatile storage, Advance Recovery systems, Remote Backup systems.

UNIT V:

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

References:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J. Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. C.S.E.

L	T	P	C
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OPEN ELECTIVE -II
CYBER SECURITY

Prerequisites

1. A Course on “Network Security and Cryptography”

Objectives

1. The purpose of the course is to educate on cyber security and the legal perspectives of cyber crimes and cyber offenses.
2. Introduce tools and methods for enhancing cyber security.
3. Topics include- cyber crimes, cyber offenses, cyber crimes on mobile and wireless devices, tools and methods to prevent cyber crimes, legal perspectives of cyber crimes and cyber security, computer forensics, Intellectual Property Rights and cyber terrorism

Outcomes

1. Demonstrate the knowledge of cyber security and understand the Indian and Global Act concerning cyber crimes
2. Employ security and privacy methods in the development of modern applications such that personal data is protected; and provide safe Internet usage.

UNIT-I

Introduction to Cybercrime:

Introduction, Cybercrime and Information security, who are cyber criminals, Classification of Cyber crimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cyber crimes.

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 and Measures in Mobile Computing Era, Laptops.

Tools and Methods Used in Cyber Crime:

Introduction, Proxy services and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT III

Cyber crimes 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.

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 IV

Cyber Security: Organizational Implications

Introduction, cost of cyber crimes 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.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cyber crimes the psychology, mindset and skills of hackers and other cyber criminals

UNIT V

Cybercrime: Illustrations, Examples and Mini-Cases

Examples:

Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

w.e.f. 2017-2018 academic year

Mini-Cases:

The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Illustrations of Financial Frauds in Cyber Domain, Digital Signature-Related Crime Scenarios.

Text book:

1. **Cyber Security**: *Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference book:

1. **Cyber Security Essentials**, James Graham, Richard Howard and Ryan Otson, CRC Press.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Met. Engg.

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CORROSION ENGINEERING
OPEN ELECTIVE-II

Pre-requisites: NIL

Course Objectives:

1. To demonstrate electrometallurgy principles in deposition winning and the efficiency of the bath.
2. To determine corrosion rate/ resistance of metals and alloys.
3. To explain corrosion protection methods and tests.

Course Outcomes:

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

1. To gain knowledge in various types of electrolytic cells and the processes taking place in them.
2. To obtain knowledge about the importance of controlling corrosion and its prevention measures.
3. The course is useful for higher studies, R&D, and also for getting into jobs in industries.

UNIT - I

Introduction, Electro Chemistry principles, electrochemical reactions, Polarization, passivity, environmental effects (oxygen, oxidizers, velocity, temperature, corrosive concentration, Galvanic coupling).

UNIT - II

Corrosion, Introduction, Definition, classification, Forms of corrosion, uniform corrosion,
Two metal corrosion: Sacrificial anode, EMF and Galvanic Series, Environmental effects,
Pitting corrosion: Pit shape and growth, Autocatalytic Nature of pitting, Crevice corrosion.

UNIT - III

Intergranular corrosion: Sensitization, weld decay, Knife-Line attack, Stress corrosion cracking: crack morphology, stress effects, environmental factors, metallurgical factors, Erosion corrosion: cavitation damage, fretting corrosion, Corrosion fatigue.

w.e.f. 2017-2018 academic year

UNIT - IV

Corrosion prevention methods: Alteration of Environment (Inhibitors), Design, Coatings, cathodic and anodic protection. Material selection, Metallurgical aspects, Hydrogen damage (hydrogen blistering, Hydrogen embrittlement, Prevention).

UNIT - V

Modern theory and applications of corrosion: Introduction, free energy, cell potentials, emf series, applications of thermodynamics to corrosion, Corrosion rate expressions and measurements, corrosion testing.

Text / Reference Books:

1. Theory of Corrosion and Protection of Metals, N. D. Tomashov, Macmillan, 1967.
2. Corrosion Engineering, M. G. Fontana, 3rd edition, McGraw-Hill, 1985.
3. Corrosion and Corrosion Control, H. H. Uhlig, Wiley, 1985.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Met. Engg.

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TESTING OF MATERIALS
OPEN ELECTIVE-II

Pre-requisites: NIL

Course Objectives:

1. To gain and understanding of the response of various metals under the application of stress and/or temperature.
2. To build necessary theoretical back ground of the role of lattice defects in governing bot;h elastic and plastic properties of metals will be discussed.
3. Obtain a working knowledge of various hardness testing machines BHN, VHN, RHN
4. Obtain a working knowledge of creep and fatigue and analysis of data.

