ACADEMIC REGULATIONS, COURSE STRUCTURE

AND DETAILED SYLLABUS

UNDER

CHOICE BASED CREDIT SYSTEM (CBCS)

Effective from the Academic Year 2015-16

CIVIL ENGINEERING (CE)

For

B. Tech. Four Year Degree Course

(MR-15 Regulations)

MALLAREDDY ENGINEERING COLLEGE (Autonomous)

(An Autonomous Institution approved by UGC and affiliated to JNTUH, Approved by AICTE & Accredited by NAAC with 'A' Grade and NBA & Recipient of World Bank Assistance under TEQIP Phase – II, S.C 1.1)

Maisammaguda, Dhulapally (Post & Via Kompally), Secunderabad-500 100

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

MR 15 – ACADEMIC REGULATIONS (CBCS) FOR B.Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of B.Tech. (Regular) programme from the Academic Year ***2015-16*** and onwards

The B.Tech. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

VISION

To establish a reputable professional education centre, to impart high quality trend setting technologies in an ambience of humanity, wisdom, intellect and innovation to nurture the students to become competent and committed professionals with disciplined ethical values.

MISSION

Commitment to progress in mining new knowledge by adopting cutting-edge technologies to promote academic growth by offering state-of-the-art undergraduate and postgraduate programmes based on well-versed perceptions of global areas of specialization to serve the nation with advanced technical knowledge.

DEPARTMENT VISION

Striving to be the centre of excellence in civil engineering education. To provide students the latest learning techniques and complete knowledgebase for sustainable development of society.

DEPARTMENT MISSION

Provide value based technical education and empower the students to become competent professionals.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To provide students with a solid foundation in Mathematical, Scientific, software skills and Engineering fundamentals required to solve engineering problems and also to pursue higher studies.

PEO2: To train students with good scientific and engineering breadth so as to comprehend, analyze, design and create novel products and solutions for the real life problems.

PEO3: To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach and ability to relate engineering issues to broader social context.

PROGRAMME OUTCOMES (POs)

a	an ability to apply knowledge of mathematics, science, and engineering,
b	an ability to design and conduct experiments, as well as to analyze and interpret data,
c	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
d	an ability to function on multidisciplinary teams,
e	an ability to identify, formulate, and solve engineering problems,
f	an understanding of professional and ethical responsibility,
g	an ability to communicate effectively,
h	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,
i	a recognition of the need for, and an ability to engage in life-long learning,
j	a knowledge of contemporary issues,
k	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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

MREC (Autonomous) offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2015 - 16 onwards, in the following branches of Engineering

Serial Number	Branch Code	Branch
1	01	CIVIL ENGINEERING (CE)
2	02	ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)
3	03	MECHANICAL ENGINEERING (ME)
4	04	ELECTRONICS AND COMMUNICATION ENGINEERING (ECE)
5	05	COMPUTER SCIENCE AND ENGINEERING (CSE)
6	25	MINING ENGINEERING (MinE)

2. 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 (TSEAMCET), or the University, or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.

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

3. B.Tech. Programme (UGP) Structure

3.1 The B.Tech. Programmes of MREC (A) are of Semester Pattern, with 8 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 8 Semesters, with the academic year being divided into two Semesters of 22 weeks 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: Practical 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, Study Tour, Guest Lecture etc., and identified Mandatory / Audit 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 (FC),
(b) Core Courses (CC),
(c) Elective Courses (EC),
(d) Mandatory Courses (MC),
(e) Audit Courses (AC),
(f) Minor Courses (MiC)

- **Foundation Courses (FC**) are further categorized as:
  - (i) Humanities and Social Sciences (HS)
  - (ii) Basic Sciences (BS)
  - (iii) Engineering Sciences (ES).
- **Core Courses (CC) and Elective Courses (EC)** are categorized as Professional Subjects (PS), which are further subdivided as –
  - (i) Professional/ Departmental Core (PC) Subjects,
  - (ii) Professional/ Departmental Electives (PE),
  - (iii) Open Electives (OE);
  - (iv) Project Related (PR).
- **Mandatory Courses** (**MC** - Non-credit with evaluation).
- **Audit Courses** (**AC** – Non- credit without evaluation).
- **Minor Courses** (**MiC** – One or two credit courses)

