

**ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS**

MECHANICAL ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2018-2019)



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



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(Autonomous)
Kukatpally, Hyderabad-500 085

ACADEMIC REGULATIONS 2018
for CBCS Based B.Tech. PROGRAMMES

(Effective for the students admitted into I year from the
Academic Year **2018-19** 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 2015-16 onwards, in the following Branches of Engineering.

<i>S.No.</i>	<i>Branch</i>
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)...

<i>S. No.</i>	<i>Broad Course Classification</i>	<i>Course Group/ Category</i>	<i>Course Description</i>	<i>Range of Credits</i>
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	05% - 10%
4)	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	30% - 40%
		PE – Professional Electives	Includes Elective subjects related	10% - 15%

5)	Elective Courses (ElC)		to the Parent Discipline/Department/ Branch of Engg.	
6)		OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	05% - 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 Examianations) 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 $\pm 17\%$), 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.
- 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 ($\frac{1}{3}$ of the Section Strength) opt for the same. The Maximum Strength of a Section is limited to 80 ($60 + \frac{1}{3}$ 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' (i.e., the first focus shall be on early ON-LINE ENTRY from the student for Registration in that Semester, and the second focus, if needed, will be on CGPA of the student).
- 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.

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 24 Credits out of 48 Credits of I Year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
- 8.4** A Student will not be promoted from II Year to III Year, unless he fulfils the Attendance and Academic Requirements and secures a total of 43 Credits out of 72 Credits upto II Year I Semester; from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
- 8.5** A Student will not be promoted from III Year to IV Year, unless he fulfils the Attendance and Academic Requirements and secures a total of 72 Credits out of 120 Credits upto III Year I

Semester, from all the relevant regular and supplementary examinations, whether he 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 ≥ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) ≥ 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 8 secured Credits (in terms of two of their corresponding Subjects/Courses) may be permitted for optional drop out from these 192 Credits earned; resulting in 184 Credits for UGP performance evaluation, i.e., the performance of the Student in these 184 Credits shall alone be taken into account for the calculation of 'the final CGPA (at the end of UGP, which takes the SGPA of the IV Year II Semester into account)', and shall be indicated in the Grade Card of IV Year II Semester; 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.
- 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.
- 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 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.
- 9.7a)** 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 $\geq 65\%$ 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...

<i>% of Marks Secured (Class Intervals)</i>	<i>Letter Grade (UGC Guidelines)</i>	<i>Grade Points</i>
80% and above ($\geq 80\%$, $\leq 100\%$)	O (Outstanding)	10
Below 80% but not less than 70% ($\geq 70\%$, $< 80\%$)	A⁺ (Excellent)	9
Below 70% but not less than 60% ($\geq 60\%$, $< 70\%$)	A (Very Good)	8
Below 60% but not less than 55% ($\geq 55\%$, $< 60\%$)	B⁺ (Good)	7
Below 55% but not less than 50% ($\geq 50\%$, $< 55\%$)	B (above Average)	6
Below 50% but not less than 45% ($\geq 45\%$, $< 50\%$)	C (Average)	5
Below 45% but not less than 40% ($\geq 40\%$, $< 45\%$)	P (Pass)	4
Below 40% ($< 40\%$)	F (FAIL)	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 $GP \geq 4$ (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

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

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), C_i is the no. of Credits allotted to the i^{th} Subject, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Subject.

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

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

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), C_j is the no. of Credits allotted to the jth Subject, and G_j 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 $SGPA \geq 5.00$ (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UGP, only when gets a $CGPA \geq 5.00$; subject to the condition that he secures a $GP \geq 4$ (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 from the Principal) -

(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...

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

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 \geq 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) \geq 8.00, and fulfilling the following conditions

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

(ii) Should have secured a CGPA \geq 8.00, at the end of each of the 8 Sequential Semesters, starting from the I Year I Semester onwards,

(iii) Should not have been detained or prevented from writing the End Semester Examinations in any Semester due to shortage of attendance or any other reason, shall be placed in 'FIRST CLASS with DISTINCTION'.

Students having final CGPA (at the end of UGP) \geq 8.00, but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

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

12.5 Students with final CGPA (at the end of the UGP) \geq 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".
- 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	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the

	arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	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 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.	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 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 is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be 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.	

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV/IV B.Tech (Regular)

MECHANICAL ENGINEERING

COURSE STRUCTURE (R18)
Applicable from 2018-19 admitted Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC	Engineering Mathematics–I (Linear Algebra and Calculus)	3	1	0	4
2	BSC	Engineering Physics	3	1	0	4
3	ESC	Programming for problem solving	3	0	0	3
4	ESC	Classical Engineering Mechanics	3	1	0	4
5	BSC	Engg. Physics Lab.	0	0	3	1.5
6	ESC	Programming for problem solving Lab	0	0	3	1.5
Total Credits						18

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC	Engineering Mathematics –II (Ordinary Differential Eqn. and Multivariable Calculus)	3	1	0	4
2	BSC	Engg. Chemistry	3	1	0	4
3	ESC	Engineering Graphics	1	0	4	3
4	ESC	Engineering Workshop	1	0	3	2.5
5	HSMC	English	2	0	0	2
6	BSC	Engg. Chemistry Lab.	0	0	3	1.5
7	HSMC	English Language and Communication Skill lab	0	0	2	1
8	*MC	Sports & Games	0	0	3	0
Total Credits						18

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC	Engineering Mathematics –III (Probability Distributions & Complex Variables)	3	1	0	4
2	PCC-ME	Mechanics of Solids	3	0	0	3
3	PCC-ME	Material Science & Metallurgy	3	0	0	3
4	PCC-ME	Production Technology	3	0	0	3
5	PCC-ME	Thermodynamics	3	1	0	4
6	PCC-Lab1	Production Technology Lab	0	0	2	1
7	PCC-Lab2	Machine Drawing Practice	1	0	2	2
8	PCC-Lab3	Material Science & Mechanics of Solids Lab	0	0	2	1
9	*MC	Constitution of India	3	0	0	0
Total Credits						21

II YEAR II SEMESTER

S.No	Course Code	Course Title	L	T	P	Credits
1	ESC	Basics of Electrical & Electronics Engineering	3	0	0	3
2	PCC-ME	Kinematics of Machinery	3	1	0	4
3	PCC-ME	Thermal Engineering-I	3	1	0	4
4	PCC-ME	Fluid Mechanics and Hydraulic Machinery	3	1	0	4
5	PCC-ME	Instrumentation & Control Systems	3	0	0	3
6	ESC-Lab 4	Basics of Electrical & Electronics Engineering Lab	0	0	2	1
7	PCC-Lab 5	Fluid Mechanics and Hydraulic Machinery Lab	0	0	2	1
8	PCC-Lab 6	Instrumentation & Control Systems Lab.	0	0	2	1
9	*MC	Environmental Science	3	0	0	0
Total Credits						21

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PCC-ME	Dynamics of Machinery	3	0	0	3
2	PCC-ME	Design of Machine Elements-I	3	0	0	3
3	PCC-ME	Metrology & Machine Tools	3	0	0	3
4	HSMC	Business Economics & Financial Analysis	3	0	0	3
5	PCC-ME	Thermal Engineering-II	3	0	0	3
6	PCC-ME	Operations Research	3	0	0	3
7	PCC-Lab	Thermal Engineering- I Lab	0	0	2	1
8	PCC-Lab	Metrology & Machine Tools Lab	0	0	2	1
9	PCC-Lab	Kinematics & Dynamics Lab.	0	0	2	1
10	*MC	Gender Sensitization Lab	0	0	2	0
11		Seminar	0	0	2	1
Total Credits						22

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	PCC-ME	Design of Machine Elements-II	3	0	0	3
2	PCC-ME	Heat Transfer	3	1	0	4
3	PCC-ME	CAD & CAM	3	0	0	3
4	PEC-ME1	Unconventional Machining Processes	3	0	0	3
		Machine Tool Design				
		Production Planning & Control				
5	OEC-1	Quantitative Techniques for Business Decisions	3	0	0	3
6	PCC-ME	Refrigeration & Air Conditioning	3	0	0	3
7	PCC-Lab	Heat Transfer Lab	0	0	2	1
8	PCC-Lab	Thermal Engineering –II Lab	0	0	2	1
9	HSMC-Lab	Advanced Communication Skills lab	0	0	2	1
10	UG	Mini Project (Evaluated in IV-I and Credits will be Allotted along with Project -1)	-	-	-	-
Total Credits						22

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PCC-ME	Finite Element Methods	3	0	0	3
2	PEC-2	Additive Manufacturing	3	0	0	3
		Automation in Manufacturing				
		MEMS				
3	PEC-3	Power Plant Engineering	3	0	0	3
		Automobile Engineering				
		Renewable Energy Sources				
4	PEC-4	Industrial Robotics	3	0	0	3
		Mechanical Vibrations				
		Composite Materials				
5	OEC-2	Basic Mechanical Engineering	3	0	0	3
6	PCC Lab	CAD/ CAM Lab	0	0	2	1
7	PCC Lab	R& AC Lab	0	0	2	1
8	UG	Project-I (Mini project 2 credits + Project-I 3 credits)	-	-	-	5
Total Credits						22

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PEC-5	Computational Fluid Dynamics	3	0	0	3
		Turbo Machinery				
		Fluid Power Systems				
2	PEC-6	Industrial Management	3	0	0	3
		Production Operation and Management				
		Tribology				
3	OEC-3	Non-Conventional Sources of Energy	3	0	0	3
4	PROJECT	Project-II	-	-	-	7
Total Credits						16

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ENGINEERING MATHEMATICS – I

Linear Algebra and Calculus

(Common to all Branches)

Pre Requisites: NIL

L	T	P	C
3	1	0	4

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

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

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

UNIT-III:

Vector Calculus

Vector Calculus: Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties, - Laplacian operator, Line integral – Work done – Surfaceintegrals –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

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

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, WILEY PUBLICATIONS.
3. VECTOR ANALYSIS BY GHOSH & MAITY, NEW CENTRAL BOOK AGENCY.

