ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

METALLURGICAL ENGINEERING

For

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

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

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

ACADEMIC REGULATIONS 2017 for CBCS Based B.Tech. PROGRAMMES

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

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

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

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

2.0 Eligibility for Admission

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

w.e.f. 2017-2018 academic year

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

3.0 B.Tech. Programme (UGP) Structure

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

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 Semester Scheme:
Each UGP is of 4 Academic Years (8 Semesters), with the year being divided into two Semesters of 22 weeks (≥ 90 working days) each, each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/ Course Structure as suggested by AICTE are followed.

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

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

3.2.3 Subject/ Course Classification:

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

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

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

- Minor Courses (1 or 2 Credit Courses, belonging to HS/ BS/ ES/ PC as per relevance); and
- Mandatory Courses (MC - non-credit oriented).

3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course-Structure Grouping for the each of the UGP E&T (B.Tech. Degree Programmes), is as listed below (along with AICTE specified % Range of Total Credits)…

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

4.0 Course Work

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

4.2 Each student shall Register for and Secure the specified number of Credits required for the completion of the UGP and Award of the B.Tech. Degree in respective Branch of Engineering.

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

5.0 Course Registration

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

5.2 Academic Section of the College invites 'Registration Forms' from students apriori (before the beginning of the Semester), through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examiantions) of the 'PRECEDING SEMESTER'.

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

5.4 A Student may be permitted to Register for his Subjects/ Course of CHOICE with a typical total of 24 Credits per Semester (Minimum being 20 C and Maximum being 28 C, permitted deviation being ± 17%), based on his PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses, in the Department Course Structure and Syllabus contents. However, a MINIMUM of 20 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

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

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

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.

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

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

6.0 Subjects/ Courses to be offered

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

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

6.3 More than ONE TEACHER may offer the SAME SUBJECT (Lab./ Practicals may be included with the corresponding Theory Subject in the same Semester) in any Semester. However, selection choice for students will be based on - 'FIRST COME FIRST SERVE Basis and CGPA Criterion' (ie., the first focus shall be on early ON-LINE ENTRY from the student for Registration in that Semester, and the second focus, if needed, will be on CGPA of the student).

6.4 If more entries for Registration of a Subject come into picture, then the concerned Head of Department shall take

necessary action, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT .

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

7.0 Attendance Requirements

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

7.2 Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each Semester may be granted by the College Academic Committee on genuine and valid grounds, based on the student's representation with supporting evidence.

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

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

7.5 Students, whose shortage of attendance is not condoned in any Semester, are not eligible to take their End Examinations of that Semester, they get detained and their registration for that Semester shall stand cancelled. They will not be promoted to the next Semester. They may seek re-registration for all those Subjects registered in that Semester in which he got detained, by seeking re-admission for that Semester as and when offered; in case if there are any Professional Electives and/ or Open Electives, the same may also be re-registered if offered, however, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the SAME set of Elective Subjects offered under that category.

8.0 Academic Requirements

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

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

8.2 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to - Industry oriented Mini-Project/ Seminar, if he secures not less than 40% of the total marks (40 marks) to be awarded for each. The student would be treated as failed, if he - (i) does not submit a report on his Industry oriented Mini-Project, or does not make a presentation of the same before the Evaluation Committee as per schedule, or (ii) does not present the Seminar as required in the IV year II Semester, or (iii) secures less than 40% of marks (40 marks) in Industry oriented Mini-Project/ Seminar evaluations.
He may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent Semester, as and when it is scheduled.

8.3 A Student will not be promoted from I Year to II Year, unless he fulfils the Attendance and Academic Requirements and secures a total of minimum 24 Credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

8.4 A Student will not be promoted from II Year to III Year, unless he fulfils the Attendance and Academic Requirements and secures a total of minimum 58 Credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

8.5 A Student will not be promoted from III Year to IV Year, unless he fulfils the Attendance and Academic Requirements

and secures a total of minimum 86 Credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

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

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

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

8.9 Students who fail to earn 192 Credits as per the Course Structure, and as indicated above, within 8 Academic Years

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from the Date of Commencement of their I Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

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

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

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

9.0 Evaluation - Distribution and Weightage of Marks

9.1 The performance of a student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory or Practicals or Seminar or Drawing/Design or Industry oriented Mini-Project or Minor Course, etc; however, the B.Tech. Project Work (Major Project) will be evaluated for 200 Marks. These evaluations shall be based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination), and a Letter Grade corresponding to the % marks obtained shall be given.

9.2 For all Subjects/ Courses as mentioned above, the distribution shall be 30 marks for CIE, and 70 marks for the SEE. The semester end examinations will be conducted for 70 marks

consisting of two parts viz. i) **Part-A** for 20 marks (10 x 2 marks), ii) **Part-B** for 50 marks. Part-B consists of five questions carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

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

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

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

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

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

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two internal practical tests (each of 10 marks) shall be conducted by the concerned laboratory teacher and the better of these two tests is taken into account. The SEE for Practicals shall be conducted at the end of the Semester by Two Examiners appointed by Head of the Department.

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

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

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

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

9.8 There shall be a Seminar Presentation in IV Year II Semester. For the Seminar, the student shall collect the information on a specialized topic, prepare a Technical Report and submit to the Department at the time of Seminar Presentation. The Seminar Presentation (along with the Technical Report) shall be evaluated by Two Faculty Members

assigned by Head of the Department, for 100 marks. There shall be no SEE or external examination for Seminar.

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

9.10 For NCC/ NSS/ NSO types of Courses, and/or any other Mandatory Non-Credit Course offered in a Semester, a 'Satisfactory Participation Certificate' shall be issued to the Student from the concerned authorities, only after securing ≥ 65% attendance in such a Course. No marks or Letter Grade shall be allotted for these activities.

10.0 Grading Procedure

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

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

% of Marks Secured in a Subject /	*Letter Grade*	*Grade*

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

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

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

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

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

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

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

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

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

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

Illustration of calculation of SGPA

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

SGPA = 165/24 = 6.87

10.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$CGPA = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \text{ ... for all S Semesters registered}$$

(ie., upto and inclusive of S Semesters, $S \geq 2$),

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

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

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

10.12 Passing Standards:

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

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

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

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

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

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

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

11.0 Declaration of Results

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

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

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 A Student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire UG E&T Programme (UGP), and

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secures the required number of 192 Credits (with CGPA ≥ 5.0), within 8 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

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

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

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

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

(b) should not have been detained or prevented from writing the End Semester Examinations in any Semester due to shortage of attendance or any other reason.

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

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

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

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

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

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

13.0 Withholding of Results

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

14.0 Transitory Regulations

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

15.0 Student Transfers

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

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

16.0 Scope

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

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

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

w.e.f. 2017-2018 academic year

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.

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		The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Chief Superintendent / Assistant –Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk	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

w.e.f. 2017-2018 academic year

	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.	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.	

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

METALLURGICAL ENGINEERING

COURSE STRUCTURE

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

I YEAR **I SEMESTER**

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

I YEAR **II SEMESTER**

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

w.e.f. 2017-2018 academic year

		Total Credits				**24**

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

METALLURGICAL ENGINEERING

COURSE STRUCTURE

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

II YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathematics – III	4	0	0	4
2	ES	Mechanics of Solids	4	0	0	4
3	PC	Fuels, Furnaces and Refractories	3	1	0	3
4	PC	Mineral Dressing	3	1	0	3
5	PC	Thermodynamics & Kinetics	3	1	0	3
6	PC	Fuels, Furnaces and Refractories Lab	0	0	3	2
7	PC	Mineral Dressing Lab	0	0	3	2
8	PC	JAVA Lab	0	0	3	1
9	HSS	Human Values and Professional Ethics	2	0	0	2
		Total Credits				**24**

II YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	ES	Mechanics of Fluids	4	0	0	4
2	PC	Metallurgical Analysis	4	0	0	4
3	PC	Physical Metallurgy	4	0	0	4
4	PC	Metallurgical Thermodynamics	3	1	0	3
5	PC	Principles of Extractive Metallurgy	3	1	0	3
6	HS	Gender Sensitization Lab	-	-	-	-
7	PC	Metallurgical Analysis Lab	0	0	3	2
8	PC	Physical Metallurgy Lab	0	0	3	2
9	PC	Principles of Extractive Metallurgy Lab	0	0	3	2
		Total Credits				**24**

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

METALLURGICAL ENGINEERING

COURSE STRUCTURE

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

III YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	OE-I	Open Elective - I	3	0	0	3
2	HS	Managerial Economics and Financial Analysis	4	0	0	4
3	PC	Heat Treatment and Phase Transformations	4	0	0	4
4	PC	Mechanical Behaviour of Metals	4	0	0	4
5	PC	Iron Production	4	0	0	4
6	HS	Advanced English Language Communication Skills Lab	0	0	3	1
7	PC	Heat Treatment and Phase Transformations Lab	0	0	3	2
8	PC	Mechanical Behaviour of Metals lab	0	0	3	2
		Total Credits				**24**

III YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	OE - II	Open Elective - II	3	0	0	3
2	PE - I	Professional Elective - I	4	0	0	4
3	PE - II	Professional Elective - II	4	0	0	4
4	PC	Metal Casting	4	0	0	4
5	PC	Metal Forming	3	1	0	3
6	PC	Metal casting Lab	0	0	3	2
7	PC	Metal Forming Lab	0	0	3	2
8	PC	Material Characterization Lab	0	0	3	2
		Total Credits				**24**

Summer between III & IV Year: Industry Oriented Mini Project

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

METALLURGICAL ENGINEERING

COURSE STRUCTURE

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

IV YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PE-III	Professional Elective - III	4	0	0	4
2	PE-IV	Professional Elective - IV	4	0	0	4
3	PE-V	Professional Elective - V	4	0	0	4
4	PC	Metal joining	4	0	0	4
5	PC	Electro Metallurgy & Corrosion	4	0	0	4
6	PC	Electro Metallurgy & Corrosion Lab	0	0	3	2
7	ES	Industry Oriented Mini Project				2
		Total Credits				**24**

IV YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	OE-III	Open Elective - III	3	0	0	3
2	HS	Management Science	4	0	0	4
3	PC	Metal joining Lab	0	0	3	2
4	ES	Seminar	0	0	3	1
5	PC	Major Project	2	0	2	14
		Total Credits				**24**

Professional Elective **-I**
1. Steel Making
2. Light Metals and Alloys
3. Nuclear Metallurgy

Professional Elective **-II**
1. Material Characterization Techniques
2. Welding Metallurgy
3. Alternate routes of iron Making

Professional Elective **-III**
1. Non Ferrous Extractive Metallurgy
2. Strengthening Mechanisms
3. Ferro Alloy Technology

Professional Elective **-IV**
1. Powder Metallurgy
2. Advanced Materials
3. Semiconductors and Magnetic Materials

Professional Elective **-V**
1. Ceramics and Composite Materials
2. High Temperature Materials
3. Alloy Steels

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

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

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

I Year B.Tech. Met. Engg. I-Sem	**L**	**T**	**P**	**C**
	4	**1**	**0**	**4**

MATHEMATICS – I
(Common to all Branches)

Pre Requisites: NIL

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

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

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

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

w.e.f. 2017-2018 academic year

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

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

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

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

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

ENGINEERING PHYSICS

Prerequisites: Nil

Course Objectives:

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

Outcomes:

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

w.e.f. 2017-2018 academic year

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

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

UNIT-V

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

Text books:

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

References:

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

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

APPLIED CHEMISTRY

Prerequisites: Nil

Course objectives:

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

Outcomes:

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

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

Unit-I: Water and its treatment

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

Unit-II: Electrochemistry and corrosion

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

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

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

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

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

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

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

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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	4	1	0	4

COMPUTER PROGRAMMING & DATA STRUCTURES

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

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

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

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

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

UNIT – II
Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.
Designing Structured Programs- Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

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

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

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

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

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

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

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

REFERENCES:

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

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	4	1	0	4

APPLIED MECHANICS

Prerequisites: Nil

Objectives:

- The study of Engineering Mechanics is very vital to the curriculum of Engineering Studies
- The objective of this course is to build up and enhance the knowledge of mechanics studied in the physics in the application orientation for engineering problems. This course enables the students to take up the further courses in Engineering orientation for respective branches

Outcomes:

In applied mechanic Program, the student will be given maximum flexibility in pursuing an area of special interest like

- Dynamics and Vibrations -its interfaces to materials and structures for understanding on applications. Towards characteristics of structures and study on material and structure
- Applied Mathematics and Numerical Methods
- Experimental Mechanics and Materials
- Strength of materials & structural analysis

After completing the course student will have the basic knowledge on material and structures at analysis level. This will also integrate the science, engineering and mathematical concept for student understanding.

UNIT – I

INTRODUCTION OF ENGINEERING. MECHANICS – Basic concepts System of Forces- Coplanar Forces – Components in Space – Resultant- Moment of Forces and its Application – Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams-Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product- Support reactions different beams for different types of loading – concentrated, uniformly distributed and uniformly varying loading .

UNIT – II

FRICTION: Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction –Cone of limiting friction–

Friction of wedge, block and Ladder – Screw jack – Differential screw jack - Motion of Bodies.

UNIT – III

CENTROID AND CENTER OF GRAVITY: Centrods – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies - Area moment of Inertia: – polar Moment of Inertia – Transfer – Theorems - Moments of Inertia of Composite Figures.

MOMENT OF INERTIA: Moment of Inertia of Areas and Masses - Transfer Formula for Moments of Inertia - Moment of inertia of composite areas and masses.

UNIT – IV

KINEMATICS: Introduction – Rectilinear motion – Motion with uniform and variable acceleration – Curvilinear motion – Components of motion – Circular motion – Projectiles- Instantaneous centre.

KINETICS: Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principle of conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum.

UNTI – V

MECHANICAL VIBRATIONS: Definitions, Concepts – Simple Harmonic motion – free vibrations – Simple, compound and Torsional pendulums- Numerical problems.

VIRTUAL WORK: Theory of virtual work – Applications.

TEXT BOOKS:

1. Engineering Mechanics by shames & Rao - Pearson Education.
2. Engineering Mechanics by M.V. Seshagiri rao and Durgaih; University Press.
3. Engineering Mechanics – B. Bhattacharya - Oxford University Publications.

REFERENCES:

1. Engineering Mechanics (Statics and Dynamics) by Hibbler; Pearson Education.
2. Engineering Mechanics by Fedrinand L. Singer – Harper Collings Publishers.
3. Engineering Mechanics by A. K. Tayal, Umesh Publication.
4. Engineering Mechanics – G. S. Sawhney, Printice Hall of India.
5. A text book of engineering mechanics by R. K. Bansal; Laxmi publications.
6. Engineering Mechanics by R. S. Khurmi ; S. Chand & Co.

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ENGINEERING PHYSICS LAB

LIST OF EXPERIMENTS

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

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

APPLIED CHEMISTRY LAB

LIST OF EXPERIMENTS

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

Recommeded Books:

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

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

COMPUTER PROGRAMMING & DATA STRUCTURES LAB

Week 1:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1.
   Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.

Week 2:

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

Week 3:

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

Week 4:

11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

14. Write a C program to count the lines, words and characters in a given text.

Week 5:

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

Week 6:

18. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
19. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 7:

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

Week 8:

21. i) Write a C program which copies one file to another.
    ii) Write a C program to reverse the first n characters in a file.
    (Note: The file name and n are specified on the command line.)
22. i) Write a C program to display the contents of a file.
    ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

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Week 9:

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

Week 10:

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

Week 11:

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

Week 12:

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

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3	1	0	3

MATHEMATICS – II
(Common to all Branches)

Pre Requisites: NIL

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

Outcomes:
At the end of the course, the student will be able to:
- gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations.

UNIT–I: Linear ODE with variable coefficients and series solutions (8 lectures)
Equations reducible to constant coefficients-Cauchy's and Legendre's differential equations. Motivation for series solutions, Ordinary point and Regular singular point of a differential equation, Transformation of non-zero singular point to zero singular point. Series solutions to differential equations around zero, Frobenius Method about zero.

Unit-II: Special Functions (8 lectures)
Bessel's Differential equation, Bessel functions properties: – Recurrence relations, Orthogonality, Generating function, Trigonometric expansions involving Bessel functions.

UNIT–III: Laplace Transform (8 lectures)
Definition of Integral transform. Domain of the function and Kernel for the Laplace transforms, Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem – Dirac's delta function, Periodic function – Inverse Laplace transform by Partial fractions(Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem-solving differential equations by Laplace transforms

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

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

UNIT-V: Partial Differential Equations (10 lectures)
Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and non-linear equations (Charpit's method).
Method of separation of variables for second order equations. Applications of Partial differential equations- one dimensional wave equation., Heat equation.

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

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

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	3	0	0	3

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Prerequisites: NIL

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

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

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

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

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

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

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

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

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

TEXT BOOKS:
1. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J.Millman and C.C.Halkias, Satyabratajit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.

REFERENCES:

1. Introduction to Electronic Devices and Circuits-Rober T. Paynter, Pearson Education.
2. Electronic Devices and Circuits - K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
3. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal – Wiley India Pvt. Ltd. 1/e 2009.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N.C.Jagan & C.Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

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L	T	P	C
3	0	0	3

ENGLISH

1. INTRODUCTION:

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

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

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

2. OBJECTIVES:

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

LEARNING OUTCOMES:

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

SYLLABUS:

Listening Skills:

Objectives

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

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

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

Speaking Skills:

Objectives

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

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Reading Skills:

Objectives

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

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

Writing Skills:
Objectives

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

TEXTBOOKS PRESCRIBED:

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

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

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

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

Unit –I

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

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

Unit –II

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

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Unit –III

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

Unit –IV

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

Unit –V

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

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

W - Project proposals; Project Reports and Research Papers

G - Adjectives, Prepositions and Concord

V - Collocations and Technical vocabulary, Using words appropriately

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

REFERENCES:

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

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JNTUH COLLEGE OF ENGINEERING HYDERABAD

I Year B.Tech. Met. Engg. II-Sem	**L**	**T**	**P**	**C**
	3	**0**	**3**	**4**

ENGINEERING GRAPHICS

Pre-requisites: Nil

Course objectives:

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

Outcomes:

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

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

UNIT – I

INTRODUCTION TO ENGINEERING DRAWING :

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

UNIT- II

ORTHOGRAPHIC PROJECTIONS:

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

UNIT – III

Projections of Regular Solids – Auxiliary Views.

UNIT – IV

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

UNIT – V

ISOMETRIC PROJECTIONS :

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

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

Auto CAD: Basic principles only

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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I Year B.Tech. Met. Engg. II-Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

ENVIRONMENTAL SCIENCE

Prerequisites : NIL

Objectives:

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

Outcomes:

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

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

UNIT- I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:

Definition, Scope and Importance – Need for Public Awareness.

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

UNIT - II

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

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

UNIT - III

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

UNIT - IV

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

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

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

UNIT - V

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

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

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

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

TEXT BOOK:

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

REFERENCE:

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

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2	0	0	2

COMPUTATIONAL MATHEMATICS
(Common to all Branches)

Pre Requisites: NIL

Objectives:

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

Outcomes:

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

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

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

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

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

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

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

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UNIT–III: Numerical techniques (5 lectures)

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

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

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

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

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

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

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

Text Books:

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

References:

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

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

ENGINEERING WORKSHOP

Pre-requisites: **Practical skill**

Objectives:

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

Outcomes:

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

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

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I. TRADES FOR EXERCISES :
(Any **six** trades from the following with minimum of **two** exercises in each trade)

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

II. Trades for Demonstration & Exposure

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

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

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

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ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

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

Objectives

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

Learning Outcomes

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

SYLLABUS

English Language Communication Skills Lab shall have two parts:

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

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

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

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

Exercise – II
CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.
Concord (Subject in agreement with verb) and Words often misspelt-confused/misused

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

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

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

Minimum Requirement of infrastructural facilities for ELCS Lab:

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

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

Suggested Software:

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

SUGGESTED READING:

1. Rama Krishna Rao, A. *et al. English Language Communication Skills – A Reader cum Lab Manual Course Content and Practice.* Chennai: Anuradha Publishers
2. Suresh Kumar, E. & Sreehari, P. 2009. *A Handbook for English Language Laboratories*. New Delhi: Foundation
3. *Speaking English Effectively* 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
4. Sasi Kumar, V & Dhamija, P.V. *How to Prepare for Group Discussion and Interviews*. Tata McGraw Hill
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. *English Pronunciation in Use. (Elementary, Intermediate & Advance).* Cambridge: CUP
7. Chris Redston, Gillie Cunningham, Jan Bell. *Face to Face* (2nd Edition). Cambridge University Press
8. Nambiar, K.C. 2011. *Speaking Accurately. A Course in International Communication.* New Delhi : Foundation
9. Soundararaj, Francis. 2012. *Basics of Communication in English. New Delhi: Macmillan*
10. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)

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DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Examination:

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

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

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COMPUTATIONAL MATHEMATICS LAB
(Common to all Branches)

UNIT- I: Interpolation
Programming Tasks:

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

UNIT- 1I: Curve fitting
Programming Tasks:

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

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

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

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UNIT- IV: Linear system of equations
Programming Tasks:

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

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

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

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MATHEMATICS-III
(Common to all branches except CIVIL & CSE Branches)

Pre Requisites: No Pre Requisites, Foundation Course.

Objectives:

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

Outcomes:

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

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

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

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

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

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

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

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

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

Large sample tests:

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

Small sample tests:

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

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

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

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

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

UNIT – V: C**ontour 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,10^{TH} EDITION WIELY PUBLICATIONS

References:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

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MECHANICS OF SOLIDS

Prerequisites: Physics, Mathematics II, Engineering Mechanics.