Course Outcomes:

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

1. Classify mechanical testing of ferrous and non-ferrous metals and alloys.
2. Recognize the importance of crystal defects including dislocations in plastic deformation.
3. Identify the testing methods for obtaining strength and hardness.
4. Examine the mechanisms of materials failure through fatigue and creep

UNIT – I

Introduction, Importance of testing
Hardness Test: Methods of hardness testing – Brinell, Vickers, Rockwell hardness tests.
The Impact Test: Notched bar impact test and its significance, Charpy and Izod Tests, fracture toughness testing - COD and CTOD tests, significance of transition temperature curve.

UNIT - II

The Tension Test: Engineering stress-strain and True stress-strain curves. Tensile properties, conditions for necking. Stress-Strain diagrams for steel, Aluminum and cast iron.

w.e.f. 2017-2018 academic year

UNIT - III

Fatigue Test: Introduction, Stress cycles, S-N Curve, Effect of mean stress, Mechanism of fatigue failure, Effect of stress concentration, size, surface condition and environments on fatigue.

UNIT – IV

Creep and Stress Rupture: Introduction, The creep curve, Stress-rupture test, Structural changes during creep, Mechanism of creep deformation, theories of creep. Fracture at elevated temperature.

UNIT – V

NDT: Principle, Operation, Advantages and Limitations of Liquid Penetrant, Magnetic Particle, Radio graphy and Ultrasonic tests.

TEXT / REFERENCE BOOKS:

1. Mechanical Metallurgy – G. E. Dieter
2. Mechanical behavior - Ed. Wulf.
3. Mechanical Metallurgy – White & Lemay.
Testing of Materials - A.V.K. Suryanarayana

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Chemical**. Engg.**

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OPEN ELECTIVE-II
SOLID WASTE MANAGEMENT

Objectives:

- To know the Classification of solid waste and characterization of the same
- Understand the sense of onsite handling storage and collection systems including transportation
- Understand the different processing technologies of solid waste

Unit I

Introduction: Definition, characteristics and perspectives of solid waste. Types of solid waste. Physical and chemical characteristics. Variation of composition and characteristics. Municipal, industrial, special and hazardous wastes.

General aspects: Overview of material flow in society. Reduction in raw material usage. Reduction in solid waste generation. Reuse and material recovery. General effects on health and environment. Legislations.

Unit II

Engineered systems: Typical generation rates.Estimation and factors effecting generation rates. On site handling.Storage and processing. Collection systems and devices. Transfer and transport.

Unit III

Processing Techniques: Mechanical volume reduction. Thermal volume reduction. Component separation. Land filling and land forming. Deep well injection.

Unit IV

Material recovery: Mechanical size alteration. Electromagnetic separation. Drying and dewatering. Other material recovery systems. Recovery of biological conversion products. Recovery of thermal conversion products.

Energy recovery: Energy recovery systems and efficiency factors. Determination of output and efficiency. Details of energy recovery systems. Combustion incineration and heat recovery. Gasification and pyrolysis. Refuse derived fuels (RDF).

w.e.f. 2017-2018 academic year

Unit V

Case studies: Major industries and management methods used in typical industries – Coal fired power stations, textile industry, oil refinery, distillery, sugar industry, and radioactive waste generation units.

Text Books:

1. Howard S. Peavy, Environmental Engineering, McGraw Hill International Edition, 1986.
2. Dutta, Industrial Solid Water Management and Land Filling Practice, Narose Publishing House, 1999.

Reference Books:

1. Sastry C.A., Waste Treatment Plants, Narose Publishing House, 1995.
2. Lagrega, Hazardous Waste Management, McGraw Hill, 1994.

Outcomes:

The student will be able to

- Apply the knowledge of characterization of waste and develop a suitable management plan
- Assess the cost of transportation and laboratory processing of solid waste
- Identify hazardous nature of waste if any and can suggest suitable dumping methods.
- Suggest processing waste for material for energy recovery.

OPEN ELECTIVE- III

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Civil Engg.

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OPEN ELECTIVE -III
ENVIRONMENTAL IMPACT ASSESSMENT

Pre Requisites: Environmental Engineering

Course Objectives:

This subject will cover various aspects of Environment Impact Assessment methodologies, impact of development activities. Impact on surface water, Air and Biological Environment, Environment legislation Environment.