3.2.4 Course Nomenclature:

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

Sl. No.	Classification		Course Work – Subject Area	Distribution of credits	as per AICTE
	AICTE	UGC			
1	HS	Foundation Courses	Humanities and Social sciences including English, Environmental Sciences and Management subjects	9.24	5- 10 %
2	BS		Basic Sciences (BS) including Mathematics, Physics, Chemistry.	15.76	15- 20%
3	ES		Engineering sciences (ES), including Engineering Workshop, Engineering Graphics, Basics of Electrical Electronics / Mechanical / Computer Engineering	17.39	15 – 20%
4	PC	Core Courses	Professional Core subjects are relevant to the chosen specialization/branch; (May be split into Hard (no choice) and Soft (with choice), if required.	33.15	30 – 40%
5	PR	Project Related	Minor and Major Projects, Technical Seminar and comprehensive viva-voce.	9.78	10 – 15%
6	PE	Professional Electives	Professional Electives are relevant to the chosen specialization/ branch;	9.78	10– 15 %
7	OE	Open Electives	Open Electives are the courses from other technical and/or emerging subject areas	4.89	5 – 10 %
8	MC	Mandatory Courses	These courses are non-credit courses with evaluation.	-	-
9	AC	Audit Courses	These courses are non-credit courses without evaluation	-	-
10	MiC	Minor Courses	These are one or two credit courses intended to improve the skills of the student in placements and entrepreneurship.	-	-
Total credits for UGP (B.Tech.)					**184 (100%)**

4. 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 course work). Further 2 years of extension is allowed for appearing examinations.

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 Total number of credits to be secured are 184 out of 184 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 on the Under Graduate Programme (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 within 15 days from the commencement of class work for the first semester through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'SUBSEQUENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'CURRENT SEMESTER'.

5.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from the Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it 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 deviation of ± 3 credits of the semester with minimum credits of 19 and maximum credits of 27, 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. It needs specific approval and signature of the Faculty Advisor/Counselor and Head of the Department.

5.5 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.

5.6 Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they 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 the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.7 For Audit Courses like Sports and NSS, Computational Mathematics Lab etc, a '**Satisfactory Participation Certificate**' from the concerned authorities for the relevant Semester is essential. No Marks or Credits shall be awarded for these activities.

5.8 For Mandatory Courses, a '**Satisfactory / Not Satisfactory' grade** is awarded based on the performance in both CIE and SEE.

6. 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 40 Students opt for the same. The Maximum Strength of a Section is limited to 70.

6.3 More than ONE TEACHER may offer the SAME SUBJECT (Lab / Practical 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 the 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. Attendance Requirements

7.1 A student shall be eligible to appear for the Semester End Examinations, if he acquires a minimum of 75% of attendance in aggregate of all the Subjects/ Courses (excluding 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 such as Medical, NSS, Sports and Games,** 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 register their Semester End Examinations, 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. Academic Requirements

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

8.1 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 40% marks (24 out of 60 marks) in the Semester End Examination, and a minimum of 40% of the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) marks taken together (i.e. 40 marks); 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 – Minor Project/Technical Seminar/Major Project, if he secures not less than 40% of the total marks to be awarded for each. The student would be treated as failed, if he - (i) does not submit a report on his Minor Project / Technical Seminar / Major Project, or does not make a presentation of the same before the Evaluation Committee as per schedule, or (ii) secures less than 40% of marks in Minor Project/ Technical Seminar/Major Project 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 Promotion Rules: Every Student has to fulfil the Attendance and Academic Requirements by securing the required credits as shown below:

S.No.	Semester		Requirement
	From (Even)	To (Odd)	
1	II	III	**50%** of registered credits are required upto II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
2	IV	V	**60%** of registered credits are required upto IV Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
3	VI	VII	**60%** of registered credits are required upto VI Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.4 A Student shall - register for all Subjects covering 184 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 184 Credits securing a minimum of P Grade (Pass Grade) or above in each Subject, and 'earn all 184 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.