Course objectives:

1. To learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns.
2. Detailed study of engineering properties of materials.
3. Fundamentals of applying equilibrium, compatibility, and force deformation relationships to structural elements.

Outcomes:

1. Fundamental understanding of the concepts of stress and strain in mechanics of solids and structures and material properties.
2. Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force-deformation, and stress-strain relationships to the solid and structural mechanics problems.
3. Analyze determinate and indeterminate bars, beams, and determinate trusses to determine axial forces, torques, shear forces, and bending moments.
4. Physical insight into distribution of stresses and strains in structural members by determining stress, strain, and deformation of bars, trusses, and beams, and performing stress and strain transformations.
5. Basic understanding of the method of superposition, flexibility method, and stiffness method as applied to statically determinate and indeterminate axial and torsional members, and beams.

UNIT-I

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

Unit-II

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

of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-III

FLEXURAL STRESSES:

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

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

UNIT-IV

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

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

Unit-V

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

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

TEXT BOOKS:

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

REFERENCES:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

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FUELS, FURNACES AND REFRACTORIES

Pre-requisites: None

Course Objectives:

1. This course is mainly intended to demonstrate the significance and characterization of conventional fuels that are employed in metallurgical processes, also to explain construction, salient features and heat transfer aspects of various furnaces.
2. To obtain a working knowledge of thermo-couples and pyrometers.
3. Gain an understanding of manufacture, testing, and applications of refractories.

Course Outcomes:

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

1. Identify the applications of fuels and compare solid, liquid and gaseous fuels.
2. Classify the furnaces / refractories and their operating conditions and uses.
3. Select fuels, refractories and furnaces to minimize the overall cost of production for a given application.
4. Illustrate the production, composition, properties, testing and applications of refractories.

UNIT – I:

Classification of fuels. Origin and classification of coal. Analysis of Coal. Proximate and ultimate analysis.

Principle of Carbonization. Manufacture of Metallurgical coke, Properties of Metallurgical Coke and Testing of Coke.

Manufacture, properties and uses of Producer gas and Water gas

UNIT – II:

Steady State Heat Transfer: Importance of heat transfer, conduction through plane, cylindrical, spherical and compound walls, shape factor and effect of variable thermal conductivity.

UNIT- III:

Types of Furnaces, uses. Characteristic features of vertical shaft furnaces, Reverberatory furnace, Arc and Induction furnaces. Tube and muffle type resistance furnaces, continuous furnaces. Sources of heat losses in furnaces and heat balance.

UNIT- IV:
Pyrometry:Thermo electric pyrometry- peltier and Thomas e.m.f's . Thermo-electric power of thermocouples. Required properties of thermocouples. Noble and base metal thermocouples. Thermo-pile. Measurement of e.m.f. by Milli-voltmeters and potentiometers. Thermometer; Optical and Radiation pyrometer.

UNIT – V:
Refractories: Types, properties, uses and testing of refractories.

TEXT BOOK:
1. Furnaces, Fuels and refractories – O.P.Gupta,Khanna Publishers.

REFERENCE BOOKS:
1. Elements of fuel technology –HIMUS
2. Refractories – Norton
3. Refractories- R. Chisti.
4. Furnaces-J. D. Gilchrist
5. Pyrometry-W.P. wood& J. M. Corck
6. Fuels Furnaces, Refractories & Pyrometry-A.V.K.Surya Narayana.
7. Elements of heat transfer- Jakob & Hawikns.
8. Elements of thermodynamics& heat transfer- Obert & Young.
9. Control systems & Instrumentation – S. Bhasker.

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MINERAL DRESSING

Pre-requisites: None

Course Objectives:
1. The prime objective of this course is to build a solid foundation on principles and equipment of various mineral beneficiation procedures that would facilitate metal extraction.
2. It also focuses on mathematical derivations that are associated with concentration processes.
3. Obtain the necessary knowledge and analysis of mineral processing of various types of ores used in extractive metallurgy.
4. Asses the various efficiencies in the processes

Course Outcomes:
At the end of the course the student will be able to:
1. Identify the important mineral processing technology in the extraction of metals and non metals.
2. Identify the techniques of mineral processing for concentration of ore minerals economically.
3. Review environment friendly techniques for concentration.
4. Compute the recovery of ore mineral after concentration

UNIT – I
Scope and objectives of ore dressing. Sampling methods. Theory of liberation. Crushers and toothed roll crushers. Types of size reduction techniques like and crushing and grinding size reduction laws. Types of grinding and grinders.

UNIT – II
Sizing Techniques: laboratory and industry. Types of screens, Movement of solids in fluids: Stokes and Newton's laws. Equal settling ratio, Free and hindered settling ratio

UNIT – III
Quantifying concentrating operations: Classification. Heavy media separation: Wash ability curves of coal.

UNIT –IV
Tabling- Basic principle, Wilfred Table. Jigging-Basic Principle, Harz jig

Basic principles of Magnetic separation processes and electrostatic separation process

UNIT –V

Floatation: principles of floatation, factors affecting floatation. Collectors, frothers and regulators. Floatation machines: Denver Floatation cell. Application for Cu, Pb and Zn ores.

TEXT BOOKS:

1. Principles of Mineral Dressing by A.M. Gaudin.
2. Mineral processing technology-.A. Wills

REFERENCES:

1. Elements of Ore Dressing by A.F. Taggart
2. Ore dressing practices- S. K.Jain.

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THERMODYNAMICS AND KINETICS

Pre-requisites: None

Course Objectives:

1. The prime aim of this course is to apply thermodynamics and kinetics to various metallurgical aspects like Solutions, Phase diagrams, Diffusion, and Ellingham Diagrams.
2. The course is also intended to correlate electrochemical principles with thermodynamics.

Course Outcomes:

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

1. Know the laws of thermodynamics with reference to metallurgical processes and materials.
2. Calculate the heat and energy requirements and efficiencies of metallurgical processes.
3. Identify the feasibility / non-feasibility of metallurgical processes and reactions.
4. Design alloy systems by applying the concepts of thermodynamics.

UNIT-I

Objectives and limitations to thermodynamics, concepts of system and state, heterogeneous and homogeneous systems, extensive and intensive properties of system, thermodynamic variables, thermodynamic equilibrium and Zeroth law of thermodyanamics .Reversible and irreversible processes.

UNIT-II

First Law of thermodynamics: Historical outlines, nature of first law, relationship between heat and work, internal energy and the first law of thermodynamics, calculations of work, constant capacity, reversible adiabatic processes, reversible isothermal pressure or volume changes, of an ideal gas, joules experiment, Joule- Thompson experiment, Joule-Thompson co-efficient, heat enthalpy change with temperature, Kirchoff's equation. Second law of thermodynamics: Efficiency of a cyclic process, Carnot cycle, carnot therom, second law of thermodynamics concept of entropy, entropy and qualification of irreversibility, reversible processes, thermodynamic temperature scales.

UNIT-III

Free energy functions: Purposes of the new functions, definition of Helmholtz and Gibbs free energy change, meaning of thermodynamically possible process, determination of ?G from thermal data useful relationships between free energies and other thermodynamic functions, Maxwell's equation and Gibbs-Helmholtz equation.

Third law of thermodynamics: Background of third law deductions from third law, applications of third law, other methods of obtaining AS0 for a reaction.

UNIT-IV

Fugacity, activity and equilibrium constant: Concepts of fugacity, activity and equilibrium constant variation of the equilibrium constant with temperature, Tabular methods recording, thermodynamic data ,sigma functions.

Claussius – Clapeyron equation: Introduction, derivation of the Claussius – Clapeyron equation for single substance, Duhring rule for the estimation of the vapour pressures of an element, Integration of Claussius – Clapeyron equation.

UNIT-V

Kinetics: Kinetics of chemical process, Molecularity and order of a reaction, zero order reactions, first order, second order reactions, Determination of order of reaction, collision theory, theory of absolute reaction rates, consecutives and simultaneous reactions, catalysis in chemical reactions.

TEXT BOOKS:

1. Introduction to Metallurgical Thermodynamics – D.R. Gaskell
2. An introduction to thermodynamics-Y.V.C.Rao.

REFERENCES:

1. Physical chemistry for Metallurgists – J. Mackowiak
2. An Introduction to Thermodynamics – V.C. Roy
3. Thermodynamics of solids-R.S.Swalin
4. Physical chemistry of metals-L.S.Darken & Gurry.
5. Fundamentals of thermodynamics-Sonntag et al.
6. Fundamentals of Engg thermodynamics-M.J.Moran and H.N.Shapiro.
7. Thermodynamics: Robert Balmer

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FUELS, FURNACES AND REFRACTORIES LAB

Pre-requisites: FUELS, FURNACES AND REFRACTORIES THEORY

Course Objectives:

1. This laboratory course critically deals with the characterization of fuels, refractories, and measurement of temperature.
2. Apart from this, it also concerns the flow properties of fuel oils and their variation with temperature.

Course Outcomes:

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

1. Gain hands-on experience on the equipment that facilitate property evaluation of fuels, and refractories.
2. Choose the fuels and refractories for specific use in construction of different furnaces.

LIST OF EXPERIMENTS:

1. To conduct proximate analysis of Coal
2. To conduct ultimate analysis of Coal
3. To find the Flash and Fire points of fuel oil by "PENSKY MARTINS" open and closed cup apparatus.
4. To find the flash and points of fuel oil by ABEL's Flash point apparatus
5. To find the viscosity of lubricant oil by using

   Red-wood-I Viscometer

   Red-wood-II Viscometer

   Saybolt Viscometer
6. To find the calorific value of solid and liquid fuels by using "Bomb Calorimeter"
7. To find the calorific value of gaseous fuels by using "Junker's Gas Calorimeter"
8. To study various types of refractories and find their densities, Hardness and slag penetration.

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MINERAL DRESSING LAB

List of Experiments

1. Ore sampling methods
2. Sieve analysis
3. Verification of Stoke's Law.
4. Jaw crusher.
5. Rolls crusher.
6. Ball mill.
7. To find the grindability index of coal.
8. Magnetic separator.
9. Jig.
10. Demonstration of Froth- Floatation process.

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JAVA LAB

1.a) Write a Java program that prints all real solutions to the quadratic equation ax2 + bx + c = 0.
Read in a, b, c and use the quadratic formula. If the discriminant b2 -4ac is negative, display a message stating that there are no real solutions.

b) The Fibonacci sequence is defined by the following rule. The fist two values in the sequence are 1 and 1. Every subsequent value is the run of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

2.a) Write a Java program that displays the number of characters, lines and words in a text file.

b) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

3.a) Write a Java program for sorting a given list of names in ascending order.

b) Write a Java program to multiply two given matrices.

4. Write an applet that computes the payment of a loan based on the amount of the loan, the interest rate and the number of months. It takes one parameter from the browser: Monthly rate; if true, the interest rate is per month; Other wise the interest rate is annual

5. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the + - X % operations. Add a text field to display the result.

6. Write a Java program for handling mouse events.

7. Write a Java program for creating multiple threads

8. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

9. Write a Java program that illustrates how run time polymorphism is achieved.

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HUMAN VALUES AND PROFESSIONAL ETHICS

Course Objectives

1. To introduce the basic concepts of universal human values
2. To familiarize the students with desirable business and professional ethics, rights and responsibilities
3. To prepare students against possible gaps and unethical practices in contemporary times
4. To sensitise the students so that they can protect themselves and the organization from the possible professional crime malpractices

Learning Outcomes

1. The students learn about diverse ethical issues rooted in society, trade, business, and environment on local as well as a global platform.
2. The students appreciate their role as a responsible citizen, professional, and as managers, advisors, experts and consultants.
3. The students will reflect and learn major values and ethics from their observations of a spiritual discourse and a visit to a business organization as a practical part of this course.

Unit I

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

Unit II

Professional Ethics: Profession- and professionalism - Two models of professionalism –Professional etiquette -Three types of Ethics or morality Responsibility in Engineering – Engineering standards –Engineering Ethics – Positive and Negative Faces. Professional Codes and Code of conduct of Institute of Engineers. Mini - cases.

Unit III

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

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Unit IV

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

Unit V

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

Mini-projects

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

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

References

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

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MECHANICS OF FLUIDS

Pre requisites: Differential Equations, Applied Mechanics

Course Objectives:

1. Identify and obtain values of fluid properties and relationship between them.
2. Understand the principles of continuity, momentum, and energy as applied to fluid motions.
3. Recognize these principles written in form of mathematical equations.
4. Apply these equations to analyze problems by making good assumptions and learn systematic engineering method to solve practical fluid mechanics problems.
5. Apply fundamental principles of fluid mechanics for the solution of practical civil engineering problems of water conveyance in pipes, pipe networks, and open channels.

Course Outcomes:

The Student will be acquainted with the principles relating to the measuring equipment of fluid flow. Further the student is capable of understanding the basic laws of fluid dynamics and their applications to the engineering problems occurring during their practice.

UNIT – I

Fluid Properties and Fluid Statics: Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, Pressure at a point, Pascal's law, and pressure variation with temperature, density and attitude. Hydrostatic law, Piezometer, Simple and differential manometers, pressure gauges, total pressure and center of pressure – plane, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT – II

Fluid Kinematics: Stream line, path line, streak line, stream tube, classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows – Continuity equation in 3D flow, stream function, velocity potential function.

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Fluid Dynamics: Surface and Body forces – Euler's and Bernoulli's equation derivation, Navier- stokes equation (explanation only) Momentum equation - applications, vortex – Free and Forced. Forced vortex with free surface.

UNIT – III

Similitude and Flow Measurement – Similarly laws, distorted models. Flow through Venturimeters and Orifice meter, flow through notches and weirs, Viscometers, Hotwire Anemometers, Pitot tube, Flow through nozzles.

Approximate solutions of N.S. Equations - Boundary layer- concepts, Prandtl contribution,Characteristics of boundary layer along a thin flat plate Von-karman's momentum integral equation (No derivation), laminar and turbulent Boundary layers ,BL in transition, separation of BL, control of BL separation, flow around
Submerged objects, Drag and lift – types of drag – magnus effect.

UNIT – IV

Closed Conduit Flow: Characteristics of real fluids – Reynolds experiment –Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line.
Exact Solutions of Navier Stokes Equations: Flow between parallel plates, flow through long tubes - Fow through inclined tubes, Turbulent flow, variation of friction factor with Reynold's Number – Mody's chart.

UNIT V

Flow of Compressible Fluid: Introduction, Thermodynamic relations, basic equations of compressible flow, velocity of sound wave in a fluid for isothermal and adiabatic process**,** mach number and its applications, mach angle, Propagation of Pressure waves and stagnation properties.

TEXT BOOKS:

1. Fluid Mechanics Hydraulics and Hydraulics Machines Modi & Seth, Standard publications, New Delhi.
2. Engineering Fluid Mechanics by K.L.Kumar, S.Chand & Co.

REFERENCES:

1. Fluid Mechanics – Frnk in white Mc-Grawhill.
2. Fluid Mechanics - John – F.Dauglas, Pearson Educations publishers.
3. Fluid Mechanics & Hydraulic Machines - D. Ramadurgaiah, Newage Publishers

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METALLURGICAL ANALYSIS

Pre-requisites: None

Course Objectives:
1. To know the principles/ qualitative and quantitative analysis of ores, metals, alloys, and refractory materials.
2. To know the principles and working of the various instruments utilized in Instrumental analysis.

Course Outcomes:
At the end of the course the student will be able to:
1. To know the principles and applications of different chemical analysis.
2. To determine the composition of different metals and alloys.
3. To learn the operating techniques of different instrumental methods of analysis.

UNIT-I
Importance of chemical analysis, scope of metallurgical analysis, classification of various methods used in metallurgical analysis. Solution preparations, normality, molarity, molality, Equivalent weight. Dissolution of ores in general, dissolution of metals and alloys.

UNIT-II
Chemical Analysis - Basic Principles - theory of indicators –Conventional solution methods for qualitative analysis of ores, fluxes, slags, metals and refractories.
Qualitative analysis of common non-ferrous alloys such as brasses, bronzes and solders. Estimation of C, S, Si, Mn and P in cast iron and steel.

UNIT-III
Estimation of Cr, Ni, Mo, W and V in alloy steels.
Determination of iron in iron ore, manganese in manganese ores, lime in limestone, fire-assay of precious metals.

UNIT-IV
Instrumental analysis: Importance of instrumental analysis –Comparison with standard wet chemical methods - Fundamental Physicochemical principles involved and equipment required in absorptiometry i.e, colorimetry and spectrophotometry, colorimetric titration.

UNIT-V
Spectroscopy, potentiometry, amperometric titration.
Calorimetric titrations, polarography, conductometry, electro-analysis and flame photometry.

TEXT BOOK:
1. S.K.Jain-Metallurgical analysis.

REFERENCES:
1. Agarwal, B.C. and Jain S.P., A Text Book of Metallurgical Analysis, Khanna Publishers, Delhi -1963.
2. Iyer V.G., Metallurgical Analysis: BHU Press, Varanasi.
3. Snell Foster D and Frank M Biffen: Commercial methods.of analysis / Che. Publishing Co.,1964
4. Vogel Al., A Text Book of Quantitative Inorganic Analysis Longman ELBS 1962.
5. Willard H.H.etal: Instrumental Methods of analysis Van Nostrand.

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PHYSICAL METALLURGY

Pre-requisites: Physics & Chemistry

Course Objectives:

1. The prime objective of this course is to make the student gain an understanding of the relation between microstructures characteristics, and properties of metals and alloys.
2. The course also critically focuses on the crystallography, phase transformations that occur in several ferrous and nonferrous metallurgical systems as a function of temperature and composition through phase equilibrium diagrams.

Course Outcomes:

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

1. Identify the crystal structures of metallic materials
2. Analyze the binary phase diagrams of alloys including Fe-Fe_3C, brass, and bronze
3. Correlate the microstructure, properties, processing and performance of materials.
4. Formulate and solve physical metallurgy related engineering problems.

UNIT – I

Microscopy; Metallurgical Microscope, principles and construction, types of objectives and eyepieces, common defects of lenses, electron Microscope. Structure of Metals, Hume-Rotherys classification of metals.

UNIT – II

Constitution of Alloys: Necassacity of alloying, types of solid, Hume-Rotherys rules. Intermediate alloy phases, electro-chemical compounds, size factor compounds and electron phases.

UNIT – III

Equilibrium Diagrams: Experimental methods for construction of equilibrium diagrams, Isomorphous alloy systems, types of Nucleation, determination of the size of critical nucleus, equilibrium cooling and heating of alloys, lever rule, coring, miscibility gaps – eutectic reactions.

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UNIT – IV

Transformation in solid state, allotropy, order-disorder transformation, eutectoid, peritectoid reactions and complex phase diagrams, relation between equilibrium diagrams and physical properties of alloys.

Study of important binary phase diagrams Fe-Fe_3 C, Cu-Zn, Cu-Sn, and Al-Cu.

UNIT – V

Phase transformations in steels; pearlitic, martensitic and bainitic transformations cooling curves.

Isothermal transformation diagrams, transformations on continuous cooling.

TEXT BOOKS

1. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007
2. Introduction to Physical Metallurgy – SH Avner, TATA Mc GRAW HILL ,1997
3. Metallurgy for Engineers- Clark and Varney

REFERENCE BOOKS

1. Engineering Physical Metallurgy and Heat treatment – Y Lakhtin
2. C. Suryanarayana, Experimental Techniques in Mechanics and Materials, John Wiley, John Wiley, NJ, USA,2006
3. Foundations of Materials Science and Engineering – WF Smith
4. Metallographic Laboratory Practice – Kehl
5. Essentials of Materials Science Engineering, Donald R. Askeland , Pradeep P. Phule , Cengage learning (INDIA).
6. Materials Science and Metallurgy C.Daniel Yesudian, D.G.Harris Samuel, Scitech Publications.
7. Engineering Materials V.S.R Murthy, A.K. Jena , TataMCGraw Hill
8. Engineering Materials and Metallurgy, R.Srininasan, TataMCGraw Hill

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METALLURGICAL THERMODYNAMICS

Pre-requisites: None

Course Objectives: This course is mainly intended to deals with
1. The laws of diffusion.
2. Interpret Ellingham diagrams
3. Identify metallurgical thermodynamics principles to be applied in phase diagrams.

Course Outcomes:
Obtain the skill to use Metallurgical Thermodynamics concept for
1. Extraction of metals
2. Understanding phase diagrams.

UNIT-I
DIFFUSION: Ficks law of diffusion and its application, Kirkendal effect, Darken's equations, the Metano Method.
Determination of intrinsic diffusivities, self diffusion in pure metals, Temperature dependence of the diffusion coefficient, diffusion along grain boundaries and surfaces.

UNIT-II
ELLINGHAM DIAGRAMS**:** Introduction, calculation of equilibrium constants from standard free energy changes, general description of Ellingham diagrams, Interpretation of two or more free energy change Vs. temperature lines taken together, derivation and uses of the oxygen, nomographic scale in Richardsons diagrams.

UNIT-III
THERMAL PROPERTIES: Specific heats of solids, classical, Einstein and Debyees' Model of the lattice, specific heat of solids.
Anharmonicity, thermal expansion, thermal conductivity of solids, lattice thermal conductivity and thermo-electric effects. Stability of crystal disorders.