Course Outcomes: Environmental Science

UNIT – I

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT-II

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT-III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

UNIT – IV

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

UNIT - V

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Barthwal, R. R. B. – Environmental Impact Assessment, New Age International Publications

References:

1. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
2. Suresh K. Dhaneja - Environmental Science and Engineering, S.K.,Katania & Sons Publication., New Delhi.
3. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication(P) Ltd, Delhi.
   Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers- Routledge, London, 1992.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. EEE

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OPEN ELECTIVE-III
ENTERPRISE RESOURCE PLANNING

(Students must read text book. Faculty are free to choose any other cases)

Course Aim:

It enables the student to understand the foundations of Enterprise planning and ERP System Options.

Learning Outcome: The student understands the challenges in implementation of ERP system, ERP System Implementation options, and functional modules of ERP.

1. Introduciton to ERP- Foundation for Understanding ERP systems-Buisiness benefits of ERP-The challenges of impelmenting ERP system-ERP modules and Historical Developement.
   Case: Response top RFP for ban ERP system (Mary Sumner).
2. ERP system options & Selection methods-Measurement of project Inpact- information Technology Selection-ERP proposal evaluvation-Project Evaluvation Technique.(David L.olson).
   Case: Atlantic Manufacturing (Mary Sumner).
3 ERP system Installation Options- IS/IT Management results-Risk Identificatioon analysis-System Projects- Demonstation of the system-Failure method-system Architecture & ERP (David L.Olson)
   Case: DataSolutiions & Technology Knowledge (Mary Sumner).
4 ERP - sales and Marketing- Managment control process in sales and markring-ERP custoemr relatonship managment-ERP systems-Accounting & Fiance control processes. Fiancial modules in ERP systems.
   Case: atalantic manufacturing (Mary Sumner).
5 ERP – Produciton and Material Managment-Control process on produciton and manuifacturing-Produciton module in ERP- supply chain Managmeent & e-market place-e-businesss & ERP-e supply chian & ERP- Future directions for ERP.
   Case: HR in atalntic manufacturing. (Mary Sumner).

Text Book:

1. **Mary Sumner " Enterprice Resource Planning" Pearson, 2012**.

Referencs:

1. David L.Olson " Managerial Issues in ERP systems" TMH 2012.
2. Ellen Monk "Enterprice Resource Planning" Cengage, 2012.
3. Alexis Leon "Enterprice Resource Planning" 2e, TMH ,2012
4. Goyal "Enterprice Resource Planning" TMH, 2012
5. Jagan Nathan Vaman "ERP Srategies for Steering Orgnizationsal competence and competetive Advantage" TMH, 2012.

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B.Tech. EEE **L T P C**
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OPEN ELECTIVE-III

MANAGEMENT INFORMATION SYSTEM (MIS)

The objective of the course is to provide the basic concepts of Enterprise Resource Planning and Management of Information System.

Unit – 1: Introduction to IS Models and Types of Information systems – Nolan Stage Hypothesis, IS Strategic Grid, Wards Model, Earl's Multiple Methodology, Critical Success Factors, Soft Systems Methodology, Socio-Technical Systems Approach (Mumford), System Develop Life Cycle, Prototype and End User Computing, Application Packages, Outsourcing, Deciding Combination of Methods. Types of Information Systems

Unit – 2: IS Security, Control and Audit– System Vulnerability and Abuse, business value of security and control, Need for Security, Methods of minimizing risks IS Audit, ensuring system quality.

Unit – 3: Induction to ERP: Overview of ERP, MRP, MRPII and Evolution of ERP, Integrated Management Systems, Reasons for the growth of ERP, Business Modeling, Integrated Data Model, Foundations of IS in Business, Obstacles of applying IT, ERP Market- ERP Modules: Finance, Accounting Systems, Manufacturing and Production Systems, Sales and Distribution Systems, , Human Resource Systems, Plant Maintenance System, Materials Management System, Quality Management System, ERP System Options and Selection, ERP proposal Evaluation.

Unit – 4: Benefits of ERP: Reduction of Lead Time, On-Time Shipment, Reduction in Cycle Time, Improved Resource Utilisation, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design Making Capabilities.

Unit – 5: ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to Attain Success, User Training, Maintaining ERP & IS**.** Case Studies.