Reference Books:

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

ENGINEERING PHYSICS

Prerequisites: Nil

L	T	P	C
3	1	0	4

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.

UNIT-I:

Interference: Superposition of Waves, Young's double slit experiment, Coherence, Interference in Thin films by Reflection, Newton's Rings.

Diffraction: Fresnel and Fraunhofer diffractions, Fraunhofer diffraction at a single slit and Double slit, Diffraction Grating, Resolving Power of a Grating.

Polarization: Introduction to polarization, Double Refraction, Nicol Prism, Quarter and Half wave plates

UNIT-II:

Bonding in Solids: Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander- Waal's Bond and Calculation of Cohesive Energy for Ionic Solids.

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:

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.

X-ray Diffraction: Basic Principles of X-ray Diffraction, Bragg's Law, Laue Method, Powder Method, Applications of X-ray Diffraction.

UNIT-IV:

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.

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.

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:

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.

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.

Reference Books:

1. Modern Engineering Physics by 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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

PROGRAMMING FOR PROBLEM SOLVING

Prerequisites: Nil

L	T	P	C
3	0	0	3

Course objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

Outcomes:

The student will learn

1. To write algorithms and to draw flowcharts for solving problems.
2. To translate the algorithms/flowcharts to programs (in C language).
3. To code and test a given logic in C programming language.
4. To formulate simple algorithms for arithmetic and logical problems.
5. To decompose a problem into functions and to develop modular reusable code.
6. To use arrays, pointers, strings and structures to formulate algorithms and programs.
7. Searching and sorting problems.

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 Associativity, 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, 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.

UNIT – IV:

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.

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:

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.

Sorting and Searching: Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A. M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

CLASSICAL ENGINEERING MECHANICS

Pre Requisites:

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

L	T	P	C
3	1	0	4

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 by K. Vijaya Kumar Reddy and J. Suresh Kumar, BS Publications, 3rd Edition(SI Units) Fifth impression 2013.
2. Engg. Mechanics by Irving Shames, G. Krishna Mohan Rao, Prentice Hall

REFERENCE BOOKS:

1. Engg. Mechanics by Timoshenko & Young
2. Engg. Mechanics by Umesh Regl, Tayal.

3. A text of Engineering Mechanics by YVD Rao, K. Govinda Rajulu, M. Manzoor Hussain, Academic Publishing Company
4. Text Book in Applied Mechanics by Malhotra, Subramanian, Gahlot and Rathore, New Age.
5. Engg. Mechanics by KL Kumar, Tata McGraw Hill.
6. Engg. Mechanics by M.V. Seshagiri Rao & D Rama Durgaiah.
7. Engg. Mechanics by S.S. Bhavikati & K.G. Rajasekharappa

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

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

L	T	P	C
0	0	3	1.5

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

PROGRAMMING FOR PROBLEM SOLVING LAB

Objectives

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

L	T	P	C
0	0	3	1.5

Outcomes

The student will learn

1. To write algorithms and to draw flowcharts for solving problems.
2. To translate the algorithms/flowcharts to programs (in C language).
3. To code and test a given logic in C programming language.
4. To formulate simple algorithms for arithmetic and logical problems.
5. To decompose a problem into functions and to develop modular reusable code.
6. To use arrays, pointers, strings and structures to formulate algorithms and programs.
7. Searching and sorting problems.

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: $1+x+x^2+x^3+\dots+x^n$

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)

Week 9:

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
 - iii) Insertion sort

Week 10:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ENGINEERING MATHEMATICS – II (Ordinary Differential Eqn. and Multivariable Calculus) (Common to all Branches)

Pre Requisites: NIL

L	T	P	C
3	1	0	4

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:

- To solve 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, WILEY PUBLICATIONS

Reference Books:

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. II-Sem

ENGINEERING CHEMISTRY

Prerequisites: Nil

L	T	P	C
3	1	0	4

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 the 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, electroless 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.

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).

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

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:

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

L	T	P	C
1	0	4	3

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 by N.D. Bhatt, Charotar
2. Engineering Drawing and Graphics by Rane and Shah, Pearson Edu.

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ENGINEERING WORKSHOP

Pre-requisites: **Practical skill**

L	T	P	C
1	0	3	2.5

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, equipment 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 understand 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:

- Practice on manufacturing of components using workshop trades including plumbing, 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.

I. TRADES FOR EXERCISES:

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

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

II. Trades for Demonstration & Exposure

1. Demonstration of power tools -1 Lecture
2. Welding – 2 Lecture
3. Machine Shop -2 Lectures

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.

TEXT BOOKS:

1. Workshop Practice by B.L.Juneja Cengage Learning
2. Elements of Workshop Technology–S. K.Hajra Choudhury and A. K. Hajra Choudhury.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ENGLISH

L	T	P	C
2	0	0	2

INTRODUCTION

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

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

LEARNING OBJECTIVES

The course will help students to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.

COURSE OUTCOMES

Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- The student will acquire basic proficiency in English including reading and listening comprehension, writing, and speaking skills.

SYLLABUS

- ✎ (Note: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is **Open-ended**, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the class.)

UNIT –I:

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

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

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

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence.

UNIT –II:

Vocabulary: Synonyms and Antonyms.

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

Reading: Improving Comprehension Skills – Techniques for Good Comprehension.

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

UNIT –III:

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Writing Introduction and Conclusion - Essay Writing.

UNIT –IV:

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading.

Writing: **Writing Practices**---Précis Writing.

UNIT –V:

Vocabulary: Technical Vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: **Technical Reports**- Introduction – Characteristics of a Report – Categories of Reports

Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: Listening and Speaking skills which are given under Unit-6 are covered in the syllabus of ELCS Lab Course.

Text Books:

1. Practical English Usage. Michael Swan. OUP. Fourth Edition 2016.
2. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2018

Reference Books:

1. English: Context and Culture by Board of Editors published by Orient BlackSwanPvt.Ltd.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007.
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
5. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ENGINEERING 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.

L	T	P	C
0	0	3	1.5

Text Books:

1. Inorganic Quantitative Analysis by A.I.Vogel, ELBS Publications (2007).

Reference Books:

1. Laboratory Manual of Engineering Chemistry by Y.Bharathi Kumari & Jyotsna C, VGS Booklinks, Vijayawada, 2009.
2. College Practical Chemistry by V.K.Ahulwalia., Narosa Publications Ltd., New Delhi (2007)

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

L	T	P	C
0	0	2	1

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

Objectives

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

Learning Outcomes

Students will be able to attain

- 👍 Better understanding of nuances of English language through audio- visual experience and group activities
- 👍 Neutralization of accent for intelligibility
- 👍 Speaking skills with clarity and confidence which in turn enhances their employability skills

Syllabus

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

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

Listening Skills

Objectives

1. To enable students, develop their listening skills so that they may appreciate its 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 and find the distinction between different sounds, to be able 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 involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
 - Oral practice: Just A Minute (JAM) Sessions
 - Describing objects/situations/people
 - Role play – Individual/Group activities

- **The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab)**

Exercise – I:

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II:

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.

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

Exercise – III:

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

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

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IV:

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

Exercise – V:

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

1. Introduction to Interview Skills.
2. Common errors in speaking.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

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 LCD and a projector etc.

JNTUH COLLEGE OF ENGINEERING HYDERABAD
II Year B.Tech. Mech. Engg. I-Sem
ENGINEERING MATHEMATICS – III
(Probability Distributions & Complex Variables)

L	T	P	C
3	1	0	4

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 solve 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 variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance.

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 variance & unknown variance, 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, its 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

Reference Books:

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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

MECHANICS OF SOLIDS

Pre-requisites: Basics of Engineering Mechanics

L	T	P	C
3	0	0	3

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

- 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-jointed, 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 Ferdinand L. Singer Longman
2. Strength of Materials by Jondar : Galgotia Publications

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

Material Science & Metallurgy

L	T	P	C
3	0	0	3

Prerequisites:

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

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

- Understand and analyze 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 is able to understand basic idea of 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 Rothery's rules, intermediate alloy phases, and intermetallic 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-Fe₃C.

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 plain 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, cermets, abrasive materials, nonmetallic materials – 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 by Sidney H. Avenier.
2. Material science & Metallurgy by Kodgire

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

PRODUCTION TECHNOLOGY

Pre-requisites: Physics, Chemistry, Workshop

L	T	P	C
3	0	0	3

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

- 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. Cores and Core Materials.

Solidification of casting – Solidification of pure metal – Nucleation and grain growth, casting design considerations

UNIT-II:

Welding: Classification – Types of welds and welded joints; welding positions, 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.

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 by P.N. Rao, TMH.
2. Production Technology by Sarma P C

REFERENCE BOOKS:

1. Production Technology by R.K. Jain
2. Metal Casting by T.V Ramana Rao, New Age
3. Principles of Metal Castings by Rosenthal.
4. Welding Process by Parmar
5. Manufacturing Engineering and Technology by Kalpakjin S, Pearson Edu.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

THERMODYNAMICS

L	T	P	C
3	1	0	4

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 for the analysis of thermal equipment

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

- Differentiate between different thermodynamic systems and processes
- Apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis
- Analyze the Thermodynamic cycles and evaluate performance parameters

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

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 – Constant Volume and Pressure - gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT-II:

First law of Thermodynamics – Corollaries – First law applied to a Closed System – 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, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT-III:

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry. Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes

UNIT-IV:

Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables, Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature,

Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation , Carrier's Equation – Psychrometric chart.