UNIT-IV
SOLUTIONS: Solution definition, Composition, partial molal quantities, ideal solutions, Raoults Law, actual (Nonideal) solutions, Sieverts law, Gibb's - Duhem equation, integration of Gibbs' - Duhem equation, Excess thermodynamics quantities.
APPLICATION TO PHASE DIAGRAMS: Concept of chemical potential, equality of chemical potentials in equilibrated phases, Derivation of Gibb's phase rule, solidus and liquidus lines for an ideal solution, calculation of liquidus line for eutectic systems.

UNIT-V
REVERSIBLE CELLS: Electro- Chemical cells, galvanic cells, chemical and electrical energy, thermodynamics of Electro-chemical cells, standard electrode potentials, sign convention of electrode potentials, application of Gibbs - Helmholtz equation to galvanic cells. Concentration Cells.

TEXT BOOK:
1. Physical Chemistry for Metallurgist - J. Mackowick
2. Physical Chemistry of Metals - LS Darken and Gurry

REFERENCE BOOKS:
1. Thermodynamics of solids RA Swalin
2. Physical Metallurgy Principles - RH Reed Hill.
3. Material science; A First course-Raghavan

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PRINCIPLES OF EXTRACTIVE METALLURGY

Pre-requisites: Mineral Processing and Thermodynamics and Kinetics

Course Objectives:

1. To learn and emphasize the Principles of Pyrometallurgy, hydrometallurgy and electrometallurgy.
2. To learn scientific concepts of extraction and refining
3. Obtain knowledge of equipment used in Pyrometallurgy, hydrometallurgy and electrometallurgy

Course Outcomes:

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

1. List out ore minerals for ferrous and non-ferrous metals.
2. Discuss the principles of fire refining, liquation, distillation refining and zone refining.
3. Examine the importance of slag chemistry in the extraction process.
4. Recognize the importance of Ellingham diagrams and criteria required for reduction of metals.

UNIT-I

Introduction: Classification of ores. Basics of Pyrometallurgy, Calination,Roasting and types of roasting.

UNIT-II

Sintering pelletisation and Smelting: Basic Principles with examples.
Slags: Classification, properties and uses.

UNIT-III

Hydrometallurgy: Advantages and disadvantages. Flowchart. Principles and types of leaching. Solution purification by ion and solvent exchange. cementation.

UNIT-IV

Principles of electrometallurgy: Electro winning and Electro refining with typical examples.

UNIT-V

Fire refining, Distillation, liquation, and zone refining with some examples.

w.e.f. 2017-2018 academic year

TEXT BOOK:

1. Non-ferrous extractive metallurgy:H.S.Ray,K.P.Abraham and R.Sreedhar.
2. Principles of extractive metallurgy-Gosh

REFERENCE BOOKS:

1. A text book of metallurgy-A.R.Bailey.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

(Common to All Branches)

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

Objectives of the Course:

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

Learning Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

w.e.f. 2017-2018 academic year

Unit-I: UNDERSTANDING GENDER

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

Unit – II: GENDER AND BIOLOGY

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

Unit – III: GENDER AND LABOUR

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

Unit – IV: ISSUES OF VIOLENCE

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

Unit – V: GENDER : CO-EXISTENCE

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

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

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

Reference Books:

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

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

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

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

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

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

7. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
8. Jayaprabha, A. "Chupulu (Stares)". *Women Writing in India: 600BC to the Present. Volume II*: The 20th Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.

w.e.f. 2017-2018 academic year

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

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

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

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

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

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

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

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

METALLURGICAL ANALYSIS LAB

1. Estimation of Iron in Iron ore. - to determine the percentage of Iron in Iron Ore by $KMnO_4$ method and $K_2Cr_2O_7$ method.
2. Estimation of Silicon in Cast Iron.
3. Estimation of Carbon in Steel by Strohlein apparatus method.
4. Estimation of Copper in Brass by Electrolytic method.
5. Estimation of manganese in cast iron.
6. Estimation of Chromium in Steel.
7. Estimation of Sodium and Potassium in Chloride Salts by Flame Photometry.
8. Estimation of lime in Limestone.
9. Estimation of the concentration of KMnO4 in the solution using Digital Spectrophotometer.
10. Estimation of Sulphur and Phosphorus in cast irons.
11. Estimation of Chromium in Stainless steels.
12. Estimation of Mn, Cr and Si in Ferro-Alloys

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

PHYSICAL METALLURGY LAB

LIST OF EXPERIMENTS

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. Drawing of the Binary phase diagrams of Isomorphous simple Eutectic and partial solubility diagram with interpretation.
9. Drawing of complex binary phase diagrams and identification of points, lines and areas in them.
10. Identification of Microstructures of steels.
11. Estimation of Carbon content of steels using metallurgical microscope and Spark test. Thermal analysis.
12. Experiments to obtain cooling curves for pure metals and alloys and to establish Binary phase diagram.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
0	0	3	2

PRINCIPLES OF EXTRACTIVE METALLURGY LAB

List of Experiments

1. Important flow sheets for Metal Extraction Calcination.
2. Electro Cleaning
3. Electro Etching
4. Electro polishing
5. EMF series Importance / Cementation
6. Electro plating of Cu
7. Electroplating of Ni
8. Galvanization
9. Electro winning of copper

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
4	0	0	4

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Aim:

1. To understand the concepts and importance of economics in managerial problems
2. To understand the basic financial management concepts including the principles of financial analysis

Learning outcomes:

- Students will be able to apply the principles of economics for managerial decisions.
- The students will be able to analyse the financial position of a company with the techniques of financial accounting and ratio analysis

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

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

Unit III Markets & Forms of Business Organisations:
Types of competition and Markets, Features of Perfect competition and Monopoly. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing*: Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Limited companies.

Unit IV Capital Budgeting:
Methods and sources of raising capital - Capital Budgeting: Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

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

TEXT BOOKS:

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

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson,
3. Lipsey & Chrystel, Economics, Oxford University Press, Domnick Salvatore: Managerial Economics In a Global Economy, Thomson,.
4. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI, 2012.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
4	0	0	4

HEAT TREATMENT AND PHASE TRANSFORMATIONS

Pre-requisites: Physical Metallurgy.

Course Objectives:

1. This course is mainly designed to impart knowledge about basic principles and process variables of different heat treatment processes.
2. Thermo mechanical treatment, Surface hardening techniques, heat treatment of steels, cast irons, nonferrous alloys will also be in detail.

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

1. Understand the theory of nucleation and growth kinetics of solidification.
2. Explain the phase transformation reactions of Fe-Fe3C system.
3. Apply the fundamentals of phase transformation to heat treatment of steels.
4. Analyse the heat treatment processes to enhance/ modify the mechanical properties.
5. Formulate the hardening processes based on the hardenability of steels and alloys.

UNIT - I

Principles of Heat Treatment of steels**:** Formation of Austenite on heating, Austenitic grain size, determination and decomposition of austenite; TTT curves; Effect of alloying elements on TTT curves and Fe-Fe_3C diagram.

UNIT - II

Pearlitic Transformation; Bainitic Transformation; Martensitic Transformation

UNIT - III

Annealing, Normalizing, Hardening and tempering. Tempering and its stages; Austempering, Martempering, Subzero treatment, Patenting; Hardenability of steels, Factors affecting and its determination.

UNIT – IV

Hardenability of steels, factors affecting and its determination.

Surface Heat Treatment: Carburizing, Nitriding, Cyaniding and Carbonitriding; Flame and Induction hardening.

UNIT - V

Thermo mechanical treatments: HTMT, LTMT, Ausforming, Isoforming, Cryoforming.

Heat-Treatment of Cast Irons; Cu and its alloys, Al and its alloys.

TEXT / REFERENCE BOOKS:

1. Heat Treatment of Metals - Zakharov
2. Heat Treatment Principle and Techniques - Rajan & Sharma
3. Physical Metallurgy – Lakhtin
4. Physical Metallurgy - Clark and Varney
5. Physical Metallurgy Principles - Reed Hill
6. Physical Metallurgy – Raghavan

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Met. Engg. I-Sem	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

MECHANICAL BEHAVIOUR OF METALS

Pre-requisites: Physical Metallurgy and Heat-treatment

Course Objectives:

1. To gain and understanding of the response of various metals under the application of stress and/or temperature.
2. To build necessary theoretical back ground of the role of lattice defects in governing both elastic and plastic properties of metals will be discussed.
3. Obtain a working knowledge of various hardness testing machines BHN, VHN, RHN
4. Obtain a working knowledge of creep and fatigue and analysis of data.

Course Outcomes:

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

1. Classify mechanical testing of ferrous and non-ferrous metals and alloys.
2. Recognize the importance of crystal defects including dislocations in plastic deformation.
3. Identify the testing methods for obtaining strength and hardness.
4. Examine the mechanisms of materials failure through fatigue and creep

UNIT - I

Metallurgical fundamentals: Critical resolved shear stress. Defects in crystalline materials – Point defects and line defects. The concept of dislocation - Edge dislocation and screw dislocation. Interaction between dislocations, sessile dislocation, glissile dislocation, Energy of a dislocation, dislocation climb, Jogs, Forces on dislocations. Frank Reed source, slip and twinning.

UNIT - II

Hardness Test: Methods of hardness testing – Brinell, Vickers, Rockwell, Rockwell superficial, Shore and Poldi methods, Microhardness test, relationship between hardness and other mechanical properties.

UNIT - III

The Tension Test: Mechanism of classic action, linear elastic properties. Engineering stress-strain and True stress-strain curve. Tensile properties, conditions for necking, effect of temperature and strain rate on tensile properties.

The Compression Test: Elastic and in-elastic action in compression, elastic and in-elastic properties in compression. Compression Test.

UNIT – IV

Fatigue Test: Introduction, Stress cycles, S-N Curve, Effect of mean stress, Mechanism of fatigue failure, effect of stress concentration, size, surface condition and environments on fatigue. Effect of metallurgical variables on fatigue. Low-cycle fatigue. High-cycle fatigue.

Creep and Stress Rupture: Introduction, The creep curve, Stress-rupture test, Structural changes during creep, Mechanism of creep deformation, theories of creep. Fracture at elevated temperature, Effect of Metallurgical variables on creep.

UNIT – V

Fracture: Elementary theories of fracture, Griffith's theory of brittle fracture, Ductile Fracture, Notch sensitivity.

The Impact Test: Notched bar impact test and its significance, Charpy and Izod Tests, fracture toughness testing - COD and CTOD tests, significance of transition temperature curve, Metallurgical factors affecting on transition temperature, temper embrittlement.

TEXT / REFERENCE BOOKS:

1. Mechanical Metallurgy – G. E. Dieter
2. Engineering Materials Science – C. W. Richards
3. Mechanical behavior of material - A. H.Courteny
4. Mechanical behavior - Ed. Wulf.
5. Mechanical Metallurgy – White & Lemay.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
4	0	0	4

IRON PRODUCTION

Pre-requisites:

Mineral Dressing, Principles of Extractive Metallurgy and Thermodynamics

Course Objectives:

1. Discuss the evolution of Iron making in chronological order.
2. Illustrate the applications of thermodynamics and kinetics in production of pig iron and refining it.
3. Outline the techniques for production and primary processing in Blast furnace.
4. Differentiate between past and present production methods and examine the modern trends in iron production.
5. Identify consists and effect for blast furnace irregularities and their remedial measures.

Course Outcomes:

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

1. Understand the extraction techniques of pig iron by reduction smelting in blast furnace from iron ores.
2. Classify and justify the importance of alternate routes of iron making.
3. Analyze and take remedial measures for any irregularities occurring in the production methods.

UNIT - I

History of Iron making, Raw materials for Iron making. Occurrence and distribution of iron ores, fuels and fluxes. Preparation of iron ores. Agglomeration Techniques: Sintering, pelletisation

UNIT – II

Blast Furnace profile and design considerations. Furnace lining. Furnace cooling system. BF Stoves. BF gas cleaning system. Blast furnace operation and irregularities.

UNIT - III

Systems of importance in iron making, blast furnace reactions. Thermodynamics of iron oxide reduction by CO + CO_2 and H_2 and H_2O mixtures. Control of C, Si, S, P in metals and slags. Blast furnace slags. Burden calculations.

UNIT - IV

Modern trends in blast furnace: High top pressure, humidification of blast, Oxygen enrichment, hot blast temperature, BF additives, and top charging systems.

UNIT - V

Alternative routes of iron making: Sponge iron making: HYL, Rotary Kiln, Midrex process.

Smelting and reduction methods such as Corex process.

TEXT /REFERENCE BOOKS:

1. Iron making and steel making – Theory and practice Ahindra and Ghosh.
2. Beyond the B.F – Amit Chatterjee
3. Sponge Iron production by direct reduction of Iron ores - Amit Chatterjee, P & H. publications, 2010
4. Hot metal production by smelting reduction of Iron ore - Amit Chatterjee. P & H publications, 2010

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
0	0	3	1

ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

1. Introduction

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

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

- Gathering ideas and information to 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.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

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

Learning Outcomes

- Accomplishment of sound vocabulary and its proper use contextually.
- Flair in Writing and felicity in written expression.

- Enhanced job prospects.
- Effective Speaking Abilities

3. Syllabus:

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

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

4. Minimum Requirement:

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

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**

w.e.f. 2017-2018 academic year

- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

5. Suggested Software:

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

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

6. Books Recommended:

1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
3. **Speak Well** published by Orient Black Swan Private Limited, Hyderabad.
4. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. **Business and Professional Communication:** Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
6. **The Basics of Communication: A Relational Perspective**. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
7. **English Vocabulary in Use** series, Cambridge University Press 2008.
8. **Management Shapers Series** by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
9. **Handbook for Technical Communication** by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
10. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
11. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.

12. **Job Hunting** by Colm Downes, Cambridge University Press 2008.
13. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.
14. **English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.**
15. Books on **TOEFL/GRE/GMAT/CAT/ IELTS** by Barron's/DELTA/ Cambridge University Press.
16. **International English for Call Centres** by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

***Advanced Communication Skills Lab Practical Exam**:*

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the English Language lab sessions, there shall be continuous evaluation during the year for 30 sessional marks and 70 End Examination marks. Of the 30 marks, 20 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

1. Seminar/ Professional Presentation

2. A Report on the same has to be prepared and presented.

**** Teachers may use their discretion to choose topics relevant and suitable to the needs of students.***

**** Not more than two students to work on each mini project.***

**** Students may be assessed by their performance both in oral presentation and written report.***

* * * * *

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Met. Engg. I-Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

HEAT TREATMENT AND PHASE TRANSFORMATIONS LAB

List of Experiments:

1. Annealing of medium carbon steel and observation of micro structure.
2. Normalizing of medium carbon steel and observation of micro structure.
3. Hardening of medium carbon steel and observation of micro structure.
4. Study of tempering characteristics of water quenched steel.
5. Study of age hardening phenomenon in duralumin.
6. Spheroidizing a given high carbon steel.
7. Study of case hardening by pack carburizing of low carbon steel.
8. Finding the hardenability of medium carbon steel by Jominy end Quench Test.
9. To conduct Re-crystalization studies on cold worked copper.
10. To conduct case hardening by cyanide bath.
11. To compare the properties of Martempered and Simple tempered steel.
12. To construct and study a TTT diagram of an eutectoid steel.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
0	0	3	2

MECHANICAL BEHAVIOUR OF METALS LAB

List of Experiments:

1. Hardness Test: to determine the Brinell Hardness Values of values of ferrous and non-ferrous samples.

2. Tension Test:
   - To determine the elastic modulus, ultimate tensile strength, breaking stress, percentage
     Elongation, percentage reduction in area of the given specimen.
   - To determine the strain distribution along the gauge length.

3. Impact Testing:
   - To determine the charpy and Izod (V & U Groove notch) values of a given material at room temperature.
   - To establish the ductile - brittle transition temperature of the material.

4. Fatigue Test:
   - To determine the number of cycles to failure of a given material at a given stress.

5. Magnetic flaw detector:
   - To inspect a given material for cracks.

6. Liquid penetrant Test:
   - To detect the surface flaws in a given materials by die penetrant.

7. Ultrasonic flaw detection:
   - To inspect a given material for locating cracks

8. To detect the surface flaws in steel by florescent penetrant method

9. To determine the Rockwell hardness values of heat treated steels.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
4	0	0	4

STEEL MAKING

(Professional Elective **– I)**

Pre-requisites: Iron Production, Thermodynamics

Course Objectives:

1. Discuss the evolution of steel making processes in chronological order.
2. Illustrate the applications of thermodynamics and kinetics in production of steel making.
3. Outline the techniques for production and primary processing in steel making.
4. Differentiate between past and present production methods and examine the modern trends in steel making.
5. Gain knowledge about the importance and processes of secondary steel making.

Course Outcomes:

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

1. Analyze the different steel making process.
2. Compare the raw material and products obtained in various steel making processes. Use of various equip for production of process and secondary steel making.
3. Analyze and take remedial measures for any irregularities occurring in the production methods.
4. State the importance and necessity of secondary steel making.

UNIT - I

Classification of Steel making Processes. Raw materials for steel making. Factors affecting the efficiency of steel making. Principles of Steel making - Decarburisation, Desiliconization. Dephosphorisation and Desulphurisation. Deoxidation practice. Molecular and ionic theory of slags.

UNIT - II

Construction and process details Bessemer convertors, open-hearth furnance and electric are furnace. Improvement and modification of the above processes.

UNIT - III
Details in LD, LD-AC, Kaldo and rotor steel making processes. Bottom blown O_2 processes. Combined blow processes.

UNIT - IV
Casting pit side practice, Teeming methods. Solidification of steels – killed steels, semi killed steels and Rimming steels. Ingot defects and remedies.

UNIT - V
Solidification of steels. Secondary steel making processes - Vacuum treatment of steels, Injection metallurgy, Electro-slag refining process. Vacuum are remelting. Continuous casting of steels.

TEXT BOOK:
1. Steel making by A.K. Chakravarthy PH. Pub
2. Iron and steel making – Theory an pratice Ahindra Ghosh and Amit chatterjee.
3. Modern Steelmaking – Dr. R. H. Thupkary and V. H. Thupkary
4. Steel making – Kudrin
   Fundamentals of steel making metallurgy – Brahma Deo and Rod Boom P and H publ 1993.

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LIGHT METALS AND ALLOYS
(Professional Elective -I)

Pre-requisites: Nil

Course Objective: This course is mainly intended to deal with
1. The physical metallurgy, of Aluminum Magnesium and Zinc alloys in detail.
2. The physical metallurgy, of Titanium, Beryllium and Zirconium alloys in detail.

Course Outcome: At the end of the course the student will be able:
1. To attain sound knowledge on microstructures, properties, and applications of several nonferrous alloys such as Al, Be, Mg, Ti, and Zn alloys.
2. To design light alloys for specific metallurgical applications.

UNIT - I
Aluminium alloys, Classification, Properties and physical metallurgy of Al-Cu alloys, Al-Mg alloys, Al-Zn alloys, Al-Mn alloys and Al-Si alloys Aluminium alloys: Ternary phase diagrams, Al-Cu-Mg alloys, Al-Si-Mg alloys and Al-Zn-Mg alloys.

UNIT - II
Magnesium Alloys: Precipitation hardening in Magnesium Base alloys, Mg-Al-Zn alloys, Corrosion resistance of Mg-alloys.
Zinc-base alloys: Classification, properties and applications.

UNIT - III
Commercially Pure Titanium and its properties, applications, Interstitial solid solutions of Titanium, Strengthening mechanisms of Titanium alloys.

UNIT - IV
Alpha Ti alloys, Beta Ti-alloys, Alpha plus Beta Ti alloys, Ti-6Al-4V, Ti-8Al-1Mo-1V, Ti-13V-11Cr-3Al alloys.

UNIT - V
Beryllium alloys: Classification properties and applications Zirconium alloys: Classification, properties and applications.

TEXT BOOK / REFERENCE BOOKS:

1. Heat treatment, structure and properties of Nonferrous alloys- Charlie Brooks, ASM Metals Park, Ohio, USA
2. Light alloys: Metallurgy of the light metals by I. J. Polmear.
3. Introduction to Physical Metallurgy – S.H. Avner
4. Engineering Physical Metallurgy – Lakhtin
5. ASM Metals Handbook Vol-1 & 2
6. Metallurgical abstracts on light metals and alloys Keikinzoku Shōgakukai, Light Metal Educational Foundation., 1999

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NUCLEAR METALLURGY
(Professional Elective -I)

Pre requisites: Nil

Course Objectives:
1. To explain and describe the basics of Nuclear technology and relevance of metallurgy to nuclear reactors.
2. To gain a working knowledge of extraction of nuclear metals like Uranium, Thorium, and Beryllium.

Course outcomes: At the end of the course, student would be able:
1. To get idea about the working of nuclear reactors and application in nuclear reactor.
2. Justify the extraction techniques adopted for Uranium, Beryllium, Thorium and Zirconium.

UNIT – I

ELEMENTARY NUCLEAR PHYSICS AND CHEMISTRY: Structures of nucleus, radioactivity, bending energy: nuclear interaction; fission and fusion: nuclear reaction; energy, release and chain reactions; neutron cross-section; multiplication and criticality concepts and factors.

UNIT - II

Mechanisms of moderation, radiation detection, radiation effects on fissile and non-fissile materials; radiation damage and radiation growth; thermal cycling; protection against radiations.

UNIT – III

Types of reactors and classification.
Considerations in selection and properties of common materials used as fuels, their physical and chemical properties; canning materials; coolants; control rods; reflectors and shielding materials.

UNIT – IV

Occurrence and general characteristics of nuclear minerals.Flow sheets of processing of nuclear minerals for the production of nuclear grade uranium, thorium, beryllium and zirconium with emphasis on basic scientific principles involved.