References

- Gordon B. Davis & Margrethe H.Olson: Management Information Systems, TMH, 2009.
- C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
- Alexis Leon: ERP (Demystified), 5/E, Tata McGraw-Hill, 2009.
- C.S.V.Murthy: Management Information System, Himalaya,2009
- James A. Obrein: Management Information Systems, TMH, 2009
- David L Olson: Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, International Edition-2009.
- Rainer, Turban, Potter: Introduction to Information Systems, WILEY-India, 2009.
- Vaman, ERP in Practice, TMH, 2009
- Dharminder and Sangeetha: Management Information Systems, Excel, 2009
- Gerald V.Post, David L Anderson: Management Information Systems, Irvin McGraw Hill, 2009.
- Monk: Concepts in ERP, Cengage, 2009
- Olson: Managerial Issues of ERO, TMH, 2009
- Motiwala:Enterprise Resource Planning, Pearson 2009
- Miller:MIS—Cases, Pearson, 2009

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B.Tech. EEE **L T P C**
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OPEN ELECTIVE-III
ORGANIZATIONAL BEHAVIOUR

The objective of the course is to provide the students with the conceptual framework and the theories underlying Organisational Behaviour.

Unit-1: Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organisational Behaviour. Cognitive Processes-I : Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization - Social perception – Attribution Theories – Locus of control –Attribution Errors –Impression Management.

Unit-2: Cognitive Processes-II: Personality and Attitudes - Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organisational commitment-Motivational needs and processes- Work-Motivation Approaches Theories of Motivation-Motivation across cultures - Positive organizational behaviour: Optimism – Emotional intelligence – Self-Efficacy.

Unit-3: Dynamics of OB-I: Communication – types - interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision making techniques – creativity and group decision making . Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict - strategies to cope with stress and conflict.

Unit-4: Dynamics of OB –III Power and Politics: Meaning and types of power – empowerment - Groups Vs. Teams – Nature of groups – dynamics of informal groups – dysfunctions of groups and teams – teams in modern work place.

Unit-5: Leading High performance: Job design and Goal setting for High performance- Quality of Work Life- Socio technical Design and High performance work practices - Behavioural performance

management: reinforcement and punishment as principles of Learning –Process of Behavioural modification - Leadership theories - Styles, Activities and skills of Great leaders.

References

- Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009
- McShane: Organizational Behaviour, 3e, TMH, 2008
- Nelson: Organizational Behaviour, 3/e, Thomson, 2008.
- Newstrom W.John & Davis Keith, Organisational Behaviour--Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.
- Pierce and Gardner: Management and Organisational Behaviour: An Integrated perspective, Thomson, 2009.
- Robbins, P.Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson , New Delhi, 2009.
- Pareek Udai: Behavioural Process at Work:,Oxford &IBH, New Delhi, 2009.
- Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.
- Hitt: Organizational Behaviour,Wiley, 2008
- Aswathappa: Orgganisational Behaviour,7/e,Himalaya, 2009
- Mullins: Management and Organisational Behaviour, Pearson, 2008.
- McShane,Glinow: Organisational Behaviour--Essentials, TMH, 2009.
- Ivancevich: Organisational Behaviour and Management, 7/e, TMH, 2008.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.

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FUNDAMENTALS OF ROBOTICS
OPENELECTIVE -III

Pre-Requiests: None

Course outcomes:
After this completion of this course, the student should be able to understand thre basic components of robots, differentiate types of robots and robot grippers, model forward and inverse kinematics of robot manipulators, analyse forces in links and joints of a robot, programme a robot to perform tasks in industrial applications, design intelligent robots using sensors.

Unit 1
Robotics-Introduction-classification with repect to geometrical configuration (Anatomy) , Controled system & chain type:. Serial manipulator & Parallel Manipulator. Components of Industrail robotics-Precesion of movement-resolution, accuracy & repeatability-Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors,& Velocity sensors,External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

Unit 2
Grippers - Mechanical Gripper-Grasping force-Engelberger-g-factors-mechanisms for actuation, Magnetic gripper , vaccume cup gripper-considerations in gripper selection & design . Industrial robots spefications.Selection based on the Application.

Unit 3
Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematicsfor planar serial robots

Unit 4
Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, bleding scheme. Introduction Cartesian space scheme.

ontrol- Interaction control, Rigid Body mechanics, Control architecture-position, path velocity and force control systems, computed torque control, adaptive control, and Servo system for robot control.