8.5 After securing the necessary 184 Credits as specified for the successful completion of the entire UGP, an exemption of 6 secured Credits (in terms of two of their corresponding Subjects/Courses) may be permitted for optional drop out from these 184 Credits earned; resulting in 178 Credits for UGP performance evaluation, i.e., the performance of the Student in these 178 Credits shall alone be taken into account for the calculation of 'the final CGPA (at the end of UGP, which takes the SGPA of the VIII Semester into account)' , and shall be indicated in the Grade Card of VIII Semester; however, the Student's Performances in the earlier individual Semesters, with the corresponding SGPA and CGPA for which already Grade Cards are given, will not be altered. **Further, optional drop out for such 6 secured Credits shall be allowed only for professional and open electives**.

8.6 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 184 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 184 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 to 8.7 above.

8.7 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 that 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.

8.8 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 that Batch into which he gets readmitted.

8.9 A student eligible to appear in the Semester End 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 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. Evaluation - Distribution and Weightage of Marks

The performance of a student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory or Practicals or Seminar or Drawing/Design or Minor Project or Minor Course, etc., For all Subjects/ Courses, the distribution shall be 40 marks for CIE, and 60 marks for the SEE inclusive of minor and mandatory courses. However, the B.Tech. Major Project will be evaluated for 200 Marks. These evaluations shall be based on 20% CIE (Continuous Internal Evaluation) and 80% SEE (Semester End Examination), and a Letter Grade corresponding to the % marks obtained shall be given. Students have to choose Open Electives from the given list. However, Students should not choose an Open Elective offered by their own (parent) Department, if it is already listed under any category of the courses offered by parent Department in any Semester.

9.1 Theory Courses:

9.1.1 Continuous Internal Evaluation (CIE):

During the Semester, there shall be **2 mid-term examinations** for 40 marks each. Each mid-term examination consists of online **objective paper** for 10 marks with duration of **20 minutes** and **subjective paper** for 20 marks with duration of **90 minutes**. Further, there will be an allocation of 5 marks each for Assignment and Attendance. Objective paper may be set with multiple choice questions. Subjective paper shall contain 6 questions, out of which the Student has to answer 4 questions, each for 5 marks.

The allotment of 5 marks for attendance is as given below:

S.No.	% of Attendance Range	Marks
1	> 90 and ≤ 100	5
2	> 85 and ≤ 90	4
3	> 80 and ≤ 85	3
4	> 75 and ≤ 80	2
5	≥ 70 and ≤ 75	1

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.

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 midterm examinations. The Assignments shall be as specified by the concerned subject teacher.

The first mid-term examination Marks, first Assignment Marks and relative attendance marks shall make one set of CIE Marks, and the second mid-term examination Marks, second Assignment Marks and relative attendance marks shall make second set of CIE

Marks; and 70% of the best performed plus 30% of the other shall be taken as the final marks secured by the Student towards Continuous Internal Evaluation in that Theory Subject.

9.1.2 Semester End Examination (SEE):

The distribution of marks is as given below:

Semester End Examination				
Part	**Type of Questions**	**No. of questions to be answered**	**Marks per question**	**Total**
Part A	Compulsory Questions (One from each module)	5	2	10
Part B	Choice Questions (5 out of 8) (Minimum one from each module)	5	10	50
Grand Total				60

9.2 Practical Courses:

9.2.1 Continuous Internal Evaluation (CIE):

There will be CIE for 40 marks, shall be awarded with a distribution of 20 marks for day-to-day performance and timely submission of lab records, 5 marks for viva-voce, 15 marks for internal lab exam (best out of two exams).