UNIT – V

Production and enrichment of uranium, Fabrication fuel elements. Irradiated fuel processing for recovery of Plutonium.
Nuclear power production in India and its economics.

TEXT / REFERENCE BOOKS:

1. Metallurgy in Nuclear Power Technology: Wright JC, Iliffe Book Ltd., 1962
2. Nuclear Reactor Metallurgy: Wilkinson WD and Murphy WF, Van Nostrand, 1958
3. Symposium on Rare Materials: Indian Institute of Metals.
4. Principles of Nuclear Reactor Engineering: Glasstone S and Snesonske A Macmillan, London.
5. Uranium and Thorium: Grainger L; George Newnes Ltd., London.
6. Nulcears Fuels: Gurinsky DH and Dienes JL; Macmillan.
7. Reactor Hand book Material; US Atomic Energy Commission, McGraw Hill Book Co. 1955
8. Proceedings of the symposium on Nuclear Science and Engineering – Bhabha Atomic Research Centre, Bombay.

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MATERIALS CHARACTERIZATION TECHNIQUES
(Professional Elective -I)

Pre requisites: Nil

Course Objectives:

1. To explain and describe the various working techniques of optical microscope, Scanning and Transmission Microscopes used for evaluating material properties.
2. To explain and describe the various working techniques of XRD, SPM, AFM for evaluating material properties.

Course Outcomes: At the end of the course, student will gain hands on experience on utilization of

1. Optical, Scanning and Transmission Microscopes.
2. XRD, SPM and AFM.

UNIT – I

Optical Microscopy – Introduction, optical principles, Instrumentation, specimen preparation- metallographic principles, Imaging Modes, Applications, Limitations.

UNIT – II

(a) Scanning Electron Microscopy (SEM)-Introduction, instrumentation, Contrast formation, Operational variables, Specimen Preparation, Imaging Modes, Applications, Limitations.
(b) Transmission Electron Microscopy(TEM)-Introduction, instrumentation, Specimen preparation –pre thinning, final thinning, Image modes-mass density contrast, diffraction contrast, Phase contrast, Applications , Limitations.

UNIT – III

X-Ray Diffraction (XRD) - Introduction, Basic principles of diffraction, X-ray generation, Instrumentation, Types of analysis, Data collection for analysis, Applications, Limitations.

UNIT – IV

Thermal Analysis: Introduction , Basic thermodynamics and heat transfer, common characteristics- Instrumentation, experimental parameters, Different types used for analysis ,Differential thermal

analysis , Differential Scanning Calorimetry, Thermogravimetry, Dilatometry, Dynamic Mechanical analysis- Basic Principles, Instrumentation, working principles, Applications ,Limitations.

UNIT – V

Scanning Probe Microscopy (SPM) and Atomic Force Microscopy (AFM)- Introduction, Instrumentation, Scanning Tunneling Microscopy- Basics, Probe Tips Working environment, operational modes, Applications, Limitations.

Atomic Force Microscopy (AFM) –Basic Principles, instrumentation, operational modes, Applications, Limitations.

TEXT / REFERENCE BOOKS:

1. ASM Hand book: Materials Characterization, ASM International, 2008.
2. Robert F. Speyer: Thermal Analysis of Materials, Marcel Dekker Inc., NewYork, 1994
3. V.T. Cherapin and A.K. Mallik: Experimental Techniques in Physical Metallurgy, Asia Publishing House, 1967.
4. S.J.B. Reed: Electron Microprobe nalysis, Cambridge University Press, London, 1975.

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WELDING METALLURGY
(Professional Elective -II)

Pre- requisites: Physical Metallurgy, Heat Treatment

Course Objectives:

1. To develop understanding of metallurgical fundamentals of welding
2. To study Welding of ferrous metals and alloys
3. To study Welding of non ferrous metals and alloys.
4. To gain a knowledge about quality control methods in welded joints

Course out comes:

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

1. Basic theoretical & practical knowledge of welding of ferrous metals and alloys
2. Basic theoretical & practical knowledge of welding of non ferrous metals and alloys
3. Conduct quality control tests on welded joints.

UNIT-I:

Heat flow and temperature distribution in and around weld metal. Calculation of heat input and heat affected zone width. Metallurgical considerations in welding .Structure property changes.

UNIT-II:

Problems during welding of carbon steels, cart irons, Heat treatment of weldments. Welding of Stainless steels. Schaffler diagram.

UNIT-III:

Welding of Aluminum alloys and Cu-base alloys.

UNIT-IV:

Welding of Titanium alloys and Nickel base alloys. Welding of Dissimilar metals.

UNIT-V:

Weldability and its testing, Corrosion of welds

TEXT / REFERENCE BOOKS:

1. Welding Engineering and Technology, R.S. Parmar
2. Welding Metallurgy, Simdo Kou

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ALTERNATE ROUTES OF IRON MAKING
(Professional Elective -II)

Pre- requisites: IRON PRODUCTION

Course Objectives:
1. To learn alternate route of iron making based on coal based processes
2. To learn alternate route of iron making based on gas based processes
3. Gain knowledge about important smelt reduction processes

Course out comes: At the end of the course, student will be able to gain
1. Comprehensive understanding of alternate routes to iron making concomitant to kinetics of reduction of oxides of iron.
2. Knowledge about smelt reduction processes.

UNIT-I
Blast furnace Iron making, Alternate routes of Iron making.

UNIT-II
Kinetics of Iron Oxides Reduction, Coal based DR processes.

UNIT-III
Gas based DR processes using Retorts, Fluidized bed shaft furnaces, Future outlook of DR processes.

UNIT-IV
Smelting Reduction processes, classification, Corex, Kawasaki smelting.

UNIT-V
INRED, ELRED, Plasma smelt processes etc.

TEXT / REFERENCE BOOKS
1. Amit Chatterjee, Beyond Blast Furnaces, CRC Press, 1994.
2. FathiHabashi, Hand Book of Extractive Metallurgy, Vols. I, Wiley-VCH, 1997.

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METAL CASTING
Pre-requisites: NIL

Course Objectives:
This course is mainly intended to
1. Introduce and explain various moulding, casting techniques and equipment used.
2. Principles of Solidification of casting, defects in castings and their remedies are also dealt in detail.

Course Outcomes:
This course would pave a platform for students to develop a thorough understanding on
1. The casting technology,
2. Solidification of metals and alloys.

UNIT - I
Scope and development of foundry, Types of foundries**.** Introduction to Foundry - Steps involved in casting, advantages, limitations and applications of casting process. Pattern types, allowances for pattern, pattern materials, color coding and storing of patterns.
Moulding methods and processes-materials, equipment, Moulding sand ingredients, essential requirements, sand preparation and control, testing, cores and core making - its types.

UNIT - II
Sand castings-Green and dry, pressure die casting, Gravity die casting, permanent mould casting, centrifugal casting, precision investment casting, shell Moulding, Co_2 Moulding, Recent developed process- V-forming , full mould process: Furon-no-bake sand moulds and cores. Continuous casting - squeeze casting, Cold setting and self setting process.

UNIT - III
Purpose of the gating system, Components of gating system and its functions, Design of gating system, Types of gates, Gating ratio and its functions, Gating systems and their characteristics.

UNT - IV

Solidification of metals, Homogeneous and heterogeneous nucleation, Growth mechanism, Solidification of Pure metals and alloys, Coring or Segregation, Solidification time and Chvorinov's rule, concept of progressive and directional solidifications, Metallurgical aspects of Casting. Melting furnaces- -crucibles oil fired furnaces-electric furnaces-cupola, selection of furnace, calculation of cupola charges-Degasification, inoculation, pouring techniques.

UNIT - V

Gray Cast iron- effect of chemical composition, carbon equivalent, and effect of alloying. Production of gray C.I, ductile iron and malleable iron castings. Melting of Aluminium and Copper alloys. Casting defects arising due to moulding, coring, melting and pouring practice.

TEXT / REFERENCE BOOKS:

1. Heine, Loper and Rosenthal, "Principles of Metal Casting", Tata Mc Graw Hill Publishing Co, Ltd; New Delhi, 1995.
2. Foundry Technology - Devendra Kumar and S.K . Jain
3. Metals Hand book Vol.5 published by ASM, Ohio.
4. Foundry Technology-Jain.
5. Foundry Technology Principle- Raman Rao.

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METAL FORMING

Pre-requisites:

Course Objective:

1. Gain an understanding of fundamentals of metal working.
2. Analyze the behavior of metals during plastic deformation.
3. Obtain a working knowledge of forging, rolling, extrusion, and wiredrawing.

Course Outcomes:

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

1. Identify the behavior of metals under the various modes of deformation.
2. To use mechanics of metal working principles suitable for various mechanical working operations.
3. Identify and adopt a particular deformation process to obtain the required product.

UNIT-I:

FUNDAMENTALS OF METAL WORKING: Classification of forming processes, Mechanics of metal working for slab method and uniform deformation energy method. Cold working, Recovery, Recrystallization and grain growth, hot working, Strain-Rate effects, Work of plastic deformation.

UNIT - II:

FORGING: Classification of forging processes, forging equipment. Forging in plane strain. Open-die forging, closed-die forging, Forging of a cylinder in plane-strain. Forging defects, powder metallurgy forging.

UNIT-III:

ROLLING OF METALS**:** Classification of rolling processes, rolling mills. Hot rolling, cold rolling, rolling of bars and shapes, forging and geometrical relationships in rolling.

Simplified analysis of rolling load, rolling variables, problems and defects in rolled products. Theories of hot rolling, torque and horsepower, theories of cold rolling, torque and horsepower.

UNIT-IV:

EXTRUSION: Classification of extrusion processes, extrusion equipment. Hot extrusion. Deformation and defects in extrusion. Analysis of extrusion

process. Cold extrusion. Extrusion of tubing and production of seamless pipe and tubing.

UNIT-V:

Rod and wire drawing, tube drawing processes, residual stresses in rod, wire and tubes.

Sheet metal forms, processes, Equipment.

TEXT / REFERENCE BOOKS:

1. Mechanical Metallurgy by GE Dieter (3rd edition)
2. Mechanical working of metals - Avitzone.
3. Engineering Metallurgy – Part-II – Higgins

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METAL CASTING LAB

LIST OF EXPERIMENTS:

1. Preparation of gating system using green sand.
2. Study of particle size distribution of the sand.
3. Study of the variation of permeability of the green sand with clay and water.
4. Determination of the variation of sand properties like green hardness, green compact strength with additives in sands.
5. Determination of the variation of hot compact hardness and hot shear strength with additives in sands.
6. Determination of clay content in sand.
7. Determination of the shatter index of green sand.
8. Founding of Aluminum and Cast Iron alloys in a pit furnace and casting into light components.
9. Charge calculations and melting practice of cast iron in a cupola.
10. Preparation of a shell by shell moulding process.
11. Making of pipes by centrifugal casting process.
12. Non-destructive testing of a few cast iron components.

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METAL FORMING LAB

LIST OF EXPERIMENTS:

1. Determination of forming limit diagram
2. To study the kinetics of static recrystallization in a cold worked metal.
3. To conduct rosette analysis to determine the stress components.
4. To grow single crystals by Strain annealing technique.
5. To very hall-petch relation in mild steel specimens.
6. To study the work hardening and strain rate sensitivity of a metal.
7. To study the effect of plastic anisotropy on the deformation behaviour.
8. To study the effect of rolling variables on the mechanical properties of metals.
9. To study the forging operations in the production of a hook.
10. To conduct the ring compression test to determine the friction coefficient.
11. To study the flow pattern in plasticine clay when extruded through a die.
12. To study defects produced in rolled and forged products.

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MATERIAL CHARACTERIZATION LAB

List of Experiments:

1. Study of Thermal Behaviour and Phase Transformations in cold worked Brass. (Thermo gravimetric Analysis)
2. Exothermic and endothermic reactions. (Differential Scanning Colorimetry)
3. Quantitative Thermal Analysis, Enthalpy determination. (Differential Scanning Colorimetry)
4. Wear rate of EN8 steel, alpha-beta Brass and Al – Alloy AA6061. (Pin – on – Disc Machine)
5. Wear behavior of particulate composites/coatings. (Pin – on – Disc Machine)
6. Macro and Micro hardness correlations in annealed and cold worked copper.
   (Micro hardness Tester).

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NON-FERROUS EXTRACTIVE METALLURGY

(Professional Elective **– III)**

Pre-requisites: Mineral Dressing, Principles of Extractive Metallurgy

Course Objectives:

1. To explain the various methods of extraction of non ferrous metals.
2. To describe the procedure and equipment used for production of non ferrous metals from their ores.

Course Outcome:

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

1. The course gives an insight into the various methods of production of important non ferrous metals
2. The students get an idea of energy saving methods and environment controlling methods in extractive units.
3. The course is useful for higher studies, R&D, and also for getting jobs in metallurgical processing industries.

UNIT - I

COPPER: Principal Ore and Minerals; Matte smelting – Blast furnace, Reverberatory, Electric furnace, Flash; Converting; Continuous production of blister Copper; Fire refining; Electrolytic refining; Hydro-Metallurgical copper extraction; Leaching processes, Recovery of copper from leach solutions; Electro-winning.

UNIT - II

ZINC: General Principles: Horizontal and vertical retort processes: Production in a Blast furnace: Leaching purification: Electrolysis, Refining.
LEAD: Blast furnace smelting, Refining of lead bullion

UNIT - III

ALUMINIUM: Bayer process: Hall - Heroult process: Anode effect: Efficiency of the process: Refining, Alternative processes of aluminum production.

UNIT - IV

MAGNESIUM: Production of a hydrous Magnesium chloride from seawater and magnesite. Electro-winning practice and problem, refining, Pidgeon and Handspring processes.

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TITANIUM: Upgrading of ilmenite, chlorination of titania, Kroll's process. Refining.

UNIT - V

URANIUM: Acid and alkali processes for digestion of uranium ores, Purification of crude salt, Production of reactor grade UO_2 and uranium.
Simplified flow sheets for the extraction of nickel, tungsten and gold. Review of non-ferrous metal industries in India.

TEXT / REFERENCE BOOKS:

1. Extraction of Non-Ferrous Metals - HS Ray, KP Abraham and R. Sridhar
2. Metallurgy of Non-Ferrous Metals - WH Dennis
3. Rare Metals Hand book - C.A. Hampel
4. Nuclear Reactor General Metallurgy - N. Sevryukov, B. Kuzmin and Y. Chelishchevr
5. Nuclear Chemical Engineering - Manstion Bendict and Thomas H. Pigfort

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STRENGTHENING MECHANISMS
(Professional Elective **– III)**

Pre-requisites: Physical metallurgy and Mechanical Metallurgy

Course Objectives:
1. To explain and describe various strengthening mechanisms involved in the development of existing alloys and new alloys.

Course Outcomes:
At the end of the course, student would be able
1. To understand and develop design of alloys as per the actual service condition of engineering applications.

UNIT-I
Strengthening from grain boundaries, Hall-Petch relation, ASTM grain size measurement, yield-point phenomenon, strain aging.

UNIT-II
Solid solution strengthening: Elastic interaction, modulus interaction, stacking fault interaction, electrical interaction, short range order interaction, long range order interaction.

UNIT-III
Cold working: working: Strain hardening of single crystals, annealing of cold worked metal, recovery, recrystallization and grain growth.

UNIT-IV
Strengthening from fine particle Principle, mechanisms and examples of Precipitation hardening (age hardening), Dispersion hardening.

UNIT-V
Fiber strengthening, strength and moduli of composites (Iso-strain and Iso-stress condition), influence of fiber length, orientation and concentration.

Text Books:
1. Mechanical Metallurgy - George E Dieter
2. Mechanical Behaviour of Materials - Thomas H Courtany
3. Materials Science and Engineering an Introduction - William D Callister Jr
4. Materials Science and Engineering - V Raghavan

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FERRO ALLOY TECHNOLOGY
(Professional Elective **– III)**

Pre-requisites: Iron production

Course Objective:
1. The prime objective of the course is to make the students understand various ferroalloys used in ferrous metallurgy.
2. The furnaces used for the production of ferroalloys and the present status and future scope of the ferroalloy industry in India are also dealt as an integral part of the course.

Course Outcome:
At the end of the course, student would be able to
1. Acquire sufficient knowledge on the course, the student would be able to select the required ferroalloy for a specific ferrous alloy to bring out quality yield.

UNIT-I
Introduction: Types of Ferro alloys and their uses.
Principles: Physicochemical aspects of ferroalloys. Production by various methods.

UNIT-II
Types of furnaces, its design and refractories. Mechanical euipment, auxiliaries, electric power in to heat. Furnace power supply. Working voltage, power factor and efficiency.

UNIT-III
Production: Production of ferro-silicon, ferro -manganese (high and low carbon). Ferro-chrome (high and low carbon),

UNIT-IV
Production: Ferro-molybdenum, Ferro-tungsten, ferro-titanium are ferro-vanadium.

UNIT-V
Lay out: Lay out of a ferro alloy plant and its production economics. Present status of ferroalloy industry in India. Future plans and developments.

TEXT / REFERENCE BOOKS:
1. Riss M. And Khodorovsky V - Production ferroalloys, Mir Publishers, Moscow 1967.
2. Symposium on ferro alloys: NML Technical Jl. Feb 1962.
World ferrochrome producers: Met bull

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POWDER METALLURGY
(Professional Elective **- IV)**

Pre- requisites: Basic Material Science

Course Objectives:
1. To build the necessary back ground of emergence and importance of powder metallurgy scope and limitations.
2. Obtain a necessary knowledge about various powder production techniques and characteristics.
3. Obtain a working knowledge of compaction and sintering techniques.
4. Gain an effective knowledge of applications of powder metallurgy products.

Course Outcomes:
At the end of the course the student will be able to:
1. Classify powder preparation techniques.
2. List out the characterization techniques of powders.
3. Describe hot, cold and pressure-less powder compaction and sintering techniques of powder compacts.
4. List applications of powder metallurgy.

UNIT – I
Introduction: Emergence and importance of powder metallurgy**:** Comparison of powder metallurgy with other fabrication techniques, its scope and limitations.

UNIT – II
Characterization and production of powders**:** General characteristics of metal powders, particle shape, flow rate, apparent density, and specific surface area, particle size distribution. Different methods of production of metal powders: influence of manufacturing process on powder characteristics.

UNIT – III
Compaction**:** Theory of consolidation: Pressure transmission in powders; compressibility and compactability of powders; Green strength; Hot isostatic pressing; Powder rolling.
Sintering: Mechanisms of Sintering; Factors affecting sintering; Activated sintering; Liquid phase sintering; Sintering atmospheres; Properties of sintered parts.

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UNIT –IV
Applications: Porous parts: Self-lubricating bearings, filters: Dispersion strengthened materials: Cu / Al_2O_3, Sintered Aluminum Powder. Electrical materials: Tungsten lamp filaments, electrical contacts, welding electrodes.

UNIT – V
Magnetic materials: Soft magnetic materials (Fe, Fe-Ni); Permanent magnets (Alnico, $SmCo_5$), Cemented carbides; Cermets.

TEXT / REFERENCE BOOKS:
1. Powder Metallurgy – A.K. Sinha
2. Introduction to Powder Metallurgy – J.S. Hirshhorn
3. Treatise on Powder Metallurgy – C. Goetzel Vol 1& II
4. Powder Metallurgy Principles – F.V. Lenel
5. Powder Metallurgy Practice and Applications – R.L. Sands & C.R. Shakespeare
6. Powder Metallurgy by R.M German
7. Powder Metallurgy by TC Angelo and R. Subramanyam

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ADVANCED MATERIALS
(Professional Elective - IV)

Pre-requisites: Basic courses on materials engineering

Course Objective:
1. This course has a prime objective of educating the students in such a way that the student will have an opportunity to study all significant materials under one umbrella.
2. The classification, manufacture and applications of these materials will be dealt in detail.

Course Outcome:
1. The student will be able to design an advanced system/component with the knowledge acquired through this course.
2. This also would help the student to organize his project work more effectively which also runs in the same duration.

UNIT - I
Nano-materials: Introduction – Synthesis methods, Classification of Nanomaterials
Carbon – Carbon Composites: Introduction – preparation of carbon fibers – reinforcement performs – knitting – braiding – weaving – filament winding – helical winding – polar winding – making of carbon – carbon composites – advantages and disadvantages – properties and application.

Unit – II
Intermetallic Compounds: Introduction – Types of Intermetallic compounds; Ni – Al system, Fe-Al, Ti-Al system, Preparations and properties and application of Intermetallic compounds.
Functionality Graded Materials (FGMS): Types of FGMS – classification – different systems – preparations – properties and applications of FGMS.

Unit – III
Bio-materials: Properties of Bio materials, Metallic bio-materials, Stainless steels, cobalt based, titanium based, polymers and ceramics.

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Unit – IV
Shape Memory Alloys (SMAs): Introduction – shape memory effect – classification of shape memory alloys – composition – properties and applications of shape memory alloys (SMA).

Unit – V
Cermets: Introduction – classification – fabrication techniques – bonding and microstructure – oxide cermets – carbide and carbonitride cermets – steel bounded cermets – properties and applications.
Refractory Metals and Alloys: Introduction – Manufacturing – Preparations – Properties and Application of Nb, Ta, W, Mo, Re.

TEXT REFERENCE BOOKS:
1. Materials Science and Technology – Cahan
2. Wiley Inter Science: Book Home - Hand Book of Advanced Materials.
3. High Temperature Materials by I E Campbell
4. Advanced materials: refractory fibres, fibrous metals, composites - Charles Zbigniew Carroll-Porczynski
5. ASM Metals Hand Book Vol. 1& Vol. 2
6. Handbook of advanced materials: enabling new designs by James K. Wessel

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Met. Engg. I-Sem	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

SEMI CONDUCTORS AND MAGNETIC MATERIALS
(Professional Elective - IV)

Pre-requisites: Physics

Course Objective:
1. This course specifically deals with a class of materials, semiconductors and magnetic materials which have wide application in electronic and memory storage devices.