Unit 5

Programming of Robots and Vision System-Lead through programming methods- Teach pendent- overview of various textual programming languages like VAL etc.
Machine (robot) vision:

Textbooks:

1. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., *Robotics control, Sensing, Vision and Intelligence*, McGraw-Hill Publishing Company, New Delhi, 2003.
2. Industrail Robotics/Grover/ McGraw hill
3. Robotics/ Mittal and Nagarath/ TMH

REFERENCE BOOKS:

1 Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley
2 Robot Analysis and control Asada and Slotine / Wiley Inter-Science
3 Introduction to Robotics / John J Craig / Pearson Education

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.

L	T	P	C
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NON-CONVENTIONAL SOURCES OF ENERGY
OPEN ELECTIVE-III

Pre-requisites: None

Course Outcomes:
At the end of the course, the student will be able to identify renewable energy sources and their utilization. Understand the basic concepts of solar radiation and analyze the working of solar and thermal systems. Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas and hydrogen. Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator. Identify methods of energy storage for specific applications

UNIT – I

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, extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - II

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/cooling techniques, solar distillation and drying, photovoltaic energy conversion.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT - III

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 – IV

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, their economics.

UNIT –V

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. Renewable Energy Resources / Tiwari and Ghosal / Narosa
2. Non- conventional Energy Sources / G.D. Rai
3. Biological Energy Resources/ Malcolm Fleischer & Chris Lawis.

REFERENCE BOOKS:

1. Renewable Energy Sources / Twidell & Weir
2. Solar Energy / Sukhame
3. Solar Power Engineering / B.S. Magal Frank Kreith & J.F. Kreith
4. Principles of Solar Energy / Frank Krieth & John F Kreider
5. Non-Conventional Energy / Ashok V Desai / Wiley Eastern
6. Non-Conventional Energy Systems / K Mittal / Wheeler
7. Renewable Energy Technologies / Ramesh & Kumar / Narosa

w.e.f. 2017-2018 academic year

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B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
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ASPECTS OF HEAT TRANSFER IN ELECTRONICALLY CONTROLLED UNITS
OPEN ELECTIVE-III

Pre-requisites: None

Outcomes:

After the course student should be able to analyse conduction, convection and radiation heat transfer modes, heat generation, conduction and dissipation in electronically controlled units.

UNIT-I

Conduction Heat transfer: Modes of heat transfer, Fourier's law of steady state heat conduction (one dimensional conduction), thermal conductivity and its unit, conduction through slab or plane wall, hollow cylinders and spheres conduction through composite walls and hollow cylinders and spheres with multi-layers, Convective heat transfer, Newton's law of cooling, electrical analogy and overall heat transfer coefficient, numerical problems

UNIT-II

Convective and radiation Heat transfer:

Dimensional analysis as a tool for experimental investigation, Buckingham pi theorem and method, radiation and radiation properties of surfaces, black body, emissive power, Stefan Boltzmann's law, emissivity, monochromatic emissive power and monochromatic emissivity, grey body, Kirchoff's law, Wien's displacement law, numerical problems.

UNIT - III

Cooling of Electronic equipment:

Introduction and history, manufacturing of electronic equipment, cooling load of electronic equipment, thermal environment, electronics cooling in different applications, conduction cooling, air cooling: natural convection and radiation, air cooling: forced convection, liquid cooling, immersion cooling, heat pipes, cooling of chips, PCBs, computers, logic chips etc.

UNIT - IV

Refrigeration and Air conditioning: Introduction to refrigeration, necessity and applications, unit of refrigeration and cop, Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

UNIT-V

Heat pipes: structure – operation - construction - thermal resistance-performance characteristics - effects of working fluid and operating temperature, wick - selection of material - pore size, applications.

Text books:

1. Heat Transfer- A practical approach by Yunus A. Cengel,Tata Mc Graw-Hill Edition
2. Heat Transfer – A conceptual approach – P.K.Sarma & K.Rama Krishna/New age
3. A course in Refrigeration and Air conditioning – SC Arora and & Domkundwar / Dhanpatrai

Reference books:

1. Fundamentals of Engineering, Heat and mass transfer – R.C. Sachdeva/New Age
2. Heat & mass Transfer – D.S.Kumar/S.K.Kataria & sons

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. ECE.	**L**	**T**	**P**	**C**
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PRINCIPLES OF COMPUTER COMMUNICATIONS AND NETWORKS
OPEN ELECTIVE-III

Prerequisite : Nil

Course Objectives:

- To understand the concept of computer communication.
- To learn about the networking concept, layered protocols.
- To understand various communications concepts.
- To get the knowledge of various networking equipment.