UNIT–V:

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

Refrigeration Cycles:

Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:

1. Fundamentals of Classical Thermodynamics by G. Van Wylan & R.E. Sonntag, John Wiley Pub.
2. Engineering Thermodynamics by PK Nag, TMH, III Edition
3. Thermodynamics by Achutan, PHI.

REFERENCE BOOKS:

1. Thermodynamics – An Engineering Approach by YunusCengel & Boles, TMH
2. Thermodynamics – J.P.Holman by McGrawHill
3. Engineering Thermodynamics by Jones & Dugan
4. An introduction to Thermodynamics by YVC Rao, New Age
5. Thermodynamics & Heat Engines by Yadav, Central Book Depot, Allahabad.
6. Thermodynamics by G.C. Gupta, Pearson Publications.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

PRODUCTION TECHNOLOGY LAB

Pre-requisites: Production Technology

L	T	P	C
0	0	2	1

Course Outcomes:

- To measure the properties of moulding sands and pattern making.
- To fabricate joints using gas welding and arc welding.
- To evaluate the quality of welded joints.
- To use 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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

MACHINE DRAWING PRACTICE

Pre-requisites: Engineering Graphics

Course objectives:

L	T	P	C
1	0	2	2

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

- Prepare of engineering and working drawings with dimensions and bill of material during design and development.
- Develop assembly drawings using part drawings of machine components.

Question Paper Pattern:

Question paper will consist of Part-A and Part-B. 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)

PART-A:

Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.

Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.

Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.

Title boxes, their size, location and details - common abbreviations and their liberal usage

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. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws. Keys, cottered joints and knuckle joint. Rivetted joints for plates, Shaft coupling, spigot and socket pipe joint. Journal, pivot and collar and foot step bearings.

PART-B:

Assembly Drawings:

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

Steam engine parts – stuffing boxes, cross heads, Eccentrics.

Machine tool parts: Tail stock, Tool Post, Machine Vices.

Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block

Simple designs of steam stop valve, spring loaded safety valve, feed check valve and air cock.

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

TEXT BOOKS:

1. Machine Drawing by K.L.Narayana, Wiley Eastern.
2. Machine Drawing by Junnarkar N.D., Pearson Edu.

REFERENCE BOOKS:

1. Machine Drawing by P.S.Gill.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

MATERIAL SCIENCE & MECHANICS OF SOLIDS LAB

L	T	P	C
0	0	2	1

Pre-requisites: Chemistry & Physics

Objectives:

In this laboratory, students will have the opportunity to apply loads to various materials under different equilibrium conditions. The student will perform tests on materials in tension, compression, torsion, bending, and impact. These conditions and/or constraints are designed to reinforce classroom theory by having the student perform required tests, analyze subsequent data, and present the results in a professionally prepared report. The machines and equipment used to determine experimental data include universal testing machines, torsion equipment, spring testing machine, compression testing machine, impact tester, hardness tester, etc. Data will be collected using Dial indicators, extensometers, strain gages and strain indicator equipment, as well as load and strain readouts on the machinery and graphing capabilities to print relevant plots for analysis.

- Provide the student hands-on experiences in materials science through laboratory experiments that explore the properties of materials and the interplay between processing and performance.
- Provide the student practical experience in the search, retrieval, and analysis of technical/scientific information.
- Provide the student practical experience in the acquisition, analysis and reporting of experimental results
- Instruct students in methodologies for materials selection to student-led projects.

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

MATERIAL SCIENCE 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.

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.
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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II B.Tech., I-Sem, (Reg.)

CONSTITUTION OF INDIA (Mandate Course)

L	T	P	C
3	0	0	0

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956

UNIT – I:

History of Making of the Indian Constitution:

- History
- Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution:

- Preamble
- Salient Features

UNIT – II:

Contours of Constitutional Rights & Duties:

- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT – III:

Organs of Governance:

- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions

Executive:

- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

UNIT – IV:

Local Administration:

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

UNIT – V:

Election Commission:

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

Text Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
4. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

L	T	P	C
3	0	0	3

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING

Pre-requisites: None

Course Objectives:

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

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

UNIT-I:

D.C. CIRCUITS: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II:

A.C. CIRCUITS: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III:

TRANSFORMERS: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV:

ELECTRICAL MACHINES: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

UNIT-V:

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

TEXT BOOKS:

1. Basic Electrical Engineering by D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 2010.
2. Basic Electrical Engineering by D. C. Kulshreshtha, McGraw Hill, 2009.

REFERENCE BOOKS:

1. Fundamentals of Electrical Engineering by L. S. Bobrow, Oxford University Press, 2011.
2. Electrical and Electronics Technology by E. Hughes, Pearson, 2010.
3. Electrical Engineering Fundamentals by D. Toro, Prentice Hall India, 1989.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

KINEMATICS OF MACHINERY

L	T	P	C
3	1	0	4

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

- To evaluate the relative motions obtained in all the above type of components used in mechanical Engineering.
- To analyze different mechanisms
- To draw the trajectories of various kinematic objects

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, Intermittent motion Mechanism, Ratchet & Paul Genieca Mechanism.

UNIT – II:

Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.

Plane motion of body: Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.

Klien's construction - 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.

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 by S.S.Rattan, Tata McGraw Hill Publishers.
2. Kinematics & Dynamics Of machinery by Norton, TMH

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

THERMAL ENGINEERING – I

L	T	P	C
3	1	0	4

Pre-requisite: Thermodynamics

Course Objective: To apply the laws of Thermodynamics to analyse air standard cycles and to understand and evaluate the performance analysis of the major components and systems of IC engines, refrigeration and air conditioning 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 and their analysis-fuels

UNIT-II:

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-III:

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-IV:

Measurements, Testing and Performance:

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

UNIT-V:

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

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

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

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – 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.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

FLUID MECHANICS & HYDRAULIC MACHINERY

Pre-requisites: Engineering Mathematics I

L	T	P	C
3	1	0	4

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

- Understand and apply the basic static, kinematic and dynamic principles and conservation laws to simple potential fluid flow problems in engineering applications.
- Design experimental procedure for physical model studies and hydraulic machines
- Compute drag and lift coefficients using the theory of boundary layer flows.

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 vacuum pressure-measurement of pressure- piezometer, U-Tube and Differential Manometers.

UNIT-II:

Fluid kinematics: stream line, path line and streak line and stream line, classification of flows steady & unsteady, 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 & Bernoulli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venturimeter and orifice meter, flow nozzle.

UNIT-III:

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

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

UNIT-IV:

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

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

UNIT-V:

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

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

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

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH
2. Fluid mechanics and hydraulic machines by Rajput

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

INSTRUMENTATION AND CONTROL SYSTEMS

L	T	P	C
3	0	0	3

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

Course Objectives: Understanding the basic characteristics 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: At the end of the course, the student will be able to

- To know the constructional details and working principles of various instruments and their purpose
- To identify and analyze various errors that would occur in instruments.
- To understand static and dynamic characteristics of instrument and should be able to determine loading response time.
- To specify transducer, for given range of displacement 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.

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

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

BASICS OF ELECTRICAL & ELECTRONICS LAB

Pre-requisites: Basic Electrical Engineering

L	T	P	C
0	0	2	1

Course Objectives:

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

Course Outcomes:

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:

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

TEXT BOOKS:

1. Basic Electrical Engineering by D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 2010.
2. Basic Electrical Engineering by D. C. Kulshreshtha, McGraw Hill, 2009.

REFERENCE BOOKS:

1. Fundamentals of Electrical Engineering by L. S. Bobrow, Oxford University Press, 2011.
2. Electrical and Electronics Technology by E. Hughes, Pearson, 2010.
3. Electrical Engineering Fundamentals by D. Toro, Prentice Hall India, 1989.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

Pre-requisites: None

L	T	P	C
0	0	2	1

Course Outcomes:

- Develop procedure for standardization of experiments.
 - Calibrate flow discharge measuring device used in pipes channels and tanks.
 - Determine fluid and flow properties.
 - 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)

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

INSTRUMENTATION & CONTROL SYSTEMS LAB

L	T	P	C
0	0	2	1

Pre-requisites: Mathematics-I, Thermodynamics, Basic of Electrical and Electronics Engineering.

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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ENVIRONMENTAL SCIENCE (MC)

Prerequisites: NIL

L	T	P	C
3	0	0	0

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.

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:

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

UNIT–IV:

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 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.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

DYNAMICS OF MACHINERY

Pre-requisite: Kinematics of Machinery

L	T	P	C
3	0	0	3

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. 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 by S.S.Rattan.
2. Theory of Machines by R.S.Khurmi

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

DESIGN OF MACHINE ELEMENTS - I

L	T	P	C
3	0	0	3

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 apply the general design procedures and principles in the design of machine elements.
- To apply different materials of construction and their properties and factors determining the selection of material for various applications.
- To evaluate stresses under different loading conditions.
- To apply 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 V. Bhandari, TMH Publishers

REFERENCE BOOKS:

1. Design of Machine Elements by V.M. Faires
2. Machine design by Schaum Series.
3. Mechanical Engineering Design by JE Shigley
4. Machine Design by RS Khurmi
5. Machine Design by PC Sharma
6. Machine Design by Pandya & Shah, Charotar publications

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

METROLOGY & MACHINE TOOLS

L	T	P	C
3	0	0	3

Pre-requisites: Production Technology

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-V:

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 by I C Gupta., Danpath Rai
2. Engineering Metrology by R.K. Jain, Khanna Publishers
3. Principles of Machine Tools by 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 by B.S. Raghui Vamsi, Vol.-II
5. Elements of Work Shop Technology by Hajra Choudry, Vol. II, Media Promoters.
6. Fundamentals of Metal Machining and Machine Tools by Geoffrey Boothroyd, McGraw Hill

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

L	T	P	C
3	0	0	3

Course Objective:

To prepare engineering students to analyze cost/ revenue/ financial data and to make economic and financial analysis in decision making process and to examine the performance of companies engaged in engineering.