Course Outcome:
1. This course would benefit the student through giving the inputs on semiconductor and magnetic materials technology.
2. This will allow them choose the stream of electronic materials as their subject of interest.

UNIT - I
Review of electron theory of metals; Electrical and thermal conductivity – Classical approach and quantum mechanical considerations; Resistivity of pure metals and alloys, and ordered alloys; Thermoelectric phenomena.

UNIT - II
Semiconductors: Band structures, Intrinsic semiconductors, Extrinsic semiconductors; Hall effect; Elemental and compound Semiconductors and their application; Super conductivity; super conducting materials; Structure and application.

UNIT-III
Ferromagnetism: Ferromagnetic domains; Hysteresis loops, magnetostriction and magnetoelectricity, origin of Hysteresis due to domain wall movement; soft magnetic alloys.
Ferri magnetic material; Spiral structure; Theory of ferrimagnetisms; magnetic structures of ferrites; permeability of ferrites; stress-induced anisotropy in ferrites; Applications of soft ferrites.

w.e.f. 2017-2018 academic year

UNT-IV
Factors determining the permeability of metals and alloys; Effect of fundamental properties on permeability, Ni-Fe alloys, Fe-Co alloys, high permeability of iron and ferritic iron, Si – Fe alloys and Cu – Ni alloys.
Amorphous ferromagnetic alloys and Ferro fluids: Preparation and structure of amorphous ferromagnetic and its application; Ferro fluids.

UNIT-V
Permanent magnetic materials: Energy product of a permanent magnet material; Behaviour of permanent magnets under dynamic or recoil conditions; Alnicos; Fe- Cr-Co alloys.
Cu-Ni-Fe and Cu-Ni-Co alloys; Fe-Co-Mo alloys, Pt-Co alloys; Permagnent, magnets based on the intermetallic compound Sm_2 Ca_{l2} Coercivity mechanisms; Applications of permanent magnetic; Temperature dependence of magnetic properties of permanent magnets.

TEXT / REFERENCE BOOKS

1. R.E. Hummel: Electronic Properties of materials.
2. R.A. Macurie: Ferromagnetic Materials structure and properties.
3. An Introduction to Materials science- H. L. Mancini.
4. Magnetic materials- Fundamental and devices- Nicola Spaldin.
5. Fundamentals of Semiconductors- physical and materials properties - Peter Y. Yu Manuer Cardona.
6. Semi Conductors - Halbleiter. Ed. Annuelle.

w.e.f. 2017-2018 academic year

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

L	T	P	C
4	0	0	4

CERAMICS AND COMPOSITE MATERIALS

(Professional Elective **– V)**

Pre-requisites: None

Course Objectives:

1. Develop understanding of the structure of ceramic materials on multiple length scales.
2. Develop knowledge of point defect generation in ceramic materials, and their impact on transport properties.
3. To describe key processing techniques for producing metal, ceramic-, and polymer-matrix composites.
4. To demonstrate the relationship among synthesis, processing, and properties in composite materials.

Course Outcomes:

1. Knowledge of the crystal structures of a wide range of ceramic materials and glasses..
2. Able to explain how common fibers are produced and how the properties of the fibers are related to the internal structure.
3. Able to select matrices for composite materials in different applications.
4. Able to describe key processing methods for fabricating composites.

UNIT-I

Introduction – classification of ceramics – imperfections in ceramics – structure of ceramics – crystal structures – oxide structures – silicate structures – glass formation – types of glasses.

UNIT-II

Ceramic Phase diagrams: Study of binary phase diagrams like MgO-NiO; CaO-MgO; MgO-Al_2O_3, Al_2O_3 – SiO_2

UNIT-III

Composite materials – Introduction – classification of composite materials based on structure – based on matrix – functional requirements of reinforcement and matrix - advantages and applications of composites.

UNIT-IV

Fibers: Fabrication, structures, properties and applications of glass fibers, boron fibers, carbon fibers, organic fibers, ceramic fibers and metallic fibers.

Matrix materials: Polymers, metals and ceramic matrix materials.

UNIT-V

Manufacturing of composites – polymer matrix composites – metal matrix composites – ceramic matrix composites – carbon fiber composites.

TEXT / REFERENCE BOOKS:

1. Introduction to Ceramics – W.D.Kingery et al – John Wesley publications
2. Composite materials-science and Engineering - K. K. Chawla.
3. Engineering materials and their applications - Flinn and Trojan.
4. Hand book of Fibre – reinforced composite materials – Ed. Lubin.

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

L	T	P	C
4	0	0	4

HIGH TEMPERATURE MATERIALS

(Professional Elective **– V)**

Pre-requisites: None

Course Objectives:
1. To learn and design material's microstructure for high temperature application.
2. To learn scientific issues related to high temperature such as creep, oxidation and material degradation.

Course Outcomes:
1. Comprehensive, exposure and understanding of processing, characterization and properties of high temperature materials.
2. Exposure to advanced high temperature materials such as super alloys, inter metallic and ceramics.

UNIT-I
Creep, creep resistant steels,

UNIT-II
fatigue, thermal fatigue, ageing, structural changes, material damage, crack propagation, damage mechanics, life time analysis

UNIT-III
Oxidation, high temperature corrosion, erosion, Super alloys

UNIT-IV
Ceramics and polymers for high temperature applications,

UNIT-V
Intermetallics, usage of, spring steels, evaluation of property data extrapolation.

TEXT / REFERENCE BOOKS:
1. Evans, R.W and Wilshire, B.creep of metals and alloys. Institute of metals, 1985, London.
2. J.R. Davis, ASM Specialty Handbook: Heat- resistant materials, ASM, 1997.

w.e.f. 2017-2018 academic year

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

L	T	P	C
4	0	0	4

ALLOY STEELS

(Professional Elective **– V)**

Pre-requisites: Physical Metallurgy and Heat Treatment

Course Objectives: This course deals with
1. Low carbon, Medium carbon and High carbon steels with respect to structure property correlations and strengthening mechanisms with alloy additions
2. Ultra high strength steels, Stainless steels and Tool steels with respect to heat treatment, properties and applications.

Course Outcomes:
1. Ability to understand different types of alloys used in alloy steels.
2. Ability to solve different metallurgical problems in alloy steels.
3. It has a lot of scope in R&D and in automobile engineering.

UNIT – I
Low-carbon Mild steels: Introduction; cold forming steels, High strength packing steels; HSLA steels; Low-carbon Ferrite pearlite steels – structure property relation-ships, strengthening mechanisms, Formability of HSLA steels.

UNIT – II
Medium- High carbon ferrite-pearlite steels – structure property relationships, Bainitic steels; Low-Carbon bainitic steels-requirements, development and choice of alloying elements, Mechanical properties, microstructure and impact properties; High-Carbon bainitic steels.

UNIT – III
Ultra-high strength steels: Introduction, steels tempered at low temperatures, secondary hardening, thermo- mechanical treatments, rapid austenitizing treatments, structure-property relationships in tempered mantensite, cold-drawn pearlite steels, maraging steels.

UNIT – IV
Stainless steels: Classification, Composition, Microstructures, Heat treatment an application.

UNIT- V

Tool steels and Heat resistant steels: Classification, Composition, Micro structure an Heat treatment and application.

TEXT / REFERENCE BOOKS:

1. Physical Metallurgy and the Design of steels: F. B. Pickering.
2. The physical Metallurgy of steels: W. C. Leslie.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

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

L	T	P	C
4	0	0	4

METAL JOINING

Pre-requisites: None

Course Objectives:

1. To provide with the knowledge on basics of joining processes
2. To gain the knowledge on the Gas and Arc welding and Resistance and Pressure welding processes.
3. To gain the knowledge on the special welding processes and soldering and brazing techniques.
4. To gain hands on experience on inspection and testing of weldments.

Course Outcomes:

1. Overview of joining processes; discuss in detail the weld the welding process and the physics of welding can be assessed.
2. Practical applications of welding of ferrous and non ferrous metals can be understood.

UNIT-I

Basic Science of Welding Processes. Sources of heat energy, the flame, the electric arc. Chemical reactions during welding, oxidation reaction, protection of weld pool with fluxes or gases.. Microstructural changes during welding, the effect of heat on metals. Pre-treatment and post-treatment of welds. Theory of distortion. Residual stress in welds.

UNIT-II

Gas and Arc Welding processes: Classification of welding processes-heat sources and shielding methods- fusion welding processes, oxy-acetylene welding, arc welding-manual, submerged arc welding, gas tungsten arc and gas metal arc welding; practice , joint design and preparation and their advanatages and disadvantages, Arc welding applications-equipment-polarity-governing factor in fusion welding-electrodes and types-ISI specification for electrodes

Resistance and Pressure Welding processes: Pressure welding- Cold and hot pressure welding, friction stir welding, and diffusion welding. Resistance welding- spot and projection welding; practice,joint design and preparation and their advantages and disadvantages.

w.e.f. 2017-2018 academic year

UNIT-III

Special welding processes: Principle, equipment, process variables, merits, Limitations and applications of Electron beam, plasma arc and laser beam welding processes.

Soldering and Brazing. Practice of soldering. Joint types and preparation. Fluxes. Heat sources and heat transfer. Brazing practice. Filler materials. Heat sources. Different types of brazing. Braze welding

UNIT-IV

Concept of Weldability and its assessment, dilution.

welding of structural steels, caast iron, stainless steels, and other high-alloyed steels.

Welding of Non-ferrous alloys: Aluminium, Titanium, and copper.

Welding of Dissimilar metals.

UNIT-V

Inspection and Testing of Welds and Joints. Mechanical testing. Non-destructive testing. Weld defects- their causes and remedies.

TEXT / REFERENCE BOOKS:

1. Parmar, R.S., “Welding Processes and Technology”, 2nd edn. Khanna Pub., New Delhi, 2001.
2. ASM Metals Handbook. Vol.6. “Welding Brazing & Soldering”, ASM International, Metals Park, Ohio, USA, 1993.
3. AWS Welding Handbooks, AWS, New York, 1995
4. Davies-A C. “Welding”, 10th edition, Cambridge University Press, UK, 1996.
5. Howard B Cary., “Modern Welding Technology”, 4th edn., Prentice Hall, New Jersey, USA, 1997.
6. Lancaster.J.F., “Metallurgy of Welding”, George Allen Co, Boston, 1980.

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

L	T	P	C
4	0	0	4

ELECTRO METALLURGY AND CORROSION

Pre-requisites: Basic chemistry, Thermodynamics and extractive metallurgy.

Course Objective:

1. Electrometallurgy principles in deposition winning and the efficiency of the bath to be discussed.
2. Testing methods are to be studied. Various ways in which corrosion takes place in metals/alloys together with corrosion protection methods and tests conducted are to be studied.

Course Outcome:

1. The student gains knowledge on various types of electrolytic cells and the processes taking place in them.
2. The student obtains knowledge about the importance of controlling corrosion and its preventive measures.
3. The course is useful for higher studies, R&D, and also for getting into jobs in industries.

UNIT-I

Electro chemical principles, electrochemical cell, thermodynamic aspects, nernest equation, electrolytic cell, cathodic anodic reactions, electrode potentials:, standard electrode potential , cell representation , electrolysis .

UNIT-II

Faradays laws, throwing power, current efficiency, current density, polarization, over voltage, electroplating of Cu, Ni, Cr and Zinc, testing methods for electrodeposits.

UNIT-III

Electro winning of metals e.g.: Cu and Zinc electro winning problems like metallic cloud, anode effect, electro refining, differences between electro winning and refining, anodizing process and remedies.

UNIT-IV

Introduction, types of corrosion, Uniform corrosion, galvanic corrosion, and galvanic series. Pitting corrosion, season cracking, dezincification. Crevice corrosion, stress corrosion cracking, Intergranular corrosion, weld decay, Knife-line attack, Erosion corrosion, fretting corrosion, corrosion fatigue.

UNIT-V

Corrosion protection methods, selection of materials for corrosion services, selection of environment-use of inhibitors, surface protection methods including painting, metallic coating.
Cathode protection, sacrificial anode. Difference between cathode and anode protection.

TEXT / REFERENCE BOOKS:

1. Introduction to Electrometallurgy & Corrosion by sharan – Narayan
2. Corrosion Engineering – Fontana
3. Electrometallurgy- Blum

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Met. Engg. I-Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

ELECTRO METALLURGY & CORROSION LAB

LIST OF EXPERIMENTS:

1. Electroplating of copper on brass and to study the influence of current density on current efficiency.
2. Electroplating of Nickel using watt's bath and to study the influence of current density on current efficiency.
3. To anodise the given aluminium sample and to colour with a dye and to measure the thickness of the oxide film.
4. To determine the throwing power of electroplating bath.
5. Electroplating of chromium on mild steel and to study the influence of current density on current efficiency.
6. To understand the principles in galvanic cell corrosion.
7. To study the pitting corrosion of aluminium, stainless steel in suitable environments.
8. To conduct uniform corrosion
9. Electrowinning of copper by using Aqueous electrolyte.
10. Electrowinning of copper from ores.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Met. Engg. I-Sem	**L**	**T**	**P**	**C**
	0	**0**	**0**	**2**

INDUSTRY ORIENTED MINI PROJECT

Pre-requisites: Course work relevant to the topic of the project.

Course Objective:

1. This course is mainly intended to make the students acquire real time practical experience on the industry oriented processes, and cutting-edge technologies, and applications.
2. This course also necessitates the students to apply the theoretical principles learnt up to third year of his/her program to execute an effective preliminary project allotted to him/her.

Course Outcome:

1. The student will be able to construct and organize his/her preliminary project work in an efficient manner.

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IV Year B.Tech. Met. Engg. II-Sem	L	T	P	C
	4	0	0	4

MANAGEMENT SCIENCE

Course Objective:
The course introduces the basic concepts of Management Science and Operations Management and its application to business. The topics include human resource management, project and strategic management; the course develops problem solving and spreadsheet skills, an invaluable tool for modern business.

Learning outcome
- To enable students see that many managerial decisions making situations can be addressed using standard techniques and problem structuring methods
- Students will be able to gain an understanding of the core concepts of Management Science and Operations Management;
- To discuss applications in many functional areas (operations and Human resources, strategy, marketing,);
- To get familiar with Project management techniques and strategic management

Unit I
Introduction to Management & Organisation: Concepts of Management and organization- nature, importance and Functions of Management, Systems Approach to Management - Leadership Styles. Basic concepts related to Organisation - Types and Evaluation of Organisation structures.

Unit II
Operations & Marketing Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement –Statistical Quality Control: control charts, (simple Problems) and Acceptance Sampling, TQM, Six Sigma, JIT System, Supply Chain Management- Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

Unit III
Human Resources Management (HRM): Concepts of HRM- 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.

Unit IV
Project Management *(PERT/CPM)*: PERT Vs CPM- Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing (simple problems).

Unit V
***Strategic Management*:** Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

TEXT BOOKS:
1. Aryasri: *Management Science*, McGraw Hill, 2015.
2. P.Vijay Kumar and N.Appa Rao *Management Science*, Cengage, 2014.

REFERENCES:
1. Kotler Philip & Keller Kevin Lane: Marketing Management, Pearson, 2014.
2. Koontz & Weihrich: *Essentials of Management*, McGraw Hill, 2014.
3. Thomas N.Duening & John M.Ivancevich *Management—Principles and Guidelines,* Biztantra, 2014.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2014.
5. Samuel C.Certo: *Modern Management*, 2014.

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IV Year B.Tech. Met. Engg. II-Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1**

SEMINAR

Pre-requisites: NONE

Course Objectives:

1. The prime objective of this course is to make students become effective communicators
2. Enhance their presentational and creative abilities.

Course Outcomes:

1. The student will be able to communicate and present the work carried out by him effectively
2. Also be able to clarify the questions raised.

w.e.f. 2017-2018 academic year

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

METAL JOINING LAB

LIST OF EXPERIMENTS:

1. Making of welded joints using conventional welding processes- arc welding
2. Making of welded joints using conventional welding processes- gas welding
3. Making of at least one joint using TIG Welding techniques of mild steel
4. Making of at least one joint using MIG Welding techniques of mild steel
5. Soldering
6. Arc welding of dissimilar metals
7. Microstructure study of HAZ
8. Welding of S.S using TIG Welding
9. Testing of welded joints-Hardness: Tensile test
10. Microstructure study of welded joints
11. Inspection of welded joints by dye penetration and ultrasonic method
12. Inspection by Magnetic methods

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IV Year B.Tech. Met. Engg. II-Sem	**L**	**T**	**P**	**C**
	2	**0**	**2**	**14**

MAJOR PROJECT

Pre-requisites: Course work relevant to the topic of the project.

Course Objective:

1. This course is mainly intended to make the students acquire real time practical experience on the industry oriented processes, technologies, and applications once again.
2. This course also necessitates the students to work in teams and take lead in execution of project allotted to them.

Course Outcome:

1. The student will be able to cope up with the production base as well as research base organizations' atmosphere.
2. Also have an ability to create novel processes and problem-solving.

w.e.f. 2017-2018 academic year

OPEN ELECTIVE- I

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Civil Engg

L	T	P	C
3	0	0	3

OPEN ELECTIVE-I
DISASTER MANAGEMENT

Pre Requisites: NIL

Course Objectives:
The subject provide different disasters, tools and methods for disaster management

Course Outcomes:
Estimate, perform quantity survey & valuate various engineering works

UNIT 1 : Understanding Disaster
Concept of Disaster
Different approaches
Concept of Risk
Levels of Disasters
Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerability
Natural and man-made hazards; response time, frequency and forewarning levels of different hazards
Characteristics and damage potential or natural hazards; hazard assessment
Dimensions of vulnerability factors; vulnerability assessment
Vulnerability and disaster risk
Vulnerabilities to flood and earthquake hazards

UNIT 2 : Disaster Management Mechanism
Concepts of risk management and crisis managements
Disaster Management Cycle
Response and Recovery
Development, Prevention, Mitigation and Preparedness
Planning for Relief

UNIT 3: Capacity Building
Capacity Building: Concept
Structural and Nonstructural Measures
Capacity Assessment; Strengthening Capacity for Reducing Risk
Counter-Disaster Resources and their utility in Disaster Management
Legislative Support at the state and national levels

w.e.f. 2017-2018 academic year

UNIT 4: Coping with Disaster
Coping Strategies; alternative adjustment processes
Changing Concepts of disaster management
Industrial Safety Plan; Safety norms and survival kits
Mass media and disaster management

UNIT 5: Planning for disaster management
Strategies for disaster management planning
Steps for formulating a disaster risk reduction plan
Disaster management Act and Policy in India
Organizational structure for disaster management in India
Preparation of state and district disaster management plans

Text Books
1. Alexander, D. Natural Disasters, ULC press Ltd, London, 1993.
2. Carter, W.N. Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok, 1991.
3. Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.

References
1. Abarquez I. & Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.
2. Goudie, A. Geomorphological Techniques, Unwin Hyman, London 1990.
3. Goswami, S.C Remote Sensing Application in North East India, Purbanchal Prakesh, Guwahati, 1997.
4. Chakrabarty, U.K. Industrial Disaster Management and Emergency Response, Asian Book Pvt. Ltd., New Delhi 2007.
5. Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
6. National Policy on Disaster Management, NDMA, New Delhi, 2009
7. Disaster Management Act. (2005), Ministry of Home Affairs, Government of India, New Delhi, 2005.
8. District Disaster Management Plan-Model Template, NIDM, New Delhi, 2005.
9. Disaster Management, Future challenge and opportunities, Edited by Jagbir singh, I.K. International publishing home Pvt, Ltd.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. EEE **L T P C**
3 0 0 3

OPEN ELECTIVE-I
NON CONVENTIONAL POWER GENERATION

Pre-requisite: Nil.

OBJECTIVES:

- To introduce various types of renewable technologies available.
- The technologies of energy conversion from these resources and their quantitative analysis.

UNIT - I

Fundamentals of Solar Energy-Solar spectrum- Solar Radiation on Earth's surface-Solar radiation geometry-Solar radiation measurements- Solar radiation data- Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion- Flat plate collectors-concentrated collectors- construction and thermal analysis- Solar applications- Solar ponds- Heliostat systems-water heater-air heater-solar still.

UNIT - II

Solar-Electric Power generation- Photovoltaic cells- Equivalent circuit- V-I Characteristics- Photovoltaic modules – constructional details- design considerations- Tracking- Maximum power point tracking - Solar Thermo electric conversion.

UNIT - III

Wind Energy- Fundamentals of wind energy-power available in wind- Betz Limit-Aerodynamics of wind turbine- Wind turbines-Horizontal and vertical axis turbines –their configurations- Wind Energy conversion systems.

UNIT - IV

Energy from Bio Mass- Various fuels- Sources-Conversion technologies-Wet Processes – Dry Processes- Bio Gas generation – Aerobic and anaerobic digestion - Factors affecting generation of bio gas - Classification of bio gas plants-Different Indian digesters-Digester design considerations - Gasification process - Gasifiers – Applications. Geothermal Energy - sources- Hydrothermal convective - Geo-pressure resources - Petro-thermal systems (HDR) - Magma Resources-Prime Movers.

w.e.f. 2017-2018 academic year

UNIT - V

OTEC Systems- Principle of operation - Open and closed cycles, Energy from Tides - Principle of Tidal Power - Components of tidal Power plants - Operation Methods - Estimation of Energy in Single and double basin systems - Energy and Power from Waves-Wave energy conversion devices - Fuel Cells - Design and Principle of operation - Types of Fuel Cells - Advantages and disadvantages - Types of Electrodes – Applications - Basics of Batteries - Constructional details of Lead acid batteries - Ni-Cd Batteries.