9.2.2 Semester End Examination (SEE):

There will be SEE for 60 marks, shall be awarded with a distribution of 20 marks for write-up on the given experiment, 20 marks for proficiency in the exam, 10 marks for results and 10 marks for viva-voce. For conducting SEE, one internal examiner and one external examiner will be appointed by the Chief Controller of Examinations of the College. The external examiner should be selected from outside the College among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

9.3 Design and/or Drawing:

For these Subjects, (such as Engineering Graphics, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 40 marks for **CIE** (20 marks for day-to-day work, 20 marks for internal test with a duration of 120 minutes(better out of two exams)). 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. The **SEE** will be evaluated for 60 marks.

9.4 Gender Sensitization:

9.4.1 Continuous Internal Evaluation (CIE):

There will be CIE for 40 marks shall be awarded with a distribution of 25 marks for day-to-day performance and 15 marks for internal practical exam in the form of assignments shall be given and evaluated by the teacher concerned.

9.4.2 Semester End Examination (SEE):

The SEE for 60 marks shall be conducted with an external examiner and the laboratory teacher. To reduce the burden on the students, the External Lab Exam should be conducted as an open-book system for the duration of 120 minutes. Eight questions have to be given from **Essential Reading "Towards a World of Equals: A Bilingual**

Textbook on Gender", out of which students should answer only 5. Each question carries 12 marks. So, each answer will take nearly 24 minutes.

9.5 Projects:

9.5.1 Minor Project:

Minor Project has to be taken up for about eight weeks including summer vacation after VI semester. **CIE** of 40 marks are awarded based on the performance in two presentations and **SEE** of 60 marks will be evaluated by a committee consisting of Head of the Department, supervisor and an external examiner. The external examiner should be selected from outside the College among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department. The Minor Project shall be evaluated in the VII Semester.

9.5.2 Major Project:

Major Project has to be carried out during the VIII Semester, as per the instructions of the Project Supervisor assigned by the Head of the Department. Out of total 200 marks allotted for the Major Project, 40 marks shall be for **CIE** (Continuous Internal Evaluation) and 160 marks for the **SEE** (Semester End Viva-voce Examination). CIE 40 marks shall be awarded by a Departmental Committee consisting of Head of the Department, a senior faculty member and Project Supervisor, based on the work carried out and the presentation made by the Student during the Major Project. The Major Project Viva-voce shall be conducted by a Committee comprising of an External Examiner, Head of the Department and Project Supervisor. The external examiner should be selected from outside the College among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

9.6 Technical Seminar:

For Technical Seminar Presentation, 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 a committee consisting of Head of the Department and Two Faculty Members for 100 marks. There shall be no external evaluation.

9.7 Comprehensive Viva-Voce:

The Comprehensive Viva-Voce shall be conducted in VIII Semester for 100 marks. This Viva-Voce is intended to assess the students' understanding of various subjects studied during the B. Tech. programme of study and will be evaluated by a Committee, consisting of the Head of the Department and two senior faculty members. There shall be no external evaluation.

9.8 Non-Credit Courses:

9.8.1 Audit Courses:

For Audit Courses offered in any 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.

9.8.2 Mandatory Courses:

For Mandatory Non-Credit Courses offered in any semester, a 'Satisfactory / Not Satisfactory' shall be awarded to the student based on the performance in both CIE and SEE

10. Grading Procedure

10.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/ Practical, or Seminar, or Project, or Minor-Project or 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	Grade Points	Letter Grade
≥80	10	O (Out Standing)
≥70 to < 80	9	A^+ (Excellent)
≥60 to < 70	8	A (Very Good)
≥55 to < 60	7	B^+ (Good)
≥50 to < 55	6	B (Above Average)
≥45 to < 50	5	C (Average)
≥40 to < 45	4	P (Pass)
< 40	0	F (Fail)
Absent	Ab	Ab

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 Semester End Examination (SEE), as and when conducted. 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 ≥ 4 (P Grade or above).

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

$\text{SGPA} = \left\{\sum_{i=1}^{N} C_i G_i\right\} / \left\{\sum_{i=1}^{N} C_i\right\}$ … 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.