Course Outcome:

To perform and evaluate present and future worth of the alternate projects and to appraise projects by using traditional and DCF Methods. To carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.

UNIT- I:

Introduction to Engineering Economics- Basic Principles and Methodology of Engineering Economics– Fundamental Concepts - Demand – Demand Determinants - Law of Demand- Demand Forecasting and Methods - Elasticity of Demand - Theory of Firm – Supply- Elasticity of Supply.

UNIT- II:

Macro Economic Concepts: National Income Accounting - Methods of Estimation- Various Concepts of National Income - Inflation – Definition – Causes of Inflation and Measures to Control Inflation - New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.

UNIT- III:

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT- IV:

Capital Budgeting Techniques: Significance of Capital Budgeting - cash flows-Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques- Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.

Unit- V:

Introduction to Accounting: Accounting Principles (GAPP), concepts, conventions- Double entry system of Book keeping – Accounting rules- Journal- ledger- Trial balance- Trading and Profit and Loss account- Balance Sheet (Simple Problems).

Text Books:

1. Engineering Economics, Principles by Henry Malcom Steinar, McGraw Hill Pub.
2. Business Economics - Theory and Applications by D.D.Chaturvedi, S.L.Gupta,, International Book House Pvt. Ltd. 2013.

Reference Books:

1. Accounting by Jain and Narang, Kalyani Publishers.
2. Cost Accounting by Arora, M.N., Vikas Publication.
3. Financial Management by S.N.Maheshwari, Vikas Publishing House.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

THERMAL ENGINEERING - II

L	T	P	C
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Pre-requisite: Thermodynamics

Course Objective: To apply the laws of Thermodynamics to analyse steam and gas turbine cycles and to perform the 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 by Rajput, Lakshmi Publications
2. Gas Turbines by V.Ganesan, TMH
3. Thermodynamics and Heat Engines by R. Yadav, Central Book Depot
4. Thermal Engineering by Ajoy Kumar, Narosa

REFERENCE BOOKS:

1. Gas Turbines and Propulsive Systems by P.Khajuria&S.P.Dubey, Dhanpatrai Pub
2. Thermal Engineering by Ballaney, Khanna Pub.
3. Gas Turbines by Cohen, Rogers and SaravanaMuttoo, Addison Wesley, Longman

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

OPERATIONS RESEARCH

Prerequisites: None

L	T	P	C
3	0	0	3

Objectives:

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

Outcome:

- To identify problem variables & constraints and apply appropriate optimization model

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 BOOKS:

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

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

THERMAL ENGINEERING LAB-I

Pre-Requisite: Thermodynamics & Thermal Engineering - I

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Objective:

To apply the working principles of IC Engines, Compressors, Refrigeration and Air Conditioning Systems and evaluate the performance parameters

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

- To measure the thermal and transport properties of fuels and lubricants
- Take measurements and evaluate performance parameters of IC engines, compressor and other thermal equipment, including refrigeration and air conditioning equipment

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 Heat Balance
8. I.C. Engines Economical speed test on a SI engine
9. I.C. Engines effect of A/F Ratio in a SI engine
10. Performance Test on Variable Compression Ratio Engine
11. Performance Test on Reciprocating Air – Compressor Unit
12. I.C Engines Morse Test to Evaluate Frictional Power
13. I.C Engines Retardation Test to Evaluate Frictional Power
14. I.C Engines William Motoring Test to Evaluate Frictional Power

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

METROLOGY & MACHINE TOOLS LAB

Prerequisites: Theoretical exposure to Metrology and Machine tools.

Objectives:

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

L	T	P	C
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Outcomes: At the end of the course, the student will be able to use different measuring instruments towards quality control.

1. Step turning and taper turning on lathe machine
2. Thread cutting and knurling on lathe machine
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

(Minimum of six experiments in each lab)

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

Kinematics & Dynamics Lab

L	T	P	C
0	0	2	1

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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. I Semester

(Common to All Branches)

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

L	T	P	C
0	0	2	1

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.

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 Bhargubanda, 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.

Text Books:

1. More than One Million Women are Missing by Sen, Amartya, 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. By the Numbers: Where Indian Women Work by Tripti Lahiri, *Women’s Studies Journal* (14 November 2012) Available online at: <http://blogs.wsj.com/India/real-time/2012/11/14/by-the-numbers-where-indian-women-work/>

Reference Books:

1. 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
2. Vantillu The Kitchen by Vimala, *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.
3. 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.
4. Stree Shakti Sanghatana. “*We Were Making History*’ *Life Stories of Women in the Telangana People’s Struggle*. New Delhi: Kali for Women, 1989.

5. Menon, Nivedita. *Seeing like a Feminist*. New Delhi: Zubaan-Penguin Books, 2012
6. 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.
7. 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)
8. 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.
9. 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/>
10. Jeganathan Pradeep, Partha Chatterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent Black and Ravi Dayal Publishers, New Delhi, 2000
11. K. Kapadia. *The Violence of Development: The Politics of Identity, Gender and Social Inequalities in India*. London: Zed Books, 2002
12. S. Benhabib. *Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics*, London: Routledge, 1992
13. Virginia Woolf. *A Room of One's Own*. Oxford: Black Swan. 1992.
14. T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a Human Face*, Karachi: Oxford University Press, 1997

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
3	0	0	3

DESIGN OF MACHINE ELEMENTS-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:

- To apply the design principles for the design of various engine parts
- Estimate the 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- important Design parameters – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for wear.

TEXT BOOKS:

1. Machine tool design by V. Bhandari TMH

REFERENCE BOOKS:

1. Machine Design by P.Kannaiah, Scitech
2. Machine Design Volume II by S.Md.Jalaludeen
3. Machine Design Data Book by PV Ramana Murthi & M .Vidyasagar, BS Publications
4. Machine Design by Pandya & Shah, Charotar

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

HEAT TRANSFER

L	T	P	C
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Pre-requisite: Thermodynamics

Course Objective: To understand different modes of heat transfer and apply basics in the design of thermal systems

these

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

- Represent the physical problems of heat transfer in terms of governing equations or mathematical models
- Differentiate between different boundary conditions and apply the same for solving heat transfer problems
- Design thermal systems applying the concepts of heat transfer under steady state and well as unsteady state conditions.

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 II 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.

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

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.

UNIT – IV:

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

TEXT BOOKS:

1. Fundamentals of Heat Transfer by Incropera & Dewitt, John Wiley
2. Fundamentals of Engineering, Heat & Mass Transfer by R.C.Sachdeva, NewAge.
3. Heat & Mass Transfer by D.S.Kumar, S.K.Kataria & sons

REFERENCE BOOKS:

1. Heat Transfer by Ghoshdastidar, Oxford University press.
2. Heat Transfer by A Practical Approach, YunusCengel, Boles, TMH
3. Heat Transfer by HOLMAN, TMH
4. Engineering Heat and Mass Transfer by Sarit K. Das, DhanpatRai Pub
5. Heat and Mass Transfer by R. Yadav, CPH
6. Essential Heat Transfer by Christopher A Long, Pearson Education
7. Heat Transfer by P.K.Nag, TMH

Note : Heat and Mass transfer Data Book by C P Kothandaraman and Subrahmanyam is used to design and analyze various thermal processes and thermal equipment

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

CAD/CAM

Pre-requisites: None

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3	0	0	3

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:

- To apply 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.

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 by P.N.Rao, TMH
2. CAD/CAM Concepts and Applications by Alavala, PHI

REFERENCE BOOKS:

1. CAD/CAM by Groover M.P., Pearson education
2. CAD/CAM Theory and Practice,/ Ibrahim Zeid,TMH
3. CAD/CAM/CIM by Radhakrishnan and Subramanian, New Age
4. Principles of Computer Aided Design and Manufacturing by Farid Amirouche, Pearson
5. Computer Numerical Control Concepts and programming by Warren S Seames, Thomson.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

UNCONVENTIONAL MACHINING PROCESSES

(Professional Elective Course- ME-I)

Prerequisites: Theory of metal cutting, machine tools

L	T	P	C
3	0	0	3

Course Objectives:

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

Outcomes:

- 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.
- Gain the knowledge of basic mechanism of various Unconventional machining processes and related equipment, variables, advantages, limitations, applications.
- Given a set of physical, electrical and other parameters. Student can identify a suitable Unconventional machining process.

UNIT-I:

INTRODUCTION: Need for non-conventional machining processes, Classification of non -conventional machining processes, considerations in process selection, materials, general characteristics and applications of non-conventional machining processes, Historical development.

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 Beam Machining, Electron Beam Machining, Ion Beam Machining - basic principles, components, process variables, advantages, limitations and 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, limitations and 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. Advanced machining processes by VK Jain, Allied publishers.
2. Non Traditional Manufacturing Processes by Gary F Benedict, CRC Press.