OUTCOMES:

- The student will be able analyse solar thermal and photovoltaic systems and related technologies for energy conversion.
- Wind energy conversion and devices available for it.
- Biomass conversion technologies.
- Geo thermal resources and energy conversion principles and technologies.
- Power from oceans (thermal, wave, tidal) and conversion and devices.
- Fundamentals of fuel cells and commercial batteries.

TEXT BOOKS

1. John Twidell & Wier, Renewable Energy Resouces, CRC Press, 2009.
2. G.D.Rai – Non Conventional Energy sources, Khanna publishers.

REFERENCE BOOKS

1. D.P .Kothari, Singal,Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.
2. F.C.Treble, Generating Electricity from Sun.
3. C.S.Solanki, Solar Photo volatics- Fundamentals- Principles and Applications, PHI 2009
4. S.P.Sukhatme, Solar Energy Principles and Application - TMH

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B.Tech. EEE

L	T	P	C
3	0	0	3

OPEN ELECTIVE-I
ELECTRICAL ENGINEERING MATERIALS

Pre-requisites: Nil

Objectives: To understand the importance of various materials used in electrical engineering and obtain a qualitative analysis of their behavior and applications.

UNIT- I

DIELECTRIC MATERIALS: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT – II

MAGNETIC MATERIALS: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. factors effecting permeability and hysteresis

UNIT – III

SEMICONDUCTOR MATERIALS: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI)

UNIT – IV

MATERIALS FOR ELECTRICAL APPLICATIONS: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

w.e.f. 2017-2018 academic year

UNIT – V

SPECIAL PURPOSE MATERIALS: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI

OUTCOMES: Will be able to

- Understand various types of dielectric materials, their properties in various conditions.
- Evaluate magnetic materials and their behavior.
- Evaluate semiconductor materials and technologies.
- Materials used in electrical engineering and applications.

TEXT BOOKS

1. R K Rajput: A course in Electrical Engineering Materials, Laxmi Publications. 2009
2. T K BasaK: A course in Electrical Engineering Materials:, New Age Science Publications 2009
3. TTTI Madras: Electrical Engineering Materials
4. Adrianus J.Dekker: Electrical Engineering Materials, THM Publication.

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B.Tech. EEE

L	T	P	C
3	0	0	3

OPEN ELECTIVE-I
NANO-TECHNOLOGY

Pre-requisites: Nil

OBJECTIVES: To enable the student to understand fundamentals of nano materials and technologies for these materials and their manufacturing, applications in various fields.

UNIT - I

Background of Nanotechnology: Scientific Revolutions, Nanotechnology and Nanomachines - The Periodic Table, Atomic Structure, Molecules and Phases, Energy, Molecular and Atomic size, Surfaces and Dimensional Space, Top down and Bottom up approach.

UNIT - II

Molecular Nanotechnology: Atoms by inference, Electron Microscopes, Scanning electron microscope, Modern transmission electron microscope, Scanning probe microscope-atomic force microscope, scanning, tunneling microscope, Self Assembly.

UNIT - III

Nanopowders and Nanomaterials: Preparation, Plasma arcing, chemical vapor deposition, Sol-gels, Electrodeposition, Ball milling, using natural nanoparticles, Applications of nanomaterials.

UNIT - IV

Nanoelectronics: Approaches to nanoelectronics, Fabrication of integrated circuits, MEMS, NEMS, Nano circuits, Quantum wire, Quantum well, DNA-directed assembly and application in electronics.

UNIT - V

Applications: MEMS, NEMS, Coatings, Optoelectronic Devices, Environmental Applications, Nanomedicine.

w.e.f. 2017-2018 academic year

OUTCOMES:

- To evaluate electronic structural studies of nano materials and different synthesis methods to obtain nano structures.
- Understand characterization techniques through various measurements to study electrical, mechanical,thermal properties of nano materials.
- Applications of nano materials for specific purposes like MEMS, NEMS, nano electronics, energy storage.

TEXT BOOKS

1. Introduction to Nanoscience and Nanotechnology Gabor L. Hornyak, **NanoThread, Inc., Golden, Colorado, USA**; H.F. Tibbals, **University of Texas Southwestern Medical Center, Dallas, USA**; Joydeep Dutta, **Asian Institute of Technology, Pathumthani, Thailand**; John J. Moore, **Colorado School of Mines, Golden, USA**
2. Introduction to Nanotechnology by Charles P. Poole Jr and Frank J.Owens Wiley India Pvt Ltd.
3. Introduction to Nanoscience and Nanotechnology, Chatopadhyaya.K.K, and Banerjee A.N,
4. Introduction to nano tech by phani kumar
5. Introduction to Nano Technology by Charles P. Poole Jr and Frank J. Owens. Wiley India Pvt Ltd.
6. Introduction to Nanoscience and Nanotechnology, Chatopadhyaya.K.K, and Banerjee A.N,

NANOTECHNOLOGY Basic Science and EmergingTsechnologies by Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse**-** CHAPMAN & HALL/CRC PRESS 2002.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.

L	T	P	C
3	0	0	3

OPERATIONS RESEARCH
OPEN ELECTIVE-I

Prerequisites: None

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

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

UNIT – I
Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.
ALLOCATION: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT – II
TRANSPORTATION PROBLEM – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.
Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT – III
SEQUENCING – Introduction – Flow **–**Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines-graphical model
REPLACEMENT: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV
THEORY OF GAMES: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.
INVENTORY: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

w.e.f. 2017-2018 academic year

UNIT – V
WAITING LINES: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.
DYNAMIC PROGRAMMING:
Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

TEXT BOOK :
1. Operation Research /J.K.Sharma/ MacMilan.
2. Operations Research/A.C.S.Kumar/Yesdee

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

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B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
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BASICS OF THERMODYNAMICS
OPEN ELECTIVE-I

Pre-requisite: Engineering Chemistry and Physics

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

Course Outcomes:
At the end of the course, the student should be able to
- Understand and differentiate between different thermodynamic systems and processes
- Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes
- Understand and analyze the Thermodynamic cycles

UNIT – I
Introduction: Basic Concepts:
System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle, Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility

UNIT II
Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT – III
First and Second Laws of Thermodynamics: First Law: Cycle and Process, Specific Heats (cp and cv), Heat interactions in a Closed System for various processes, Limitations of First Law, Concept of Heat Engine (H.E.) and Reversed H.E. (Heat Pump and Refrigerator), Efficiency/COP, Second Law: Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, Statement of Clausius Inequality, Property of Entropy, T-S and P-V Diagrams

UNIT IV

w.e.f. 2017-2018 academic year

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

UNIT - V
Power Cycles : Otto, Diesel cycles - Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis
Refrigeration Cycles:
Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

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

REFERENCE BOOKS:
1. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
2. Fundamentals of Classical Thermodynamics – G. Van Wylan & R.E. Sonntag – John Wiley Pub.
3. Thermodynamics – J.P.Holman / McGrawHill
4. Engineering Thermodynamics – Jones & Dugan
5. Thermodynamics & Heat Engines – Yadav – Central Book Depot, Allahabad.

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B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
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FABRICATION PROCESSES
OPEN ELECTIVE-I

Prerequisites: Nil

Objectives:
Understand the philosphipies of various Manufacturing process.

Outcomes:
For given product, one should be able identify the manufacturing process.

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

UNIT – II
Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.
Inert Gas Welding _ TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT – III
Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth.
Stamping, forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.

w.e.f. 2017-2018 academic year

Types of presses and press tools. Forces and power requirement in the above operations.

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

UNIT – V
Forging Processes : Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

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

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

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B.Tech. ECE.

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ELECTRONIC MEASURING INSTRUMENTS
OPEN ELECTIVE-I

Note: No detailed mathematical treatment is required.
Prerequisite : Nil
Course Objectives:

- It provides an understanding of various measuring systems functioning and metrics for performance analysis.
- Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

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

- Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

Unit-I:
Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

Unit-II:
Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications.

Unit-III:
Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

w.e.f. 2017-2018 academic year

Unit-IV:
Recorders: X-Y Plotter, Curve tracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

Unit-V:
Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

TEXT BOOKS:
1. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

REFERENCES:
1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. CSE

L	T	P	C
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OPEN ELECTIVE-I

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Prerequisites

1. A course on "Computer Programming & Data Structures"

Objectives

1. Introduces object oriented programming concepts using the Java language.
2. Introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
3. Introduces the implementation of packages and interfaces
4. Introduces exception handling, event handling and multithreading
5. Introduces the design of Graphical User Interface using applets and swings

Outcomes

1. Develop applications for a range of problems using object-oriented programming techniques
2. Design simple Graphical User Interface applications

UNIT I:

Object oriented thinking and Java Basics- Need for OOP paradigm, summary of OOP concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT II:

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces, Exploring java.io.

w.e.f. 2017-2018 academic year

UNIT III:

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

String handling,Exploring java.util.Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter-thread communication, thread groups, daemon threads, Enumerations, auto boxing, annotations, generics.

UNIT IV:

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menu bar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT V:

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java the complete reference, 7th editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

REFERENCES:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & Sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. An introduction to Java programming and object oriented application development,
R.A. Johnson- Thomson.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. CSE

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OPEN ELECTIVE-I
COMPUTER GRAPHICS

Prerequisites

1. Familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.
2. A course on "Computer Programming and Data Structures"

Objectives

1. The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
2. Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

Outcomes

1. Acquire familiarity with the relevant mathematics of computer graphics.
2. Be able to design basic graphics application programs, including animation
3. Be able to design applications that display graphic images to given specifications

UNIT-I:

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), mid-point circle and ellipse algorithms

Filled area primitives: Scan-line polygon fills algorithm, boundary-fill and flood-fill algorithms

UNIT-II:

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland – Hodgeman polygon clipping algorithm, Polygon Filling

w.e.f. 2017-2018 academic year

UNIT-III:

3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

UNIT-IV:

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-V:

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

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

Text Books:

1. "Computer Graphics *C version*", Donald Hearn and M.Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

References:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Met. Engg.

L	T	P	C
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ENGINEERING MATERIALS
OPEN ELECTIVE-I

Pre requisites: Nil

Course Objectives:

1. To gain an knowledge about the uses and application of various ferrous metals and alloys.
2. To gain an knowledge about the uses and application of various non ferrous alloys.
3. To gain an knowledge about the uses and application of various ceramics, polymers and composites for different engineering applications.

Course Outcomes:

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

1. Ferrous metals and alloys for a given engineering applications and service condition.
2. Non ferrous alloys for a given engineering applications and service condition.
3. Ceramics, Polymers and composites for a given engineering applications and service condition.

UNIT-I

FERROUS ALLOYS: Introduction, Designations and classifications for steels, Simple Heat Treatments, Effect of Alloying Elements.

UNIT-II

NONFERROUS ALLOYS: Introduction, properties and applications, Aluminum Alloys, Magnesium Alloys, Copper Alloys and Titanium Alloys.

UNIT-III

CERAMIC MATERIALS: Introduction, Properties and Applications of Ceramics, Glasses and Refractories.

UNIT-IV

POLYMERS: Introduction, Classification of Polymers, Polymerization, Degree of Polymerization,
Typical Thermoplastics and Thermosets.

w.e.f. 2017-2018 academic year

UNIT-V

COMPOSITES: Introduction, Classification, Properties and Applications of Polymer matrix, Metal Matrix Ceramic Matrix and Laminar composites.

TEXT / REFERENCE BOOKS:

1. Donald R. Askland, Pradeep P. Phule, The Science and Engineering of Materials (4th Edition), Thomson Publishers, 2003.
2. William D. Callister Introduction to Material Science and Engineering, John Wiley and Sons, 2007.
3. W.F.Smith, Principles of Materials Science and Engineering, Mc Graw Hill, New York, 1994.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Met. Engg.	**L**	**T**	**P**	**C**
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METALLURGY FOR NON METALLURGIST
OPEN ELECTIVE-I

Pre requisites: Nil

Course Objectives:
1. To describe the basic principles of metallurgy and the importance of metallurgy in various discipline of engineering.
2. Gain a thorough knowledge about heat treatment of steels.
3. Gain a knowledge about properties and uses of cast irons and non ferrous metals.
4. Gain a working knowledge of basic testing methods for metals.

Course Outcomes:
At the end of the course Student would be able
1. To use and apply metallurgy in his own branch of engineering.
2. The student will be able to justify the various testing methods adopted for metals.

UNIT-I
Introduction: Crystal structure and defects, Crystal structure of metals, Classification of steels, Carbon steels

UNIT-II
Heat Treatment of Steels: The Iron carbon systems, Common phases in steels, Annealing, Normalizing, Hardening and tempering

UNIT-III
Cast irons: Properties and applications of Ductile irons, Malleable irons, Compacted graphite iron.

UNIT-IV
Non Ferrous Metals: Properties and applications of Light Metals (Al , Be, Mg, Ti), Super alloys

UNIT-V
Testing of Metals: Hardness testing, Tensile Testing, Impact Testing, Fatigue Testing.

w.e.f. 2017-2018 academic year

TEXT BOOKS
1. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007
2. Introduction to Physical Metallurgy – SH Avner, TATA Mc GRAW HILL ,1997
3. Metallurgy for Engineers- Clark and Varney
4. Mechanical Metallurgy – G. E. Dieter

REFERENCE BOOKS
1. Engineering Physical Metallurgy and Heat treatment – Y Lakhtin
2. C. Suryanarayana, Experimental Techniques in Mechanics and Materials, John Wiley, John Wiley, NJ, USA,2006
Foundations of Materials Science and Engineering – WF Smith

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Chemical**. Engg.**

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OPEN ELECTIVE-I
INDUSTRIAL POLLUTION CONTROL ENGINEERING

Objective:

To expose the students to various types of industrial pollutions and controlling techniques.

UNIT-I

Introduction to industrial pollution and types of pollution from chemical industries, Effects of pollution as environment and ecosystems-global warming-green house effect; Environmental legislatures-standards and guidelines.

UNIT –II

Air pollution- Meteorological aspects of pollution dispersion-adiabatic lapse rate-Environmental lapse rate-Turbulence and stability of atmosphere, Richardson number-Plume raise-plume behavior and characteristics, effective stack height. Major air pollutants and their sources, measurement of air pollutants

UNIT -III

General methods of control air pollutants removal of sulphur dioxide, oxides of nitrogen and organic vapors from gaseous effluents; Removal of particulate matter – principle and working of setting chambers, cyclone separators, fabric and fibre filters – electro static precipitators, Treatment of gaseous effluents.

UNIT -IV

Introduction to water pollution – water pollutants classification – characteristics of liquid effluents from fertilizer, pulp & paper and petroleum industries, estimation of oxygen demands – DO, BOD, COD, TOC – BOD curves, oxygen sag curve – modeling of BOD curves

Biological treatment of waste waters – aerobic and anaerobic methods – suspended and attached growth processes – bacteria – Reproduction in bacterial – Bacterial growth crushes, conventional activated sludge process – Trickling filters, Aerated lagoons – stabilization ponds – fluidized bed contractors.

w.e.f. 2017-2018 academic year

UNIT -V

Physical Treatment methods : Principle and working of screening – sedimentation – flotation – filtration – flocculation, Tertiary Treatment methods – carbon adsorption – Ion exchange – Reverse Osmosis, Boralin Chlorinating – Ultra filtration, Sludge treatment and disposal , removal of chromium and phenol from liquid effluents.

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Text books:

1. Pollution control in process industries by S.P. Mahajan TMH.,1985
2. Waste water treatment by M.Narayana Rao and A.K.Datta,Oxford and IHB publ. New Delhi

References:

1. Environmental pollution and control engineering by Rao C. S. – Wiley Eastern Limited, India, 1993.
2. Air pollution control by P.Prathap mouli and N.Venkata subbayya. Divya Jyothi Prakashan, Jodhpur.

OUTCOME: The student will be able learn the sources of air, water pollution and also their treatment methods

OPEN ELECTIVE- II

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Civil Engg.

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OPEN ELECTIVE -II
ESTIMATION, QUANTITY SURVEY & VALUATION

Pre Requisites:
Concrete Technology, RC Design, Desgin of Steel Structure

Course Objectives:
The subject provide process of estimations required for various work in construction. To have knowledge of using SOR & SSR for analysis of rates on various works .

Course Outcomes:
Able to provide control steps for disaster mitigation steps

UNIT – I
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

UNIT – II
Detailed Estimates of Buildings - Reinforcement bar bending and bar requirement schedules

UNIT – III
Earthwork for roads and canals.

UNIT – IV
Rate Analysis – Working out data for various items of work over head and contigent charges.

UNIT-V
Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation -Standard specifications for different items of building construction.

NOTE : NUMBER OF EXERCISES PROPOSED :
1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

Text Books:

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie

Reference books:

1. Standard Schedule of rates and standard data book by public works department.
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.

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B.Tech. EEE **L T P C**
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OPEN ELECTIVE-II
DESIGN ESTIMATION AND COSTING OF ELECTRICAL SYSTEMS

Pre-requisite: Power systems-I and Power Systems-II

Objectives: Objectives of this course are

- To emphasize the estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost viability.
- To design and estimation of wiring,
- To design overhead and underground distribution lines, substations and illumination design.

UNIT - I

DESIGN CONSIDERATIONS OF ELECTRICAL INSTALLATIONS: Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections , Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT - II

ELECTRICAL INSTALLATION FOR DIFFERENT TYPES OF BUILDINGS AND SMALL INDUSTRIES: Electrical installations for residential buildings – estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

UNIT - III

OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES: Introduction, Supports for transmission lines, Distribution lines – Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

UNIT - IV

SUBSTATIONS: Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substations – Floor mounted type.

UNIT – V

DESIGN OF ILLUMINATION SCHEMES: Introduction, Terminology in illumination, laws of illumination, various types of light sources, Practical lighting schemes LED, CFL and OCFL differences.

OUTCOMES: Students are in a position to Understand the design considerations of electrical installations.

- To design electrical installation for buildings and small industries.
- To identify and design the various types of light sources for different applications.

TEXT BOOKS

1. Electrical Design Estimating and Costing, K. B. Raina, S. K. BhattAcharya, New Age International Publisher.
2. Design of Electrical Installations, Er. V. K. Jain, Er. Amitabh Bajaj, University Science Press.

REFERENCE BOOKS

1. Code of practice for Electrical wiring installations,(System voltage not exceeding 650 volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS: 4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032.
4. Code of Practice for selection, Installation of Maintenance of fuse (voltage not exceeding 650V), Indian Standard Institution, IS: 3106-1966.
5. Code of Practice for earthling, Indian Standard Institution, IS:3043-1966.
6. Code of Practice for Installation and Maintenance of induction motors, Indian Standard Institution, IS: 900-1965.
7. Code of Practice for electrical wiring, Installations (system voltage not exceeding 650 Volts), Indian Standard Institution, IS: 2274-1963.
8. Electrical Installation, estimating and costing, Gupta J. B., Katson, Ludhiana.

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B.Tech. EEE **L T P C**
3 0 0 3

OPEN ELECTIVE-II
ENERGY STORAGE SYSTEMS

Pre-requisite: None

Objectives: Objectives of this course are

- To enable the student to understand the need for energy storage, devices and technologies available and their applications,

UNIT - I

Electrical Energy Storage Technologies: Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

UNIT - II

Needs for Electrical Energy Storage: Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT - III

Features of Energy Storage Systems: Classification of EES systems , Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

UNIT - IV

Types of Electrical Energy Storage systems: Electrical storage systems, Double-layer capacitors (DLC) ,Superconducting magnetic energy storage (SMES),Thermal storage systems ,Standards for EES, Technical comparison of EES technologies.

UNIT - V

Applications: Present status of applications, Utility use (conventional power generation, grid operation & service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management

and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA– aggregation of many dispersed batteries.

OUTCOMES: After this course, the student

- Can analyze the characteristics of energy from various sources and need for storage
- Can classify various types of energy storage and various devices used for the purpose
- Can apply the same concepts to real time problems.

TEXT BOOKS

1. Energy Storage Benefits and Market Analysis' by James M. Eyer, Joseph J. Iannucci and Garth P. Corey.
2. The Electrical Energy Storage by IEC Market Strategy Board.

REFERENCE BOOKS:

1. Jim Eyer, Garth Corey: Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. EEE **L T P C**
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OPEN ELECTIVE-II
MECHATRONICS

UNIT – I

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

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

UNIT – II

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

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

UNIT – III

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

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

UNIT – IV

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

UNIT – V

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

TEXT BOOKS

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

REFERENCE BOOKS

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

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.

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JET PROPULSION & ROCKET ENGINEERING
OPEN ELECTIVE-II

Prerequites: None

Course outcomes:

After doing this course, student should be in position to

1. Understand Turbo Jet Propulsion System
2. Analyze the flight performance
3. Understand Principles of Jet Propulsion and Rocketry & Nozzle Theory and Characteristics
4. Learn the Aero thermo chemistry of the combustion products
5. Understand the physics of Solid propellant rocket engine, Liquid Rocket Propulsion System & Ramjet and Integral Rocket Ramjet Propulsion System**:**

Unit - I:

Turbo Jet Propulsion System:

Gas turbine cycle analysis – layout of turbo jet engine. Turbo machinery-compressors and turbines, combustor, blade aerodynamics, engine off design performance analysis.