Course Outcomes:

- The student can get the knowledge of networking of computers, data transmission between computers.
- Will have the exposure about the various communication concepts.
- Will get awareness about the structure and equipment of computer network structures.

UNIT-I

Overview of Computer Communications and Networking :

Introduction to Computer Communications and Networking , Introduction to Computer Network , Types of Computer Networks, Network Addressing, Routing , Reliability, Interoperability and Security, Network Standards, The Telephone System and Data Communications.

UNIT-II

Essential Terms and Concepts :

Computer Applications and application protocols, Computer Communications and Networking models, Communication Service Methods and data transmission modes, analog and Digital Communications , Speed and capacity of a Communication Channel, Multiplexing and switching, Network architecture and the OSI reference model.

UNIT-III

Analog and Digital Communication Concepts :

Representing data as analog signals, representing data as digital signals, data rate and bandwidth reduction , Digital Carrier Systems.

UNIT-IV

Physical and data link layer Concepts:

The Physical and Electrical Characteristics of wire, Copper media, fiber optic media, wireless Communications. Introduction to data link Layer , the logical link control and medium access control sub-layers.

UNIT-V

Network Hardware Components:

Introduction to Connectors, Transreceivers and media convertors, repeaters, network interference cards and PC cards, bridges, switches, switches Vs Routers.

Text Books:

2. Computer Communications and Networking Technologies, Michel A. Gallo and William H. Hancock, Thomson Brooks / Cole.

Reference Books:

1. Principles of Computer Networks and Communications, M. Barry Dumas, Morris Schwartz, Pearson.

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OPEN ELECTIVE -III
WEB TECHNOLOGIES

Prerequisites

1. A Course on “Computer Programming and Data Structures”

Objectives

1. To learn the basic web concepts and Internet protocols
2. To introduce XML and processing of XML data
3. To introduce client side scripting with Javascript and DHTML
4. To introduce server side programming with Java servlets and JSP

Outcomes

1. Ability to create dynamic and interactive web sites
2. Gain knowledge of client side scripting using java sript and DHTML.
3. Demonstrate understanding of what is XML and how to parse and use XML data
4. Able to do server side programming with Java Servelets and JSP

UNIT I: Introduction

Web Essentials - Clients, Servers and Communication:
The Internet, Basic Internet Protocols: TCP/IP, UDP, DNS, The World Wide Web: Hypertext Transport Protocol, HTTP Request Message, HTTP Response Message, Web Clients, Web Servers.
Markup Languages – **HTML**: Basic Tags, Forms, Style sheets

UNIT II: Client-Side Programming

Introduction to JavaScript, JavaScript in Perspective, Basic Syntax, Variables and Data Types, Statements, Operators, Literals, Functions, Objects, Arrays, Built-in Objects, JavaScript Debuggers.

Host Objects - Browsers and the DOM: Introduction to the Document Object Model, Intrinsic Event Handling, Modifying Element Style, The Document Tree, DOM Event Handling.

UNIT III: Server-Side Programming

Java Servlets: Servlet Architecture, Servlets Generating Dynamic Content, Servlet Life Cycle, Parameter Data, Sessions, Cookies, URL Rewriting, Case Study.

UNIT IV: Representing Web Data

XML: XML Documents and Vocabularies, XML Versions and the XML Declaration, XML Namespaces, DOM-Based XML Processing, Event-oriented Parsing: SAX, Transforming XML Documents, Selecting XML Data: XPath, Template-based Transformation: XSLT, Displaying XML Documents in Browsers, Case Study.

UNIT V: Separating Programming and Presentation

JSP Technology: Introduction to JavaServer Pages, Running JSP Applications, Basic JSP, JavaBeans Classes and JSP, Tag Libraries and Files, Support for the Model-View-Controller Paradigm, Case Study.