REFERENCE BOOKS:

1. MEMS & Microsystems – Design and Manufacture by Tai-Ran Hsu, Tata McGraw Hill
2. Modern Machining Process by Pandey P.C. and Shah H.S., TMH
3. New Technology by Bhattacharya A, the Institution of Engineers, India 1984.
4. Non-Traditional Machining by P.K.Mishra, New Age.
5. Micro Machining of Engineering Materials Edited by J.Mc Geough, CRC Press.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

MACHINE TOOL DESIGN (Professional Elective Course-ME I)

L	T	P	C
3	0	0	3

Pre-requisites: Machine Design, Machine Tools and Metrology, Machining Science, Theory of Machinery.

Course Outcomes:

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

- 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 and 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. Machine Tool Design and Numerical Control by N.K. Mehta, TMH, New Delhi, 2010.
2. Principles of Machine Tools by G.C. Sen and A. Bhattacharya, New Central Book Agency, 2009.
3. Design of Machine Tools by D. K Pal, S. K. Basu, 5th Edition, Oxford IBH, 2008.

Reference Books:

1. Machine Tool Design by N. S. Acherkhan, Vol. I, II, III and IV, MIR publications, 1968.
2. Tool Design by Cyril Donaldson, 5th Edition, Mc Graw Hill.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

PRODUCTION PLANNING CONTROL (Professional Elective Course-ME I)

L	T	P	C
3	0	0	3

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 quantity 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 to evaluate MRP and JIT systems against traditional inventory control systems.
- 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. 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 by M.Mahajan, Dhanpati rai & Co
2. Production Planning and Control by Jain & Jain, Khanna publications

REFERENCE BOOKS:

1. Production Planning and Control- Text & cases by SK Mukhopadhyaya, PHI.
2. Production and operations Management by R.Panneer Selvam, PHI
3. Operations Management by Chase, PHI
4. Operations Management by William J. Stevensan, MC Graw Hills.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS (Open Elective –I)

L	T	P	C
3	0	0	3

Course Objective:

To prepare engineering students to analyze cost/ revenue/ financial data and to make economic and financial analysis in decision making process and to examine the performance of companies engaged in engineering.

Course Outcome:

To perform and evaluate present and future worth of the alternate projects and to appraise projects by using traditional and DCF Methods. To carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.

UNIT- I:

Introduction to Engineering Economics- Basic Principles and Methodology of Engineering Economics– Fundamental Concepts - Demand – Demand Determinants - Law of Demand- Demand Forecasting and Methods - Elasticity of Demand - Theory of Firm – Supply- Elasticity of Supply.

UNIT- II:

Macro Economic Concepts: National Income Accounting - Methods of Estimation- Various Concepts of National Income - Inflation – Definition – Causes of Inflation and Measures to Control Inflation - New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.

UNIT- III:

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT- IV:

Capital Budgeting Techniques: Significance of Capital Budgeting - cash flows-Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques- Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.

UNIT- V:

Introduction to Accounting: Accounting Principles (GAPP), concepts, conventions- - Double entry system of Book keeping – Accounting rules- Journal- ledger- Trial balance- Trading and Profit and Loss account- Balance Sheet. (Simple Problems)

Text Books:

1. Engineering Economics by Henry Malcom Steinar, Principles, Mc Graw Hill Pub.
2. Business Economics - Theory and Applications by D.D.Chaturvedi, S.L.Gupta, International Book House Pvt. Ltd. 2013.

Reference Books:

1. Accounting by Jain and Narang, Kalyani Publishers.
2. Cost Accounting by Arora, M.N., Vikas Publication.
3. Financial Management by S.N.Maheshwari, Vikas Publishing House.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

REFRIGERATION & AIR CONDITIONING

Prerequisites: Thermodynamics

L	T	P	C
3	0	0	3

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 Psychrometrics 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 by SC Arora & Domkundwar, Dhanpatrai
2. Refrigeration and Air Conditioning by CP Arora, TMH.
3. Refrigeration and Air Conditioning by Manohar Prasad, New Age

REFERENCE BOOKS:

1. Principles of Refrigeration by Dossat, Pearson Education
2. Basic Refrigeration and Air-Conditioning by Ananthanarayanan, TMH

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

HEAT TRANSFER LAB

Pre-requisite: Thermodynamics

L	T	P	C
0	0	2	1

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

- Apply the principles of various modes of heat transfer to evaluate thermal conductivity of different metal and non metal objects under steady state conditions
- Apply the principles of various modes of heat transfer to evaluate thermal conductivity of different objects under unsteady state conditions
- 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
- To apply the principles of radiation to evaluate the surface emissivity of a test plate and Stefan-Boltzmann's constant and compare with theoretical values

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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

THERMAL ENGINEERING LAB-II

L	T	P	C
0	0	2	1

Prerequisites: Thermodynamics, Thermal Engineering-II

Course outcomes:

At the end of course student is able to

- Apply the principles of Thermodynamics to determine the properties of the Pure Substance like Steam
 - Evaluate the performance parameters of various compressible flow equipment, viz., nozzle and turbine
 - To simulate the various flow and thermal networks and correlate them
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 for optimization.
 9. Simulation of thermal networks for optimization.
 10. Simulation of fluid flow & thermal networks for optimization.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ADVANCED COMMUNICATION SKILLS LAB

L	T	P	C
0	0	2	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 organize 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.

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.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) 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/* – 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.

Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural 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
- 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

Suggested Software:

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

- Oxford Advanced Learner's Compass, 7th 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)

Text Books:

1. **Effective Technical Communication** by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. **Academic Writing: A Handbook for International Students** by Stephen Bailey, Routledge, 5th Edition

Reference Books:

1. **Learn Correct English – A Book of Grammar, Usage and Composition** by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. **Professional Communication** by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. **English Vocabulary in Use** series, Cambridge University Press 2008.

6. **Handbook for Technical Communication** by David A. McMurrey& Joanne Buckley. 2012. Cengage Learning.
7. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. **Job Hunting** by Colm Downes, Cambridge University Press 2008.
9. **English for Technical Communication for Engineering Students**, Aysha Vishwamohan, **Tata Mc Graw-Hil** 2009.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

FINITE ELEMENT METHODS

L	T	P	C
3	0	0	3

Pre-requisites: Mechanics of Solids, Heat Transfer and Mechanical Vibrations, Mathematics

Course Objectives:

The course is intended to

- Gain a fundamental understanding of the finite element method for solving 1-D structural problem.
- Formulate the finite element equations for truss and beam elements.
- Study two-dimensional problems such as plain stress and plain strain elasticity problems.
- Learn finite element analysis of 1-D and 2-D heat conduction and torsion problem Analysis the structures by considering the mechanical vibrations.

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 Methods for solving field problems, Methods of Engineering Analysis, Functional Approximation Methods: Rayleigh- Ritz Method, Weighted Residual Methods, Applications of FEM, Advantages and Disadvantages of FEM, Stress and Equilibrium, Strain – Displacement relations, Stress – strain relations for 2D and 3D Problems. Basic Steps of FEM, Characteristics of Finite Element, Principle of Minimum Potential Energy, Convergence Requirements.

UNIT – II:

One Dimensional Problems: Formulation of Stiffness Matrix for a Bar Element by the Principle of Minimum Potential Energy, Properties of Stiffness Matrix, Characteristics of Shape Functions, Quadratic shape functions. Problems on uniform and stepped bars for different loading conditions.

Analysis of Trusses: Derivation of Stiffness Matrix for Trusses, Stress and strain Calculations, Calculation of reaction forces and displacements.

UNIT – III:

Analysis of Beams: Derivation of Stiffness matrix for two noded, two degrees of freedom per node beam element, Load Vector, Deflection, Stresses, Shear force and Bending moment, Problems on uniform and stepped beams for different types of loads applied on beams.

UNIT – IV:

Finite element – formulation of 2D Problems: Derivation of Element stiffness matrix for two dimensional CST Element, Derivation of shape functions for CST Element, Elasticity Equations, constitutive matrix formulation, Formulation of Gradient matrix. Two dimensional Isoparametric Elements and Numerical integration.

Finite element – formulation of 3D problems: Derivation of Element stiffness matrix for

Tetrahedron Element, Properties of Shape functions for 3D Tetrahedral Element, Stress-Strain Analysis for 3D Element, Strain Displacement for Relationship Formulation.

UNIT – V:

Steady state heat transfer analysis: One Dimensional Finite Element analysis of fin and composite slabs. **Two dimensional steady state heat transfer problems:** Derivation of Thermal Stiffness matrix for 2D heat transfer problems-CST, Derivation of thermal force vector for 2D heat transfer problems.

Dynamic Analysis: Formulation of mass matrices for uniform bar and beam Elements using lumped and consistent mass methods, Evaluation of Eigen values and Eigen vectors for a stepped bar and beam Problems.

TEXT BOOKS:

1. Introduction to Finite Elements in Engineering by Chandrupatla, Ashok and Belegundu, Prentice, Hall, Pearson
2. The Finite Element Methods in Engineering by SS Rao, Pergamon.