Flight Performance:

Forces acting on vehicle – Basic relations of motion – multi stage vehicles.

Unit - II:

Principles of Jet Propulsion and Rocketry:

Fundamentals of jet propulsion, Rockets and air breathing jet engines – Classification – turbo jet , turbo fan, turbo prop, rocket (Solid and Liquid propellant rockets) and Ramjet engines.

Nozzle Theory and Characteristics Parameters:

Theory of one dimensional convergent – divergent nozzles – aerodynamic choking of nozzles and mass flow through a nozzle – nozzle exhaust velocity – thrust, thrust coefficient, A_c / A_t of a nozzle, Supersonic nozzle shape, non-adapted nozzles, summer field criteria, departure from simple analysis – characteristic parameters – 1) characteristic velocity, 2) specific impulse 3) total impulse 4) relationship between the characteristic parameters 5) nozzle efficiency, combustion efficiency and overall efficiency.

Unit - III: Aero Thermo Chemistry of The Combustion Products:
Review of properties of mixture of gases – Gibbs – Dalton laws – Equivalent ratio, enthalpy changes in reactions, heat of reaction and heat of formation – calculation of adiabatic flame temperature and specific impulse – frozen and equilibrium flows.

Solid Propulsion System:
Solid propellants – classification, homogeneous and heterogeneous propellants, double base propellant compositions and manufacturing methods. Composite propellant oxidizers and binders. Effect of binder on propellant properties. Burning rate and burning rate laws, factors influencing the burning rate, methods of determining burning rates.

Unit - IV:
Solid propellant rocket engine – internal ballistics, equilibrium motor operation and equilibrium pressure to various parameters. Transient and pseudo equilibrium operation, end burning and burning grains, grain design. Rocket motor hard ware design. Heat transfer considerations in solid rocket motor design. Ignition system, simple pyro devices.

Liquid Rocket Propulsion System:
Liquid propellants – classification, Mono and Bi propellants, Cryogenic and storage propellants, ignition delay of hypergolic propellants, physical and chemical characteristics of liquid propellant. Liquid propellant rocket engine – system layout, pump and pressure feed systems, feed system components. Design of combustion chamber, characteristic length, constructional features, and chamber wall stresses. Heat transfer and cooling aspects. Uncooled engines, injectors – various types, injection patterns, injector characteristics, and atomization and drop size distribution, propellant tank design.

Unit - V: Ramjet and Integral Rocket Ramjet Propulsion System:
Fuel rich solid propellants, gross thrust, gross thrust coefficient, combustion efficiency of ramjet engine, air intakes and their classification – critical, super critical and sub-critical operation of air intakes, engine intake matching, classification and comparison of IIRR propulsion systems.

TEXT BOOKS:
1. Gas Turbines and propulsive systems-P.Khajuria& S.P.Dubey/Dhanpatrai pub.
2. Gas Dynamics & Space Propulsion M.C.Ramaswamy / Jaico Publishing House.

REFERENCE BOOKS:
1. Rocket propulsion –Sutton
2. Gas Turbines /Cohen, Rogers & Sarvana Muttoo/Addision Wesley & Longman.
3. Gas Turbines-V.Ganesan /TMH.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.

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ERGONOMICS
OPEN ELECTIVE-II

Prerequists: None

Objectives:
Provide a broad based introduction to ergonomic principles and their application in the design of work, equipment and the workplace. Consideration is given to musculo-skeletal disorders, manual handling, ergonomic aspects of the environment as well as to the social and legal aspects.

Course Outcomes:
On completing this course successfully the student will be able to:
- understand and apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace;
- understand ergonomic risk assessments and appropriate control measures;
- understand the causes of upper limb disorders and how to reduce them;
- appreciate workplace layout and equipment design;
- appreciate environmental aspects of good ergonomic design.

UNIT I
Introduction to Ergonomics, Human, Machine Systems, Basic Work Systems, Human Relations and Occupational Psychology, Hawthrone Experiments, Participation, Occupational Medicine, Human Performance Psychology, FMJ versus FJM, Human Factors and Ergonomics. Modern Work Systems and Neo, Taylorism, Attempts to Humanize Work, Generic Tools in Ergonomics, Effectiveness and Cost Effectiveness of Ergonomics in General.

UNIT II
Design and Evaluation of Manual Handing Tasks, Anatomy and Biomechanics of Manual Handling, Prevention of Manual Handling Injuries in the Workplace, Design of Manual Handling Tasks.
Body Mechanics at Work: Risk Assessment and Design, Low Back Pain, Biomechanics of Spinal Loading, Ergonomics and Musculoskeletal System in General, Effectiveness and Cost Effectiveness.

UNIT III

Physically Demanding Work: Stress and Fatigue, Physically and Psychologically Demanding Work, Muscles, Structure and Function, and Capacity, Physical work capacity.

User, Cantered Workspace Design Anthropometric Data, Statistical Essentials, Types of Anthropometric Data, Applications Of Anthropometry in Design, Multiple Workspace Configurations, Status of Anthropometry in Ergonomics.

UNIT IV

Human Error, Accidents, and Safety, Micro ergonomics, Human Error, and Accidents, Prevention of Error in Human, Machine Interaction, Macroergonomices: Performance Shaping Factors.

UNIT V

Visual Environment: Measurements and Design, Vision and the Eye, Measurement of Light, Lighting Design Considerations, Visual figure, Eyestrain, and Near Work, Status of Methods in Risk Assessment and Task design.

Hearing, Sound, Noise and Vibration, Measurement of Sound, Hearing Protection, Design of Acoustic Environment.

Text books

1. Introduction to Ergonomics(Third Edition)/ R.S.Bridger/CRC Press , Taylor & Francis Group

References

1. Human factors in Engineering and Design/E.J.McCormick/ TMH Edison
2. Motion and Time Design and Measurement of work/ Barnes Ralph., / John Wiley & sons Newyork, 2002

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JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Mech. Engg.

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MECHATRONICS
OPEN ELECTIVE-II

Pre-requisites: None.

Course objectives:

- They should be able to link up mechanical and electronics.

Outcomes:

- Develop a relationship between mechanical elements and electronics elements for proper functioning of mechanical systems.

UNIT – I

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

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

UNIT – II

PRECISION MECHANICAL SYSTEMS :

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

Note: (text book: Mechatronics HMT – chapter 5)

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

UNIT – III

ELECTROMECHANICAL DRIVES : Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors -

4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.
MICROCONTROLLERS OVERVIEW : 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming –Assembly, C (LED Blinking , Voltage measurement using ADC).

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

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

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

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

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. ECE. **L T P C**
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PRINCIPLES OF ELECTRONIC COMMUNICATIONS
OPEN ELECTIVE-II

Prerequsite : Nil

Course Objectives:
The objective of this subject is to:
- Introduce the students to modulation and various analog and digital modulation schemes.
- They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.

Course Outcomes:
By completing this subject, the student can
- Work on various types of modulations.
- Should be able to use these communication modules in implementation.
- Will have a basic understanding of various wireless and cellular, mobile and telephone communication systems.

Unit 1:
Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

Unit 2:
Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

Unit 3:
Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

Unit 4:
Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.

Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

Unit 5:

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, WCDMA.

Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. Kennady, Davis, Electronic Communications systems, 4e, TMH, 1999

Reference Books:

1. Tarmo Anttalainen, Introduction to Telecommunications Network Engineering, Artech House Telecommunications Library.
2. Theodore Rappaport, Wireless Communications-Principles and practice, Printice Hall, 2002.
3. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
4. Wayne Tomasi, Introduction to data communications and networking, Pearson Education, 2005.

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JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. CSE

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OPEN ELECTIVE-II
DATABASE MANAGEMENT SYSTEMS

Prerequisites

1. A course on “Advanced Data Structures”

Objectives

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Outcomes

1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiarity with database storage structures and access techniques

UNIT I:

Database System Applications: database system Vs. file system, view of data, data abstraction, instances and schemas, data models, the ER model, relational model, other models, database languages, DDL, DML, database access for application programs, database users and administrator, transaction management, database system structure, storage manager, the query processor, history of data base systems, data base design and ER diagrams, beyond ER design entities, attributes and entity sets, relationships and relationship sets, additional features of ER model, concept design with the ER Model, conceptual design for large enterprises.

UNIT II:

Introduction to the Relational Model: integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views, form of basic SQL query, examples of basic SQL

queries, introduction to nested queries, correlated nested queries, set comparison operators, aggregation operators, NULL values, comparison using null values, logical connectivity's, AND, OR and NOT, impact on SQL constructs, outer joins, disallowing NULL values, complex integrity constraints in SQL, triggers and active data bases, Oracle, SQL Server, DB2.

UNIT III:

Relational Algebra: Selection and projection, set operations, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus, Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

Schema refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, dependency preserving decomposition, schema refinement in database design, multi valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT IV:

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity. Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with loss of nonvolatile storage, Advance Recovery systems, Remote Backup systems.

UNIT V:

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

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References:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J. Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. C.S.E.

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OPEN ELECTIVE -II
CYBER SECURITY

Prerequisites

1. A Course on "Network Security and Cryptography"

Objectives

1. The purpose of the course is to educate on cyber security and the legal perspectives of cyber crimes and cyber offenses.
2. Introduce tools and methods for enhancing cyber security.
3. Topics include- cyber crimes, cyber offenses, cyber crimes on mobile and wireless devices, tools and methods to prevent cyber crimes, legal perspectives of cyber crimes and cyber security, computer forensics, Intellectual Property Rights and cyber terrorism

Outcomes

1. Demonstrate the knowledge of cyber security and understand the Indian and Global Act concerning cyber crimes
2. Employ security and privacy methods in the development of modern applications such that personal data is protected; and provide safe Internet usage.

UNIT-I

Introduction to Cybercrime:

Introduction, Cybercrime and Information security, who are cyber criminals, Classification of Cyber crimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cyber crimes.

Cyber offenses: How criminals Plan Them

Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT-II

Cybercrime: Mobile and Wireless Devices

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

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Tools and Methods Used in Cyber Crime:

Introduction, Proxy services and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT III

Cyber crimes and Cyber Security: the Legal Perspectives Introduction

Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment Cyber law, Technology and Students: Indian Scenario.

Understanding Computer Forensics

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques Forensics Auditing

UNIT IV

Cyber Security: Organizational Implications

Introduction, cost of cyber crimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cyber crimes the psychology, mindset and skills of hackers and other cyber criminals

UNIT V

Cybercrime: Illustrations, Examples and Mini-Cases

Examples:

Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases:

The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Illustrations of Financial Frauds in Cyber Domain, Digital Signature-Related Crime Scenarios.

Text book:

1. **Cyber Security**: *Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference book:

1. **Cyber Security Essentials**, James Graham, Richard Howard and Ryan Otson, CRC Press.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Met. Engg.

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CORROSION ENGINEERING
OPEN ELECTIVE-II

Pre-requisites: NIL

Course Objectives:

1. To demonstrate electrometallurgy principles in deposition winning and the efficiency of the bath.
2. To determine corrosion rate/ resistance of metals and alloys.
3. To explain corrosion protection methods and tests.

Course Outcomes:

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

1. To gain knowledge in various types of electrolytic cells and the processes taking place in them.
2. To obtain knowledge about the importance of controlling corrosion and its prevention measures.
3. The course is useful for higher studies, R&D, and also for getting into jobs in industries.

UNIT - I

Introduction, Electro Chemistry principles, electrochemical reactions, Polarization, passivity, environmental effects (oxygen, oxidizers, velocity, temperature, corrosive concentration, Galvanic coupling).

UNIT - II

Corrosion, Introduction, Definition, classification, Forms of corrosion, uniform corrosion,

Two metal corrosion: Sacrificial anode, EMF and Galvanic Series, Environmental effects,

Pitting corrosion: Pit shape and growth, Autocatalytic Nature of pitting, Crevice corrosion.

UNIT - III

Intergranular corrosion: Sensitization, weld decay, Knife-Line attack, Stress corrosion cracking: crack morphology, stress effects, environmental factors, metallurgical factors, Erosion corrosion: cavitation damage, fretting corrosion, Corrosion fatigue.

UNIT - IV

Corrosion prevention methods: Alteration of Environment (Inhibitors), Design, Coatings, cathodic and anodic protection. Material selection, Metallurgical aspects, Hydrogen damage (hydrogen blistering, Hydrogen embrittlement, Prevention).

UNIT - V

Modern theory and applications of corrosion: Introduction, free energy, cell potentials, emf series, applications of thermodynamics to corrosion, Corrosion rate expressions and measurements, corrosion testing.

Text / Reference Books:

1. Theory of Corrosion and Protection of Metals, N. D. Tomashov, Macmillan, 1967.
2. Corrosion Engineering, M. G. Fontana, 3rd edition, McGraw-Hill, 1985.
3. Corrosion and Corrosion Control, H. H. Uhlig, Wiley, 1985.

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Met. Engg.

L	T	P	C
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TESTING OF MATERIALS
OPEN ELECTIVE-II

Pre-requisites: NIL

Course Objectives:

1. To gain and understanding of the response of various metals under the application of stress and/or temperature.
2. To build necessary theoretical back ground of the role of lattice defects in governing bot;h elastic and plastic properties of metals will be discussed.
3. Obtain a working knowledge of various hardness testing machines BHN, VHN, RHN
4. Obtain a working knowledge of creep and fatigue and analysis of data.

Course Outcomes:

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

1. Classify mechanical testing of ferrous and non-ferrous metals and alloys.
2. Recognize the importance of crystal defects including dislocations in plastic deformation.
3. Identify the testing methods for obtaining strength and hardness.
4. Examine the mechanisms of materials failure through fatigue and creep

UNIT – I

Introduction, Importance of testing

Hardness Test: Methods of hardness testing – Brinell, Vickers, Rockwell hardness tests.

The Impact Test: Notched bar impact test and its significance, Charpy and Izod Tests, fracture toughness testing - COD and CTOD tests, significance of transition temperature curve.

UNIT - II

The Tension Test: Engineering stress-strain and True stress-strain curves. Tensile properties, conditions for necking. Stress-Strain diagrams for steel, Aluminum and cast iron.

UNIT - III

Fatigue Test: Introduction, Stress cycles, S-N Curve, Effect of mean stress, Mechanism of fatigue failure, Effect of stress concentration, size, surface condition and environments on fatigue.

UNIT – IV

Creep and Stress Rupture: Introduction, The creep curve, Stress-rupture test, Structural changes during creep, Mechanism of creep deformation, theories of creep. Fracture at elevated temperature.

UNIT – V

NDT: Principle, Operation, Advantages and Limitations of Liquid Penetrant, Magnetic Particle, Radio graphy and Ultrasonic tests.

TEXT / REFERENCE BOOKS:

1. Mechanical Metallurgy – G. E. Dieter
2. Mechanical behavior - Ed. Wulf.
3. Mechanical Metallurgy – White & Lemay.

Testing of Materials - A.V.K. Suryanarayana

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Chemical**. Engg.**

L	T	P	C
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OPEN ELECTIVE-II
SOLID WASTE MANAGEMENT

Objectives:

- To know the Classification of solid waste and characterization of the same
- Understand the sense of onsite handling storage and collection systems including transportation
- Understand the different processing technologies of solid waste

Unit I

Introduction: Definition, characteristics and perspectives of solid waste. Types of solid waste. Physical and chemical characteristics. Variation of composition and characteristics. Municipal, industrial, special and hazardous wastes.

General aspects: Overview of material flow in society. Reduction in raw material usage. Reduction in solid waste generation. Reuse and material recovery. General effects on health and environment. Legislations.

Unit II

Engineered systems: Typical generation rates.Estimation and factors effecting generation rates. On site handling.Storage and processing. Collection systems and devices. Transfer and transport.

Unit III

Processing Techniques: Mechanical volume reduction. Thermal volume reduction. Component separation. Land filling and land forming. Deep well injection.

Unit IV

Material recovery: Mechanical size alteration. Electromagnetic separation. Drying and dewatering. Other material recovery systems. Recovery of biological conversion products. Recovery of thermal conversion products.

Energy recovery: Energy recovery systems and efficiency factors. Determination of output and efficiency. Details of energy recovery systems. Combustion incineration and heat recovery. Gasification and pyrolysis. Refuse derived fuels (RDF).

Unit V

Case studies: Major industries and management methods used in typical industries – Coal fired power stations, textile industry, oil refinery, distillery, sugar industry, and radioactive waste generation units.

Text Books:

1. Howard S. Peavy, Environmental Engineering, McGraw Hill International Edition, 1986.
2. Dutta, Industrial Solid Water Management and Land Filling Practice, Narose Publishing House, 1999.

Reference Books:

1. Sastry C.A., Waste Treatment Plants, Narose Publishing House, 1995.
2. Lagrega, Hazardous Waste Management, McGraw Hill, 1994.

Outcomes:

The student will be able to

- Apply the knowledge of characterization of waste and develop a suitable management plan
- Assess the cost of transportation and laboratory processing of solid waste
- Identify hazardous nature of waste if any and can suggest suitable dumping methods.
- Suggest processing waste for material for energy recovery.

w.e.f. 2017-2018 academic year

OPEN ELECTIVE- III

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Civil Engg.

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OPEN ELECTIVE -III
ENVIRONMENTAL IMPACT ASSESSMENT

Pre Requisites: Environmental Engineering

Course Objectives:

This subject will cover various aspects of Environment Impact Assessment methodologies, impact of development activities. Impact on surface water, Air and Biological Environment, Environment legislation Environment.

Course Outcomes: Environmental Science

UNIT – I

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT-II

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT-III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

UNIT – IV

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

UNIT - V

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

w.e.f. 2017-2018 academic year

Text Books:

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Barthwal, R. R. B. – Environmental Impact Assessment, New Age International Publications

References:

1. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
2. Suresh K. Dhaneja - Environmental Science and Engineering, S.K.,Katania & Sons Publication., New Delhi.
3. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication(P) Ltd, Delhi.
   Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers- Routledge, London, 1992.

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B.Tech. EEE **L T P C**
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OPEN ELECTIVE-III
ENTERPRISE RESOURCE PLANNING

(Students must read text book. Faculty are free to choose any other cases)

Course Aim:

It enables the student to understand the foundations of Enterprise planning and ERP System Options.

Learning Outcome: The student understands the challenges in implementation of ERP system, ERP System Implementation options, and functional modules of ERP.

1. Introduciton to ERP- Foundation for Understanding ERP systems-Buisiness benefits of ERP-The challenges of impelmenting ERP system-ERP modules and Historical Developement.
   Case: Response top RFP for ban ERP system (Mary Sumner).
2. ERP system options & Selection methods-Measurement of project Inpact- information Technology Selection-ERP proposal evaluvation-Project Evaluvation Technique.(David L.olson).
   Case: Atlantic Manufacturing (Mary Sumner).
3 ERP system Installation Options- IS/IT Management results-Risk Identificatioon analysis-System Projects- Demonstation of the system-Failure method-system Architecture & ERP (David L.Olson)
   Case: DataSolutiions & Technology Knowledge (Mary Sumner).
4 ERP - sales and Marketing- Managment control process in sales and markring-ERP custoemr relatonship managment-ERP systems-Accounting & Fiance control processes. Fiancial modules in ERP systems.
   Case: atalantic manufacturing (Mary Sumner).
5 ERP – Produciton and Material Managment-Control process on produciton and manuifacturing-Produciton module in ERP- supply chain Managmeent & e-market place-e-businesss & ERP-e supply chian & ERP- Future directions for ERP.
   Case: HR in atalntic manufacturing. (Mary Sumner).

w.e.f. 2017-2018 academic year

Text Book:

1. **Mary Sumner " Enterprice Resource Planning" Pearson, 2012**.

Referencs:

1. David L.Olson " Managerial Issues in ERP systems" TMH 2012.
2. Ellen Monk "Enterprice Resource Planning" Cengage, 2012.
3. Alexis Leon "Enterprice Resource Planning" 2e, TMH ,2012
4. Goyal "Enterprice Resource Planning" TMH, 2012
5. Jagan Nathan Vaman "ERP Srategies for Steering Orgnizationsal competence and competetive Advantage" TMH, 2012.

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OPEN ELECTIVE-III

MANAGEMENT INFORMATION SYSTEM (MIS)

The objective of the course is to provide the basic concepts of Enterprise Resource Planning and Management of Information System.

Unit – 1: Introduction to IS Models and Types of Information systems – Nolan Stage Hypothesis, IS Strategic Grid, Wards Model, Earl's Multiple Methodology, Critical Success Factors, Soft Systems Methodology, Socio-Technical Systems Approach (Mumford), System Develop Life Cycle, Prototype and End User Computing, Application Packages, Outsourcing, Deciding Combination of Methods. Types of Information Systems

Unit – 2: IS Security, Control and Audit– System Vulnerability and Abuse, business value of security and control, Need for Security, Methods of minimizing risks IS Audit, ensuring system quality.

Unit – 3: Induction to ERP: Overview of ERP, MRP, MRPII and Evolution of ERP, Integrated Management Systems, Reasons for the growth of ERP, Business Modeling, Integrated Data Model, Foundations of IS in Business, Obstacles of applying IT, ERP Market- ERP Modules: Finance, Accounting Systems, Manufacturing and Production Systems, Sales and Distribution Systems, , Human Resource Systems, Plant Maintenance System, Materials Management System, Quality Management System, ERP System Options and Selection, ERP proposal Evaluation.

Unit – 4: Benefits of ERP: Reduction of Lead Time, On-Time Shipment, Reduction in Cycle Time, Improved Resource Utilisation, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design Making Capabilities.