TEXT BOOKS:

1. Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education

REFERENCES:

1. Deitel H.M. and Deitel P.J., “Internet and World Wide Web How to program”, Pearson International, 2012, 4th Edition.
2. J2EE: The complete Reference By James Keogh, McGraw-Hill
3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson
4. Paul Dietel and Harvey Deitel, ”Java How to Program”, Prentice Hall of India, 8th Edition
5. Web technologies, Black Book, Dreamtech press.
6. Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India

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OPEN ELECTIVE -III
SIMULATION AND MODELING

Prerequisites

1.A course on “Computer Oriented Statistical Methods”

Objectives

1. The overall aim of the course is to provide an understanding of methods, techniques and tools for modeling, simulation and performance analysis of complex systems
2. The topics include system models and studies; random number generation; simulation of continuous and discrete systems; simulation of queuing systems and pert networks
3. The course also provides practical knowledge of simulation experimentation and introduces simulation languages.

Outcomes

1. Ability to construct a model for a given system/set of data.
2. Ability to generate and test random number variates and apply them to develop simulation models.
3. Ability to interpret the model and apply the results to resolve issues in a real world environment

Unit-I: System Models and Studies

System Models: Concepts of a System, System Environment, Stochastic Activities, Continuous and Discrete Systems, System Modeling, Types of Models, Static Physical Models, Dynamic Physical Models, Static Mathematical Models, Dynamic Mathematical Models, Principles Used in Modeling.

System Studies: Subsystems, A Corporate Model, Environment Segment, Production Segment, Management Segment, The Full Corporate Model, Types of System Study, System Analysis, System Design, System Postulation

Unit-II: Random Numbers

Random Number Generation: Properties, Generation of Pseudo-Random Numbers, Techniques of generating random numbers, tests for random numbers

Random-Variate Generation: Inverse-Transform Technique, Acceptance-Rejection Technique, Special Properties.

Unit-III: Simulation of Continuous and Discrete Systems

Simulation of Continuous Systems: A chemical reactor, Numerical integration vs. continuous system simulation, Selection of an integration formula, Runge-Kutta integration formulas, Simulation of a servo system, Simulation of a water reservoir system, Analog vs. digital simulation.

Discrete System Simulation: Fixed time-step vs. event-to-event model, On simulating randomness, Generation of random numbers, Generation of non-uniformly distributed random numbers, Monte-Carlo computation vs. stochastic simulation.

Unit-IV: System Simulation

Simulation of Queuing Systems: Rudiments of queuing theory, Simulation of a single-server queue, Simulation of a two-server queue, Simulation of more general queues.

Simulation of a Pert Network: Network model of a project, Analysis of activity network, Critical path computation, Uncertainties in activity durations, Simulation of activity network, Computer program for simulation, Resource allocation and cost considerations.

Unit-V: Simulation Experimentation

Design and Evaluation of Simulation Experiments: Length of simulation runs, Variance reduction techniques, Experimental layout, Validation.

Simulation Languages: Continuous and discrete simulation languages, Continuous simulation languages, Block-structured continuous simulation languages, Expression-based languages, Discrete-system simulation languages, GPSS.

Text Books

1. System Simulation, Geoffrey Gordon, Prentice-Hall of India Private Limited, Second Edition, 1978. (for Unit-I: Chapters 1 and 2)
2. Discrete-Event System Simulation, Jerry Banks, John S. Carson II, Barry L. Nelson, David M.Nicol, Pearson, Fifth Edition, 2010. (for Unit-II: Chapters 7 and 8)
3. System Simulation with Digital Computer, Narsingh Deo, Prentice-Hall of India Private Limited, 1979. (for Unit-III to V: Chapters 2 to 5 and 7,8).

Reference Books

1. System Modeling and Simulation: An Introduction, Frank L. Severance, Wiley Publisher, 2005

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SURFACE ENGINEERING
OPEN ELECTIVE-III

Pre-requisites: Thermodynamics, Physical Metallurgy.

Course Objectives:

1. To provide a state- of- the art knowledge to the students and various surface engineering techniques.

Unit- I

Introduction to surface modification, need for surface modification, surface properties, surface property modification, history of surface modification

Unit-II

Plating and coating process: concept of coating, types of coatings, properties of coatings, hard facing, anodizing, PVD, CVD, Electro deposition Electro less deposition, hot deposition, hot dipping.

Unit-III

Thermo-chemical Processes: carburizing, nitriding, carbonitriding, nitro carburizing, Boronising, Plasma nitriding, thermal spraying, Plasma spraying.

Unit-IV

Thermal Processes: hardening, tempering, laser hardening, laser surface alloying, laser cladding, electro beam hardening.