REFERENCE BOOKS:

1. Finite Element Methods: Basic Concepts and applications by Alavala, PHI
2. Finite Element Method by Zincowitz, Mc Graw Hill
3. Introduction to Finite element analysis by S.Md.Jalaludeen, Anuradha Publications, print-2012
4. Finite Element Analysis by P.Seshu, PHI
5. Finite Element Analysis by Hutton, TMH
6. Finite Element Analysis by Bathe, PHI
7. Finite Element Method by Krishna Murthy, TMH

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

Additive Manufacturing (Professional Elective Course-2)

L	T	P	C
3	0	0	3

Prerequisites: Manufacturing Processes

Course outcomes:

- To understand the fundamentals for additive manufacturing and how it is different and discuss about various types of liquid based, solid based and powder based AM technologies.
- To understand the various types of Pre-processing, processing, post-processing errors in AM. Also to know the various types of data formats and software's used in AM.
- To know the various applications of AM in design analysis, aerospace, automotive, biomedical and other fields

UNIT – I:

Introduction: Prototyping fundamentals: Need for time compression in product development, Need for Additive Manufacturing, Historical development, Fundamentals of Additive Manufacturing, AM Process Chain, Advantages and Limitations of AM, Commonly used Terms, Classification of AM process, Fundamental Automated Processes: Distinction between AM and CNC, other related technologies.

UNIT – II:

Liquid-based AM Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Polyjet: Process, Principle, working principle, Applications, Advantages and Disadvantages, Case studies. Microfabrication.

Solid-based AM Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Multi-Jet Modelling (MJM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT – III:

Powder Based AM Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Laser Engineered Net Shaping (LENS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Electron Beam Melting (EBM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies

Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification: Indirect Rapid Tooling Methods: Arc Spray Metal Deposition, Investment Casting, Sand Casting, 3D Keltool process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

UNIT – IV:

AM Data Formats: Reengineering for Digital Representation, STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Mesh Refining by Sub division Techniques.

AM Software's: Need for AM software, Features of various AM software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor, SurgiGuide, 3-matic, Simplant, MeshLab.

UNIT –V:

AM Applications: Application – Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customised Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules. Web Based Rapid Prototyping Systems

Text Books:

1. Rapid prototyping: Principles and Applications - Chua C.K., Leong K.F. and LIM C.S, World Scientific publications, Third Edition, 2010.
2. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer , 2001

Reference Books:

1. Wohlers Report 2000 – Terry Wohlers, Wohlers Associates, 2000
2. Rapid Prototyping & Engineering Applications – Frank W.Liou, CRC Press, Taylor & Francis Group, 2011.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

AUTOMATION IN MANUFACTURING

(Professional Elective Course – 2)

L	T	P	C
3	0	0	3

Prerequisites:

Objectives:

- Lower Cost and Improve Time-to-Market
- Automation investment life-cycle analysis
- Empowered teams of talented employees
- Partnering with automation suppliers
- On-line process analysis
- Procedural process control
- Information integration and data warehousing

UNIT-I:

Introduction to Automation: Automation in Production Systems-Automated Manufacturing Systems, Computerized Manufacturing Support Systems, Reasons for Automation, Automation Principles and Strategies. Manufacturing operations, Production Concepts and Mathematical Models. Costs of Manufacturing Operations, Basic Elements of an Automated Systems, Advanced Automation Functions, Levels of automation.

UNIT-II:

Introduction to Material Handling: Overview of Material Handling Equipment, Considerations in Material Handling System Design, the 10 Principles of Material Handling. Material Transport Systems, Automated Guided Vehicle Systems, Monorails and other Rail Guided Vehicles, Conveyor Systems, Analysis of Material Transport Systems. Storage Systems, Storage System Performance, Storage Location Strategies, Conventional Storage Methods and Equipment, Automated Storage Systems, Engineering Analysis of Storage Systems. Automatic data capture-overview of Automatic identification methods, bar code technology, other ADC technologies.

UNIT -III:

Manual Assembly Lines: Fundamentals of Manual Assembly Lines, Alternative Assembly Systems, Design for Assembly, Analysis of Single Model Assembly Lines, Line balancing problem, largest candidate rule, Kilbridge and Wester method, and Ranked Positional Weights Method, Mixed Model Assembly Lines, Considerations in assembly line design.

UNIT-IV:

Transfer lines: Fundamentals of Automated Production Lines, Storage Buffers, and Applications of Automated Production Lines. Analysis of Transfer Lines with no Internal Storage, Analysis of Transfer lines with Storage Buffers.

UNIT-V:

Automated Assembly Systems, Fundamentals of Automated Assembly Systems, Design for Automated Assembly, and Quantitative Analysis of Assembly Systems - Parts Delivery System at Work Stations, Multi- Station Assembly Machines, Single Station Assembly Machines, Partial Automation.

TEXT BOOKS:

1. Automation, Production systems and computer integrated manufacturing, Mikel P. Groover/ Pearson Education.
2. CAD CAM: Principles, Practice and Manufacturing Management / Chris Mc Mohan, Jimmie Browne / Pearson edu. (LPE)

REFERENCE BOOKS:

1. Automation, Buckinghsm W, Haper& Row Publishers, New York, 1961
2. Automation for Productivity, Luke H.D, John Wiley & Sons, New York, 1972.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

MEMS (Professional Elective Course – 2)

L	T	P	C
3	0	0	3

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

- Synthesize and characterize nanomaterials for engineering applications
- Design and analyze methods and tools for micro and nano manufacturing.
- Improve the quality of MEMS by analysing the variables of the underlying micro and nano manufacturing method
- Select appropriate industrially-viable process, equipment and tools for a specific product.

UNIT - I:

Overview and working principles of MEMS and Microsystems: MEMS & Microsystems, Evolution of Micro fabrication, Microsystems & Microelectronics, Microsystems & miniaturization, Applications of MEMs in Industries, Micro sensors, Micro actuation, MEMS with Micro actuators Micro accelerometers, Micro fluidics

UNIT - II:

Engineering Science for Microsystems Design and Fabrication: Atomic structure of Matter, Ions and Ionization, Molecular Theory of Matter and Intermolecular Forces, Doping of Semiconductors, The Diffusion Process, Plasma Physics, Electrochemistry, Quantum Physics.

UNIT - III:

Engineering Mechanics for Microsystems Design: Static Bending of Thin plates, Mechanical Vibration, Thermomechanics, Fracture Mechanics, Thin- Film Mechanics, Overview of Finite Element Stress Analysis

UNIT - IV:

Thermo Fluid Engineering & Microsystems Design: Overview of Basics of Fluid Mechanics in Macro and Mesoscales, Basic equations in Continuum Fluid Dynamics, Laminar Fluid Flow in Circular Conduits, Computational Fluid Dynamics, Incompressible Fluid Flow in Micro conduits, Fluid flow in Sub micrometer and Nano scale, Overview of Heat conduction in Solids, Heat Conduction in Multilayered Thin films and in solids in sub micrometer scale, Design Considerations, Process Design Mechanical Design, Mechanical design using FEM, Design of a Silicon Die for a Micro pressure sensor.

UNIT V:

Materials for MEMS & Microsystems and their fabrication: Substrates and Wafers, Active substrate materials, Silicon as a substrate material, Silicon compounds, Silicon Piezoresistors, Gallium Arsenide, Quartz, Piezoelectric Crystals and Polymers, Photolithography, Ion implantation, Diffusion and oxidation, Chemical and Physical vapor deposition, etching, Bulk micro manufacturing, Surface Micromachining, The LIGA Process.

TEXT BOOKS:

1. Tia-Ran Hsu, MEMS & Microsystems. Design & Manufacturing, TMH 2002
2. Foundation of MEMS/ Chang Liu/Pearson, 2012

REFERENCE BOOKS:

1. Maluf, M., "An Introduction to Microelectromechanical Systems Engineering". Artech House, Boston 2000
2. Trimmer, W.S.N., "Micro robots and Micromechanical Systems", Sensors & Actuators, Vol 19, 1989
3. Trim., D.W., "Applied Partial Differential Equations", PWS-Kent Publishing, Boston, 1990

L	T	P	C
3	0	0	3

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

POWER PLANT ENGINEERING

(Professional Elective Course- 3)

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 – II:**Internal 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 comparison.

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 BOOKS:

1. Power Plant Engineering by P.C.Sharma, S.K.Kataria Pub
2. A Course in Power Plant Engineering by Arora and S. Domkundwar.

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

AUTOMOBILE ENGINEERING (Professional Elective Course – 3)

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

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

RENEWABLE ENERGY SYSTEMS

(Professional Elective Course -3)

Prerequisites: None

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3	0	0	3

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, CO₂ 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.

Text Books:

1. Power plant technology by J Wakhil
2. Non-Conventional Energy Sources by G.D Rai

Reference Books:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

INDUSTRIAL ROBOTICS

(Professional Elective Course-4)

L	T	P	C
3	0	0	3

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

UNIT-III:

Differential transformation of manipulators, Jacobians – problems.

Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint interpolated motion – straight line motion.

UNIT-IV:

Robot actuators and Feedback components:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison 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 by Groover M P, Pearson Edu.
2. Robotics by Fu K S, McGraw Hill.
3. Theory of Applied Robotics (kinematics, Dynamics and Control-Jazar, Springer.

REFERENCE BOOKS:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

MECHANICAL VIBRATIONS

(Professional Elective Course-4)

L	T	P	C
3	0	0	3

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, viscous damping, coulomb damping, forced vibrations, 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- undamped, damped free and forced vibrations, undamped vibration absorbers. Vibration measuring instruments: Vibrometers: velocity meters & accelerometers.

UNIT- IV:

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-V:

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: Rayleigh's method, Stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Mechanical Vibrations by SS Rao, Pearson, 2009, Ed 4,
2. Mechanical Vibration by Rao V.Dukkipati & J Srinivas, PHI, 2010.
3. Mechanical Vibrations by V. Ram Murthy.
4. Vibration problems in Engineering by S.P. Timoshenko.
5. Mechanical Vibrations by Seto, Schaum's Outlines, McGraw Hill.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

COMPOSITE MATERIALS (Professional Elective Course-4)

L	T	P	C
3	0	0	3

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 boron carbide fibers. Particulate composites, Polymer composites, Thermoplastics, Thermosets, 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, Angle of 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.