Unit – 5: ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to Attain Success, User Training, Maintaining ERP & IS**.** Case Studies.

w.e.f. 2017-2018 academic year

References

- Gordon B. Davis & Margrethe H.Olson: Management Information Systems, TMH, 2009.
- C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
- Alexis Leon: ERP (Demystified), 5/E, Tata McGraw-Hill, 2009.
- C.S.V.Murthy: Management Information System, Himalaya,2009
- James A. Obrein: Management Information Systems, TMH, 2009
- David L Olson: Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, International Edition-2009.
- Rainer, Turban, Potter: Introduction to Information Systems, WILEY-India, 2009.
- Vaman, ERP in Practice, TMH, 2009
- Dharminder and Sangeetha: Management Information Systems, Excel, 2009
- Gerald V.Post, David L Anderson: Management Information Systems, Irvin McGraw Hill, 2009.
- Monk: Concepts in ERP, Cengage, 2009
- Olson: Managerial Issues of ERO, TMH, 2009
- Motiwala:Enterprise Resource Planning, Pearson 2009
- Miller:MIS—Cases, Pearson, 2009

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OPEN ELECTIVE-III
ORGANIZATIONAL BEHAVIOUR

The objective of the course is to provide the students with the conceptual framework and the theories underlying Organisational Behaviour.

Unit-1: Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organisational Behaviour. Cognitive Processes-I : Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization - Social perception – Attribution Theories – Locus of control –Attribution Errors –Impression Management.

Unit-2: Cognitive Processes-II: Personality and Attitudes - Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organisational commitment-Motivational needs and processes- Work-Motivation Approaches Theories of Motivation-Motivation across cultures - Positive organizational behaviour: Optimism – Emotional intelligence – Self-Efficacy.

Unit-3: Dynamics of OB-I: Communication – types - interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision making techniques – creativity and group decision making . Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict - strategies to cope with stress and conflict.

Unit-4: Dynamics of OB –III Power and Politics: Meaning and types of power – empowerment - Groups Vs. Teams – Nature of groups – dynamics of informal groups – dysfunctions of groups and teams – teams in modern work place.

Unit-5: Leading High performance: Job design and Goal setting for High performance- Quality of Work Life- Socio technical Design and High performance work practices - Behavioural performance management: reinforcement and punishment as principles of Learning –Process of Behavioural modification - Leadership theories - Styles, Activities and skills of Great leaders.

References

- Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009
- McShane: Organizational Behaviour, 3e, TMH, 2008
- Nelson: Organizational Behaviour, 3/e, Thomson, 2008.
- Newstrom W.John & Davis Keith, Organisational Behaviour--Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.
- Pierce and Gardner: Management and Organisational Behaviour: An Integrated perspective, Thomson, 2009.
- Robbins, P.Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson , New Delhi, 2009.
- Pareek Udai: Behavioural Process at Work:,Oxford &IBH, New Delhi, 2009.
- Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.
- Hitt: Organizational Behaviour,Wiley, 2008
- Aswathappa: Orgganisational Behaviour,7/e,Himalaya, 2009
- Mullins: Management and Organisational Behaviour, Pearson, 2008.
- McShane,Glinow: Organisational Behaviour--Essentials, TMH, 2009.
- Ivancevich: Organisational Behaviour and Management, 7/e, TMH, 2008.

w.e.f. 2017-2018 academic year

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B.Tech. Mech. Engg.

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FUNDAMENTALS OF ROBOTICS
OPENELECTIVE -III

Pre-Requiests: None

Course outcomes:
After this completion of this course, the student should be able to understand thre basic components of robots, differentiate types of robots and robot grippers, model forward and inverse kinematics of robot manipulators, analyse forces in links and joints of a robot, programme a robot to perform tasks in industrial applications, design intelligent robots using sensors.

Unit 1
Robotics-Introduction-classification with repect to geometrical configuration (Anatomy) , Controled system & chain type:. Serial manipulator & Parallel Manipulator. Components of Industrail robotics-Precesion of movement-resolution, accuracy & repeatability-Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors,& Velocity sensors,External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

Unit 2
Grippers - Mechanical Gripper-Grasping force-Engelberger-g-factors-mechanisms for actuation, Magnetic gripper , vaccume cup gripper-considerations in gripper selection & design . Industrial robots spefications.Selection based on the Application.

Unit 3
Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematicsfor planar serial robots

Unit 4
Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, bleding scheme. Introduction Cartesian space scheme.

w.e.f. 2017-2018 academic year

ontrol- Interaction control, Rigid Body mechanics, Control architecture-position, path velocity and force control systems, computed torque control, adaptive control, and Servo system for robot control.

Unit 5
Programming of Robots and Vision System-Lead through programming methods- Teach pendent- overview of various textual programming languages like VAL etc.
Machine (robot) vision:

Textbooks:
1. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., *Robotics control, Sensing, Vision and Intelligence*, McGraw-Hill Publishing Company, New Delhi, 2003.
2. Industrail Robotics/Grover/ McGraw hill
3. Robotics/ Mittal and Nagarath/ TMH

REFERENCE BOOKS:

1 Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley
2 Robot Analysis and control Asada and Slotine / Wiley Inter-Science
3 Introduction to Robotics / John J Craig / Pearson Education

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B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
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NON-CONVENTIONAL SOURCES OF ENERGY
OPEN ELECTIVE-III

Pre-requisites: None

Course Outcomes:
At the end of the course, the student will be able to identify renewable energy sources and their utilization. Understand the basic concepts of solar radiation and analyze the working of solar and thermal systems. Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas and hydrogen. Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator. Identify methods of energy storage for specific applications

UNIT – I
PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - II
SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/cooling techniques, solar distillation and drying, photovoltaic energy conversion.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT - III
BIO-MASS: Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation, and economic aspects.

w.e.f. 2017-2018 academic year

UNIT – IV
GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.
OCEAN ENERGY – OTEC, Principles, utilization, setting of OTEC plants, thermodynamic cycles. Tidal and Wave energy: Potential and conversion techniques, mini-hydel power plants, their economics.

UNIT –V
DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:
1. Renewable Energy Resources / Tiwari and Ghosal / Narosa
2. Non- conventional Energy Sources / G.D. Rai
3. Biological Energy Resources/ Malcolm Fleischer & Chris Lawis.

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

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B.Tech. Mech. Engg.	**L**	**T**	**P**	**C**
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ASPECTS OF HEAT TRANSFER IN ELECTRONICALLY CONTROLLED UNITS
OPEN ELECTIVE-III

Pre-requisites: None

Outcomes:
After the course student should be able to analyse conduction, convection and radiation heat transfer modes, heat generation, conduction and dissipation in electronically controlled units.

UNIT-I
Conduction Heat transfer: Modes of heat transfer, Fourier's law of steady state heat conduction (one dimensional conduction), thermal conductivity and its unit, conduction through slab or plane wall, hollow cylinders and spheres conduction through composite walls and hollow cylinders and spheres with multi-layers, Convective heat transfer, Newton's law of cooling, electrical analogy and overall heat transfer coefficient, numerical problems

UNIT-II
Convective and radiation Heat transfer:
Dimensional analysis as a tool for experimental investigation, Buckingham pi theorem and method, radiation and radiation properties of surfaces, black body, emissive power, Stefan Boltzmann's law, emissivity, monochromatic emissive power and monochromatic emissivity, grey body, Kirchoff's law, Wien's displacement law, numerical problems.

UNIT - III
Cooling of Electronic equipment:
Introduction and history, manufacturing of electronic equipment, cooling load of electronic equipment, thermal environment, electronics cooling in different applications, conduction cooling, air cooling: natural convection and radiation, air cooling: forced convection, liquid cooling, immersion cooling, heat pipes, cooling of chips, PCBs, computers, logic chips etc.

w.e.f. 2017-2018 academic year

UNIT - IV
Refrigeration and Air conditioning: Introduction to refrigeration, necessity and applications, unit of refrigeration and cop, Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

UNIT-V
Heat pipes: structure – operation - construction - thermal resistance-performance characteristics - effects of working fluid and operating temperature, wick - selection of material - pore size, applications.

Text books:
1. Heat Transfer- A practical approach by Yunus A. Cengel,Tata Mc Graw-Hill Edition
2. Heat Transfer – A conceptual approach – P.K.Sarma & K.Rama Krishna/New age
3. A course in Refrigeration and Air conditioning – SC Arora and & Domkundwar / Dhanpatrai

Reference books:
1. Fundamentals of Engineering, Heat and mass transfer – R.C. Sachdeva/New Age
2. Heat & mass Transfer – D.S.Kumar/S.K.Kataria & sons

w.e.f. 2017-2018 academic year

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. ECE.	**L**	**T**	**P**	**C**
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PRINCIPLES OF COMPUTER COMMUNICATIONS AND NETWORKS
OPEN ELECTIVE-III

Prerequisite : Nil

Course Objectives:

- To understand the concept of computer communication.
- To learn about the networking concept, layered protocols.
- To understand various communications concepts.
- To get the knowledge of various networking equipment.

Course Outcomes:

- The student can get the knowledge of networking of computers, data transmission between computers.
- Will have the exposure about the various communication concepts.
- Will get awareness about the structure and equipment of computer network structures.

UNIT-I

Overview of Computer Communications and Networking :

Introduction to Computer Communications and Networking , Introduction to Computer Network , Types of Computer Networks, Network Addressing, Routing , Reliability, Interoperability and Security, Network Standards, The Telephone System and Data Communications.

UNIT-II

Essential Terms and Concepts :

Computer Applications and application protocols, Computer Communications and Networking models, Communication Service Methods and data transmission modes, analog and Digital Communications , Speed and capacity of a Communication Channel, Multiplexing and switching, Network architecture and the OSI reference model.

UNIT-III

Analog and Digital Communication Concepts :

Representing data as analog signals, representing data as digital signals, data rate and bandwidth reduction , Digital Carrier Systems.

UNIT-IV

Physical and data link layer Concepts:

The Physical and Electrical Characteristics of wire, Copper media, fiber optic media, wireless Communications. Introduction to data link Layer , the logical link control and medium access control sub-layers.

UNIT-V

Network Hardware Components:

Introduction to Connectors, Transreceivers and media convertors, repeaters, network interference cards and PC cards, bridges, switches, switches Vs Routers.

Text Books:

2. Computer Communications and Networking Technologies, Michel A. Gallo and William H. Hancock, Thomson Brooks / Cole.

Reference Books:

1. Principles of Computer Networks and Communications, M. Barry Dumas, Morris Schwartz, Pearson.

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B.Tech. C.S.E	**L**	**T**	**P**	**C**
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OPEN ELECTIVE -III
WEB TECHNOLOGIES

Prerequisites

1. A Course on "Computer Programming and Data Structures"

Objectives

1. To learn the basic web concepts and Internet protocols
2. To introduce XML and processing of XML data
3. To introduce client side scripting with Javascript and DHTML
4. To introduce server side programming with Java servlets and JSP

Outcomes

1. Ability to create dynamic and interactive web sites
2. Gain knowledge of client side scripting using java sript and DHTML.
3. Demonstrate understanding of what is XML and how to parse and use XML data
4. Able to do server side programming with Java Servelets and JSP

UNIT I: Introduction

Web Essentials - Clients, Servers and Communication: The Internet, Basic Internet Protocols: TCP/IP, UDP, DNS, The World Wide Web: Hypertext Transport Protocol, HTTP Request Message, HTTP Response Message, Web Clients, Web Servers.

Markup Languages – **HTML**: Basic Tags, Forms, Style sheets

UNIT II: Client-Side Programming

Introduction to JavaScript, JavaScript in Perspective, Basic Syntax, Variables and Data Types, Statements, Operators, Literals, Functions, Objects, Arrays, Built-in Objects, JavaScript Debuggers.

Host Objects - Browsers and the DOM: Introduction to the Document Object Model, Intrinsic Event Handling, Modifying Element Style, The Document Tree, DOM Event Handling.

UNIT III: Server-Side Programming

Java Servlets: Servlet Architecture, Servlets Generating Dynamic Content, Servlet Life Cycle, Parameter Data, Sessions, Cookies, URL Rewriting, Case Study.

w.e.f. 2017-2018 academic year

UNIT IV: Representing Web Data

XML: XML Documents and Vocabularies, XML Versions and the XML Declaration, XML Namespaces, DOM-Based XML Processing, Event-oriented Parsing: SAX, Transforming XML Documents, Selecting XML Data: XPath, Template-based Transformation: XSLT, Displaying XML Documents in Browsers, Case Study.

UNIT V: Separating Programming and Presentation

JSP Technology: Introduction to JavaServer Pages, Running JSP Applications, Basic JSP, JavaBeans Classes and JSP, Tag Libraries and Files, Support for the Model-View-Controller Paradigm, Case Study.

TEXT BOOKS:

1. Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education

REFERENCES:

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition.
2. J2EE: The complete Reference By James Keogh, McGraw-Hill
3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson
4. Paul Dietel and Harvey Deitel, "Java How to Program", Prentice Hall of India, 8th Edition
5. Web technologies, Black Book, Dreamtech press.
6. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India

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B.Tech. C.S.E

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OPEN ELECTIVE -III
SIMULATION AND MODELING

Prerequisites

1.A course on “Computer Oriented Statistical Methods”

Objectives

1. The overall aim of the course is to provide an understanding of methods, techniques and tools for modeling, simulation and performance analysis of complex systems
2. The topics include system models and studies; random number generation; simulation of continuous and discrete systems; simulation of queuing systems and pert networks
3. The course also provides practical knowledge of simulation experimentation and introduces simulation languages.

Outcomes

1. Ability to construct a model for a given system/set of data.
2. Ability to generate and test random number variates and apply them to develop simulation models.
3. Ability to interpret the model and apply the results to resolve issues in a real world environment

Unit-I: System Models and Studies

System Models: Concepts of a System, System Environment, Stochastic Activities, Continuous and Discrete Systems, System Modeling, Types of Models, Static Physical Models, Dynamic Physical Models, Static Mathematical Models, Dynamic Mathematical Models, Principles Used in Modeling.

System Studies: Subsystems, A Corporate Model, Environment Segment, Production Segment, Management Segment, The Full Corporate Model, Types of System Study, System Analysis, System Design, System Postulation

Unit-II: Random Numbers

Random Number Generation: Properties, Generation of Pseudo-Random Numbers, Techniques of generating random numbers, tests for random numbers

Random-Variate Generation: Inverse-Transform Technique, Acceptance-Rejection Technique, Special Properties.

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Unit-III: Simulation of Continuous and Discrete Systems

Simulation of Continuous Systems: A chemical reactor, Numerical integration vs. continuous system simulation, Selection of an integration formula, Runge-Kutta integration formulas, Simulation of a servo system, Simulation of a water reservoir system, Analog vs. digital simulation.

Discrete System Simulation: Fixed time-step vs. event-to-event model, On simulating randomness, Generation of random numbers, Generation of non-uniformly distributed random numbers, Monte-Carlo computation vs. stochastic simulation.

Unit-IV: System Simulation

Simulation of Queuing Systems: Rudiments of queuing theory, Simulation of a single-server queue, Simulation of a two-server queue, Simulation of more general queues.

Simulation of a Pert Network: Network model of a project, Analysis of activity network, Critical path computation, Uncertainties in activity durations, Simulation of activity network, Computer program for simulation, Resource allocation and cost considerations.

Unit-V: Simulation Experimentation

Design and Evaluation of Simulation Experiments: Length of simulation runs, Variance reduction techniques, Experimental layout, Validation.

Simulation Languages: Continuous and discrete simulation languages, Continuous simulation languages, Block-structured continuous simulation languages, Expression-based languages, Discrete-system simulation languages, GPSS.

Text Books

1. System Simulation, Geoffrey Gordon, Prentice-Hall of India Private Limited, Second Edition, 1978. (for Unit-I: Chapters 1 and 2)
2. Discrete-Event System Simulation, Jerry Banks, John S. Carson II, Barry L. Nelson, David M.Nicol, Pearson, Fifth Edition, 2010. (for Unit-II: Chapters 7 and 8)
3. System Simulation with Digital Computer, Narsingh Deo, Prentice-Hall of India Private Limited, 1979. (for Unit-III to V: Chapters 2 to 5 and 7,8).

Reference Books

1. System Modeling and Simulation: An Introduction, Frank L. Severance, Wiley Publisher, 2005

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Met. Engg.

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SURFACE ENGINEERING
OPEN ELECTIVE-III

Pre-requisites: Thermodynamics, Physical Metallurgy.

Course Objectives:
1. To provide a state- of- the art knowledge to the students and various surface engineering techniques.

Unit- I
Introduction to surface modification, need for surface modification, surface properties, surface property modification, history of surface modification

Unit-II
Plating and coating process: concept of coating, types of coatings, properties of coatings, hard facing, anodizing, PVD, CVD, Electro deposition Electro less deposition, hot deposition, hot dipping.

Unit-III
Thermo-chemical Processes: carburizing, nitriding, carbonitriding, nitro carburizing, Boronising, Plasma nitriding, thermal spraying, Plasma spraying.

Unit-IV
Thermal Processes: hardening, tempering, laser hardening, laser surface alloying, laser cladding, electro beam hardening.

Unit-V
General design principles related to surface engineering, design guidelines for surface preparation, surface engineering solution to specific problems.

Course Outcomes:
1. This course provides an opportunity to the students to engineer the microstructure for an enhanced performance based on the need in actual practice.

w.e.f. 2017-2018 academic year

Text books/ References:
1. Advanced thermal assisted surface engineering processes, Ramnarayan, Chattopadhyay,Kluwer Academy Publishers.
2. Surface engineering of metals: principles, Equipment and techniques, Tadeusz Burokowski, Tadeusz Wierzchon, CRCProcess.
3. Advanced techniques for surface engineering, W.Gissler, Herman A.Jehn, Kluwar Academy Publishers
4. Laser material processing, W.Steen, Springer

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B.Tech. Met. Engg.

L	T	P	C
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NANOMATERIALS
OPEN ELECTIVE-III

Pre-requisites: Physics, chemistry

Course Objective:

1. This course is primarily intended to expose the students to a highly interdisciplinary subject.
2. This would emphasize on the classification, synthesis and applications of Nano materials.

Course Outcomes:

The student will be able to design a component/material that would provide us a 'better tomorrow' via nanotechnology.

Unit -I

Introduction

What is Nano —Why Nano - Properties at Nano Scales, Advantages and Disadvantages, top down and bottom up approaches, General applications of Nano materials.

Unit-II

Materials of Nano Technology

Introduction- Si based materials –Ge- based materials- Ferro electric materials –Polymer Materials GaAs and InP (III-V) Group materials.

UNIT-III

Nano Particles: Introduction Synthesis procedures -- wet chemical approach & physical vapor synthesis approach, size effect and shape change and their properties —examples of systems involved characterization techniques properties & their applications

UNIT- IV

Nano Wires: Introduction --- Various synthesis procedures (template assisted method and VLS methods) Principles, characterization procedures, properties and applications of Nano wires

Carbon Nano Tubes: Synthesis procedures properties and applications of carbon Nano tubes.

w.e.f. 2017-2018 academic year

UNIT-V

Thin films deposition and Doping. Applications of Thin films.

TEXT / REFERENCE BOOKS

1. Nano Materials: A. K. Bandyopadyay, New age Publications
2. Nano Essentials: T. Pradeep, TMH
3. Springer Handbook of Nanotechnology
4. The Guest for new materials Auther S. T. Lakshmi Kumar, Published by Vigyan Prasar.
5. Nano – The Essentials: C – Pradeep (IIcue Professor), McGraw Hill
6. Nano Materials Synthesis, Properties and applications, 1996, Edlstein and Cammarate

JNTUH COLLEGE OF ENGINEERING HYDERABAD

B.Tech. Chemical**. Engg.**

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INDUSTRIAL SAFETY & HAZARD MANAGMENT

OPEN ELECTIVE-III

Objective: The student will be exposed to various industrial hazards and prevention and control methods

UNIT I

Introduction: Safety program, Engineering ethics, Accident and loss statistics, Acceptable risk, Public perception.

UNIT II

Toxicology: How toxicants enter biological organisms, How toxicants are eliminated from biological organisms.

Industrial Hygiene: Government regulations, Identification, Evaluation, Control.

UNIT III

Fires and Explosions: The fire triangle, Distinction between fire and explosions; Definitions, Flammability characteristics of liquids and vapors, MOC and inerting, ignition energy, Auto ignition, Auto oxidation, Adiabatic compression, Explosions.

UNIT IV

Designs to prevent fires and explosions: Inerting, Explosion proof equipment and instruments, Ventilations, Sprinkler systems.

Introduction to Reliefs: Relief concepts, Definitions, Location of reliefs, Relief types, Data for sizing reliefs, Relief systems.

UNIT V

Relief Sizing: Conventional spring operated reliefs in liquids, Conventional spring operated relief's in vapor or gas service, Rupture disc relief's in liquid, vapour or gas service.

Hazards Identification: Process hazards checklists, Hazard surveys, Hazop safety reviews.

w.e.f. 2017-2018 academic year

TEXT BOOK:

1 Chemical Process Safety (Fundamentals with applications), D.A.Crowl & J.F.Louvar, Prentice Hall, New Jersey,(1990).

REFERENCES:

1. Safety and Accident Prevention in Chemical Operations, 2nd ed., H. H. Fawcett and W.S. Wood, John Wiley and Sons, New York 1982
2. Coulson and Richardson's – Chemical Engineering, Vol.6, R.K.Sinnot, , Butterworth-Heinmann Limited 1996.

OUTCOME: The student will be equipped with the knowledge by which thorough safety is ensured in the organization.

Prerequisite: Nil