Unit-V

General design principles related to surface engineering, design guidelines for surface preparation, surface engineering solution to specific problems.

Course Outcomes:

1. This course provides an opportunity to the students to engineer the microstructure for an enhanced performance based on the need in actual practice.

Text books/ References:

1. Advanced thermal assisted surface engineering processes, Ramnarayan, Chattopadhyay,Kluwer Academy Publishers.
2. Surface engineering of metals: principles, Equipment and techniques, Tadeusz Burokowski, Tadeusz Wierzchon, CRCProcess.
3. Advanced techniques for surface engineering, W.Gissler, Herman A.Jehn, Kluwar Academy Publishers
4. Laser material processing, W.Steen, Springer

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NANOMATERIALS
OPEN ELECTIVE-III

Pre-requisites: Physics, chemistry

Course Objective:

1. This course is primarily intended to expose the students to a highly interdisciplinary subject.
2. This would emphasize on the classification, synthesis and applications of Nano materials.

Course Outcomes:

The student will be able to design a component/material that would provide us a 'better tomorrow' via nanotechnology.

Unit -I

Introduction

What is Nano —Why Nano - Properties at Nano Scales, Advantages and Disadvantages, top down and bottom up approaches, General applications of Nano materials.

Unit-II

Materials of Nano Technology

Introduction- Si based materials –Ge- based materials- Ferro electric materials –Polymer Materials GaAs and InP (III-V) Group materials.

UNIT-III

Nano Particles: Introduction Synthesis procedures -- wet chemical approach & physical vapor synthesis approach, size effect and shape change and their properties —examples of systems involved characterization techniques properties & their applications

UNIT- IV

Nano Wires: Introduction --- Various synthesis procedures (template assisted method and VLS methods) Principles, characterization procedures, properties and applications of Nano wires

Carbon Nano Tubes: Synthesis procedures properties and applications of carbon Nano tubes.

UNIT-V

Thin films deposition and Doping. Applications of Thin films.

TEXT / REFERENCE BOOKS

1. Nano Materials: A. K. Bandyopadyay, New age Publications
2. Nano Essentials: T. Pradeep, TMH
3. Springer Handbook of Nanotechnology
4. The Guest for new materials Auther S. T. Lakshmi Kumar, Published by Vigyan Prasar.
5. Nano – The Essentials: C – Pradeep (IIcue Professor), McGraw Hill
6. Nano Materials Synthesis, Properties and applications, 1996, Edlstein and Cammarate

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INDUSTRIAL SAFETY & HAZARD MANAGMENT

OPEN ELECTIVE-III

Objective: The student will be exposed to various industrial hazards and prevention and control methods

UNIT I

Introduction: Safety program, Engineering ethics, Accident and loss statistics, Acceptable risk, Public perception.

UNIT II

Toxicology: How toxicants enter biological organisms, How toxicants are eliminated from biological organisms.

Industrial Hygiene: Government regulations, Identification, Evaluation, Control.

UNIT III

Fires and Explosions: The fire triangle, Distinction between fire and explosions; Definitions, Flammability characteristics of liquids and vapors, MOC and inerting, ignition energy, Auto ignition, Auto oxidation, Adiabatic compression, Explosions.

UNIT IV

Designs to prevent fires and explosions: Inerting, Explosion proof equipment and instruments, Ventilations, Sprinkler systems.

Introduction to Reliefs: Relief concepts, Definitions, Location of reliefs, Relief types, Data for sizing reliefs, Relief systems.

UNIT V

Relief Sizing: Conventional spring operated reliefs in liquids, Conventional spring operated relief's in vapor or gas service, Rupture disc relief's in liquid, vapour or gas service.

Hazards Identification: Process hazards checklists, Hazard surveys, Hazop safety reviews.

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TEXT BOOK:

1 Chemical Process Safety (Fundamentals with applications), D.A.Crowl & J.F.Louvar, Prentice Hall, New Jersey,(1990).

REFERENCES:

1. Safety and Accident Prevention in Chemical Operations, 2nd ed., H. H. Fawcett and W.S. Wood, John Wiley and Sons, New York 1982
2. Coulson and Richardson's – Chemical Engineering, Vol.6, R.K.Sinnot, , Butterworth-Heinmann Limited 1996.

OUTCOME: The student will be equipped with the knowledge by which thorough safety is ensured in the organization.

Prerequisite: Nil