Reference Books:

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 Reinhold, New York, 1969.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

Basic Mechanical Engineering (Open Elective-2)

Instructional Objectives

- To familiarize with the basic machine elements
- To familiarize with the Sources of Energy and Power Generation
- To familiarize with the various manufacturing processes

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UNIT-I:

Machine Elements: Helical and leaf springs – Springs in series and parallel. Cams: Types of cams and followers – Cam profile.

UNIT-II:

Power Transmission Elements: Gears terminology of spur, helical and bevel gears, gear trains. Belt drives (types). Chain drives.

UNIT-III:

Energy: Sources: Renewable and non-renewable (various types, characteristics Advantages/disadvantages). Power Generation: External and internal combustion engines Hydro, thermal and nuclear power plants (layouts, element/component description, advantages, disadvantages, applications). Simple Problems.

UNIT-IV:

Manufacturing Processes: Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes (applications, advantages / disadvantages). Welding: Types – Equipments – Tools and accessories – Techniques employed -applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

UNIT-V:

Machine Tools: Lathe machine: Types - Description of main components – Cutting tools – Work holding devices – Basic operations. Simple Problems. Drilling Machine: Introduction Types – Description – Tools. Simple Problems.

Text Books:

1. Basic Mechanical Engineering by Kumar, T., Leenus Jesu Martin and Murali, G., Suma Publications, Chennai, 2007

Reference Books:

1. Basic Mechanical Engineering by Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S., Scitech Publications, Chennai, 2000.
2. Elements of Workshop Technology by Hajra Choudhary, S.K. and HajraChoudhary, A. K., Vols. I & II, Indian Book Distributing Company Calcutta, 2007.
3. Power Plant Engineering by Nag P.K., Tata McGraw-Hill, New Delhi, 2008.
4. Theory of Machines by Rattan, S.S., Tata McGraw-Hill, New Delhi, 2010.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

CAD/CAM LAB

Pre-requisites:

To give the exposure to usage of software tools for design and manufacturing. To acquire the skills needed to analyze and simulate engineering systems.

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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

CAD Experiments

DRAFTING:

1. Development of part drawings for various components in the form of orthographic and isometric.

PART MODELING:

1. Generation of various 3D Models through pad, shaft, shell sweep.
2. Feature based and Boolean based modelling surface and Assembly Modelling. Design simple components.
3. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
4. To make an isometric dimensional drawing of a connecting rod.
5. Draw Different type's bolts and nuts with internal and external threading in Acme and Square threading standards. Save the bolts and nut as blocks suitable for insertion.
6. A Study of a FEA package and modeling stress analysis of a Bars of constant cross sectional area, tapered and stepped bars.
7. Analysis of various Trusses – (Minimum 2 exercises).
8. Analysis of different types of Beams i.e.; Simply supported, cantilever, beams with UDL, beams with varying load etc (Minimum 6 exercises)

CAM Experiments:

1. To write the manual part program to the given dimensions and execute in CNC Lathe for Box Turning Cycle.
2. To write the manual part program to the given dimensions and execute in CNC Lathe for Multiple Turning Cycle.
3. To write the manual part program to the given dimensions and execute in CNC Lathe for Taper Turning Cycle.
4. Write the manual part program to the given dimensions and execute in CNC Lathe for Multiple Grooving Cycle.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

REFRIGERATION AND AIR CONDITIONING LAB

L	T	P	C
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Pre-requisite: Thermodynamics

Course Objective: To apply the principles of Thermodynamics to analyse different types of refrigeration and air conditioning systems experimentally and evaluate performance parameters under actual conditions in relation to the ideal conditions.

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 based on the measured properties
 - Apply the principles of Psychrometrics to measure and evaluate the air conditioning performance for different indoor conditions.
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. Determination of the performance of cooling tower.
 7. Simulation of refrigeration system for different operating conditions and working fluids using Refrigeration simulation software and flow simulation software
 8. Visit to any refrigeration or air conditioning plant.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

COMPUTATIONAL FLUID DYNAMICS

(Professional Elective Course – 5)

L	T	P	C
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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 them 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 apply 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:

Review of Modes of Heat Transfer – Governing Equations – Initial and boundary conditions

Methods to solve a physical problem – Relative advantages and disadvantages of experimental, analytical and numerical methods – Scope of CFD – Its applications and limitations - Brief comparison between different numerical methods, viz., FDM, FEM & FVM Methods to solve a system of simultaneous Linear Algebraic Equations, - Direct Method – Banded Matrices – Thomas algorithm / TDMA - iterative schemes of Matrix Inversion.

UNIT – II:

Classification of PDE – Elliptic, parabolic and hyperbolic PDE as governing equations – Examples and their physical significance

FDM – Discretization of Partial Derivative Terms using Taylor's series of approximation – Finite Difference Formulae – Application and implementation aspects of finite-difference equations – Consistency

Application of FDM to elliptic equations, viz., Laplace Equations – solution of 1D steady state heat conduction using FDM – Systems with heat generation – Systems with variable thermal conductivity - Fins

UNIT – III:

Application of FDM to solve 1D steady state heat conduction in Curvilinear geometry – Singularities – Treatment of singularities

Application of FDM to solve 2D steady state heat conduction – with and without heat generation and subjected to different boundary conditions

UNIT – IV:

Parabolic Equations – Use of Explicit, implicit and semi implicit methods – Errors and Stability analysis - application of FDM to solve 1D transient heat conduction equations – ADI Scheme – Treatment and Implementation

UNIT-V:

Numerical methods for incompressible flow – Governing equations – Difficulties in solving N-S equations – Stream function and Vorticity method – Advantages and disadvantages – treatment of boundary conditions – Determination of Pressure for viscous flows – Disadvantages – Staggered Grid – SIMPLE algorithm for pressure liked equations.

Text Books:

1. Computational Fluid Flow and Heat Transfer/ Muralidharan&Sundarajanan/ Narosa Publications
2. Finite Difference Method in Heat Transfer – NecatiOzisik, CRC Press
3. Computer Simulation of Flow and Heat Transfer – Ghoshdastidar, Tata McGraw Hill
4. Numerical Methods – Chapra and Canale, TMH
5. Numerical Methods –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.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

Turbo Machinery **(Professional Elective Course – 5)**

Prerequisites: Thermodynamics 1 & 2

Course Objectives:

The course is intended to

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- Understand the fundamental concepts of turbo machines.
- Apply concepts of fluid mechanics in turbo machines.
- Understand the thermodynamic analysis of steam nozzles and turbines.
- Understand the different types of compressors and evaluating their performances in the form of velocity triangles.
- Familiarize the basic concepts of gas dynamics and analyze the performance of axial flow gas turbines

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

- To design and analyse the performance of Turbo machines for engineering applications
- To understand the energy transfer process in Turbo machines and governing equations of various forms.
- To understand the structural and functional aspects of major components of Turbo machines.
- To design various Turbo machines for power plant and aircraft applications
- Understand the design principles of the turbo machines
- Analyze the turbo machines to improve and optimize their performance

UNIT-I:

FUNDAMENTALS OF TURBO MACHINES: Classifications, Applications, Thermodynamic analysis, isentropic flow, Energy transfer, Efficiencies, Static and Stagnation conditions, Continuity equations, Euler's flow through variable cross sectional areas, unsteady flow in turbo machines

UNIT -II:

STEAM NOZZLES: Convergent and Convergent-Divergent nozzles, Energy Balance, Effect of back pressure of analysis, Designs of nozzles.

Steam Turbines: Impulse turbines, Compounding, Work done and Velocity triangle, Efficiencies, Constant reactions, Blading, Design of blade passages, Angle and height, Secondary flow. Leakage losses, Thermodynamic analysis of steam turbines.

UNIT-III:

GAS DYNAMICS: Fundamental thermodynamic concepts, isentropic conditions, mach numbers and area, Velocity relations, Dynamic Pressure, Normal shock relation for perfect gas. Super sonic flow, oblique shock waves. Normal shock recoveries, Detached shocks, Aerofoil theory.

Centrifugal compressor: Types, Velocity triangles and efficiencies, Blade passage design, Diffuser and pressure recovery. Slip factor, Stanitz and Stodola's formula's, Effect of inlet mach numbers, Pre whirl, Performance

UNIT-IV:

AXIAL FLOW COMPRESSORS: Flow Analysis, Work and velocity triangles, Efficiencies, Thermodynamic analysis. Stage pressure rise, Degree of reaction, Stage Loading, General design, Effect of velocity, Incidence, Performance

Cascade Analysis: Geometrical and terminology. Blade force, Efficiencies, Losses, Free end force, Vortex Blades.

UNIT-V:

AXIAL FLOW GAS TURBINES: Work done. Velocity triangle and efficiencies, Thermodynamic flow analysis, Degree of reaction, Zweifel's relation, Design cascade analysis, Soderberg, Hawthorne, Ainley, Correlations, Secondary flow, Free vortex blade, Blade angles for variable degree of reaction. Actuator disc, Theory, Stress in blades, Blade assembling, Material and cooling of blades, Performances, Matching of compressors and turbines, off design performance.

Text Books:

1. Principles of Turbo Machines by DG Shepherd, Macmillan
2. Fundamentals of Turbomachinery by William W Perg, John Wiley & Sons
3. Element of Gas Dynamics by Yahya, TMH

Reference Books:

1. Principles of Jet Propulsion and Gas Turbine by NJ Zucrow, John Wiley & Sons, Newyork
2. Turbines, Pumps, Compressors by Yahya, TMH
3. Practice on Turbo Machines by G.Gopal Krishnan & D. Prithviraj, Sci Tech Publishers, Chennai
4. Theory and practice of Steam Turbines by WJ Kearton, ELBS Pitman, London
5. Gas Turbines Theory and Practice by Zucrow/John Wiley & Sons, Newyork
6. Element of Gas Dynamics by Liepeman and Roshkow, Dover Publications
7. Elements of Gas Turbine Propulsion by Jack D. Mattingly
8. Turbines, Compressors and Fans by S M Yahya, MGH.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

FLUID POWER SYSTEMS (Professional Elective Course – 5)

Prerequisites: Fluid Mechanics and Hydraulics Machinery

L	T	P	C
3	0	0	3

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. Performance 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.

Test books:

1. Fundamentals of Fluid Power Control by John Watton, 1st Ed. Cambridge University Press, 2009
Prerequisite
2. Fluid Power Control by Blackburn J. F., G.Reethof, and J. L.Shearer, New York: Technology Press of M. I.T. and Wiley.
3. Fluid Power with applications by Anthony Esposito, Pearson Education.

Reference Books:

1. Hydraulic operation and control of Machine tools by Ian Mencil, Ronald Press.
2. Hydraulic and Pneumatic power for production by Sterwart, Industrial Press.
3. Fundamentals of Pneumatics/electropeumatics by Hasebrink J.P., and Kobler R., FESTO Didactic publication No. 7301, Esslingen Germany, 1979.
4. Pneumatic Control-An introduction to the principles by Werner Deppert and Kurt Stoll, Vogel-Verlag.
5. The analysis and Design of Pneumatic Systems by Blaine W.Andersen, John Wiley
6. Oil Hydraulic Power and its Industrial Applications by Ernst, W., New York: McGraw Hill.
7. Design of Hydraulic Control Systems by Lewis E.E., and H.Stern, New York: McGraw Hill.
8. Electro hydraulic Servomechanism by Morse A. C., New York: McGraw Hill.
9. Fluid Power Control systems by Pippenger, J.J., and R.M.Koff, New York: McGraw Hill.
10. Fluid Power Control Systems by Fitch, Jr. E.C., New York: McGraw Hill.
11. Hydraulic and Pneumatic Control of Machine Tools by Khaimovitch,
12. Fluid Power Systems: modeling, simulation and microcomputer control by John Watton, Prentice Hall International.
13. Hydraulic control systems by Herbert E. Merritt, John Wiley and Sons Inc.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

Industrial Management (Professional Elective Course – 6)

Prerequisites: None

Course objectives: The main objectives of this course are the following:

- Philosophies of various management gurus & characteristics of various organization structures
- Various Industrial Engineering practices
- Human resource management practices
- Network analysis through PERT and CPM techniques

L	T	P	C
3	0	0	3

Course outcomes: At the end of course, students should be able to

- Practice the management theories proposed by Taylor, Fayol etc
- Consider various factors and identify plant location for given industry.
- Determine EOQ, classify items and implement P-system and Q-system
- Conduct workstudy(method study+ Work measurement:a) Time study & Work sampling))
- Practice HRM principles
- Analyze the networks by using PERT & CPM

UNIT - I:

Management and Organisation – Functions of Management - Contributions of Taylor, Fayol, Douglas Mc-Gregor, Mayo, Herzberg and Maslow. – Systems Approach to Management - *Organisational Structures*: Basic concepts related to Organisation - Departmentation and Decentralisation, Types of mechanistic and organic structures of organisation and their merits, demerits and suitability.

UNIT- II:

Operations Management-I: Plant location, definition, factors affecting the plant location, comparison of rural and urban sites-methods for selection of plant- Matrix approach. Types of plant layout – various data analyzing forms-travel chart - Work study: Method study and Work measurement. Inventory – functions, types, Determination of Economic Order Quantity (EOQ), ABC and VED analysis. Inventory Control Systems-Continuous review system-periodical review system. Stores Management and Stores Records. Purchase management, duties of purchase manager, JIT System.

UNIT –III:

Operations Management-II: Inspection and quality control, types of inspections - Statistical Quality Control-techniques- Charts for variables and attributes. Acceptance sampling plan- single sampling and double sampling plans-OC curves. Introduction to TQM-Quality Circles, ISO 9000 series procedures. Functions of Marketing, Marketing vs Selling, Marketing mix, Product Life Cycle.

Unit -IV:

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- V:

PERT / CPM: Project management, network modelling-probabilistic model, various types of activity time's estimation-programme evaluation review techniques- Critical Path-probability of completing the project, Critical Path Method (CPM) - Project crashing. Simple problems.

TEXT BOOKS

1. Aryasri, Management Science, McGraw hill, 2012
2. Kumar, Rao and Chhalil : Introduction to Management Science, Cengage 2012.

REFERENCE BOOKS:

1. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.
2. Amrine, Manufacturing Organization and Management, Pearson, 2012.
3. Chase, Jacobs, Aquilano, Operations Management, McGraw Hill, 2012.
4. Panner Selvam, Production and Operations Management, PHI, 2012.
5. Nadha Muni Reddy & Vijaya Kumar Reddy, Reliability Engineering & Quality Engineering, Galgotia, 2012.
6. Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 2012.
7. L.S.Srinath, PERT / CPM, Affiliate East-West Press, New Delhi, 2012.
8. Gary Dessler, Human Resource Management, Pearson Education Asia,
9. 2012.
10. Phillip Kotler, Marketing Management, Pearson, 2012.
11. S.K.Basu,K.C.Sahu,B.Rajiv : Industrial Organization and Management, PHI, 2012.
12. Dipak Kumar Bhattacharyya: Industrial Management, Vikas publishing house 2013

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

Production Operation and Management (Professional Elective Course – 6)

Prerequisites: Operations Research, Production Planning and Control

L	T	P	C
3	0	0	3

Objectives:

- Learn Aggregate planning, MRP Work study, and scheduling
- Learn Value analysis, design the plant layout for the specified production system

Course Outcomes: At the end of the course, the student is able to

- Understand the importance of production and operations Management, for getting the Competitive edge
- Do value analysis for a given product and design the plant layout for the specified production system.
- Do Aggregate planning, MRP Work study, and scheduling
- able to apply the project management techniques

UNIT-I:

Overview of Production & Operations Management (POM): Introduction-Definition-Importance-Historical Development of POM-POM scenario today

Product & Process design: Role of product development- Product development process-Tools for efficient product development (briefly)- Determination of process characteristics- Types of processes and operations systems- Continuous –Intermittent-Technology issues in process design- Flexible Manufacturing Systems- Automated Material Handling Systems

UNIT –II:

Value Analysis: Definition-Objectives-Types of Values-Phases- Tools -FAST diagram-Steps-Advantages-Matrix method-Steps.

Plant Location& Plant layout: Factors affecting locations decisions-Location planning methods-Location factor rating -Centre of Gravity method-Load distance method. Plant layout- Definition-Objectives-Types of layouts-Design of product layout-Line balance-Terminology-RPW method.

UNIT- III:

Aggregate Planning: Definition- Objectives-Basic strategies for aggregate production planning-Aggregate production planning method-Transportation model- Master Production Scheduling.

Material Requirement Planning: Terminology-Logic-Lot sizing methods-Advantages & Limitations

UNIT – IV:

Work Study: Work study: method study –definition-objectives-steps-Charts used- Work measurement-Time study- Definition-steps- Determination of standard time- Performance rating- Allowances. Work sampling- steps- comparison with time study.

Quality Management: Economics of quality assurance-Control charts for variables and for attributes – Acceptance sampling plans-Total Quality Management-ISO 9000 series standards-Six sigma

UNIT – V:

Scheduling: Need-basis for scheduling- Scheduling rules- Flow shop & Job shop scheduling. Line of Balance.

Project management: PERT- Critical path determination- Probability of completing project in a given time- CPM- Types of floats- Critical path determination- Crashing of simple networks- Optimum project schedule.

TEXT BOOKS:

1. Operations Management for Competitive Advantages by Chase Aquinano, TMH, 2009
2. Operations Management: Theory and Practice by B. Mahadevan Pearson.
3. Industrial Engineering and Management by Dr. Ravi Shankar, Galgotia.

REFERENCE BOOKS:

1. Modern Production and Operations Management by Buffa, Wiley
2. Theory and Problems in Production and Operations Management by SN Chary TMH.
3. Operations Management 8e Process and Value Chains by Lee Krajewski et al Pearson

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

TRIBOLOGY (Professional Elective Course – 6)

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

L	T	P	C
3	0	0	3

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 BOOKS:

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

REFERENCE BOOKS:

1. Tribology by B.C. Majumdar

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV B.Tech. Mech. Engg. II Semester

NON-CONVENTIONAL SOURCES OF ENERGY (Open Elective -3)

Pre-requisites: None

L	T	P	C
3	0	0	3

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 tilted 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 by Tiwari and Ghosal, Narosa
2. Non- conventional Energy Sources by G.D. Rai
3. Biological Energy Resources by Malcolm Fleischer & Chris Lawis.

REFERENCE BOOKS:

1. Renewable Energy Sources by Twidell & Weir
2. Solar Energy by Sukhame
3. Solar Power Engineering by B.S. Magal Frank Kreith & J.F. Kreith
4. Principles of Solar Energy by Frank Krieth & John F Kreider
5. Non-Conventional Energy by Ashok V Desai, Wiley Eastern
6. Non-Conventional Energy Systems by K Mittal, Wheeler
7. Renewable Energy Technologies by Ramesh & Kumar, Narosa