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 II Semester onwards, at the end of each Semester, as per the formula

$\text{CGPA} = \left\{\sum_{j=1}^{M} C_j G_j\right\} / \left\{\sum_{j=1}^{M} C_j\right\}$ … for all S semesters registered

(i.e., upto and inclusive of S semesters, S ≥ 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 he gets a CGPA ≥ 5.00; subject to the condition that he secures a GP ≥ 4 (P Grade or above) in every registered Subject/ Course in each Semester (during the entire UGP) for the Degree Award, as required.

10.12.2 Inspite of securing P Grade or above in some (or all) Subjects/ Courses in any Semester, if a Student receives a SGPA < 5.00 and/ or CGPA < 5.00 at the end of such a Semester, then he 'may be allowed' (on the 'specific recommendations' of the Head of the Department and subsequent approval from the Principal) - (i) to go into the next subsequent Semester (subject to fulfilling all other attendance and academic requirements as listed under Items 7&8); (ii) to 'improve his SGPA of such a Semester (and hence CGPA) to 5.00 or above', by reappearing for ONE or MORE (as per Student's choice) of the same 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 in any Non-Credit Course, if he secures a 'Satisfactory Participation Certificate' for that Audit Course and "Satisfactory Certificate' for 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, and Grade Earned etc.), Credits earned, SGPA, and CGPA.

11. Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 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. Award of Degree

12.1 A Student who register for all the specified Courses as listed in the Course Structure, satisfies all the Course Requirements, passes all the examinations prescribed in the entire UG Programme (UGP) within the specified period (refer 4.1), and secures the required number of 184 Credits (with CGPA ≥ 5.0), 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:

Class Awarded	CGPA
First Class with Distinction	≥ 8.00
First Class	≥ 6.50 and < 8.00
Second Class	≥ 5.50 and < 6.50
Pass Class	≥ 5.00 and < 5.50

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

13. Withholding of Results

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

14. Transitory Regulations

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 Semester).

15. Student Transfers

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

16. Scope

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

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

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

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

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**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 SEE)	Expulsion from the examination hall and cancellation of the performance in that course only.
(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 course 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 that course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate shall be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The

		candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme 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 course.
6	Refuses to obey the orders of the Chief Controller of Examinations (CCE) / Controller of Examinations (CE) /	In case of students of the college, they shall be expelled from examination halls and cancellation

	Assistant Controller of Examinations (ACE) / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-incharge, 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	of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police cases 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme 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 course and all other courses the candidate has already appeared including

		practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. 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.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that SEE.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the CCE for further action toward suitable punishment.	

Note: ***The student(s) found indulging in malpractices during the CIE also will be punished based on the recommendations of the College Academic Committee.***

MALLA REDDY ENGINEERING COLLEGE (Autonomous)
Academic Year 2015-16 (Choice Based Credit System)
COURSE STRUCTURE – B.Tech. CIVIL ENGINEERING (CE)
(MR15 Regulations)

I SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	BS	50B01	Engineering Mathematics	3	2	-	4	40	60	100
2	BS	50B02	Applied Physics - I	2	2	-	3	40	60	100
3	BS	50B03	Applied Chemistry	2	2	-	3	40	60	100
4	ES	50501	Computer Programming	2	2	-	3	40	60	100
5	ES	50301	Engineering Graphics	1	1	3	3	40	60	100
6	BS	50B05	Applied Chemistry Lab	-	-	4	2	40	60	100
7	ES	50502	Computer Programming Lab	-	-	4	2	40	60	100
8	ES	50302	Engineering Workshop	-	-	4	2	40	60	100
9	AC	50A01	NSS & Sports	-	-	2	-	-	-	-
			Total	10	9	17	**22**	**Contact Hours:36**		

II-SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	HS	50H01	English	2	-	-	2	40	60	100
2	BS	50B06	Computational Mathematics	3	2	-	4	40	60	100
3	BS	50B07	Applied Physics - II	2	2	-	3	40	60	100
4	ES	50303	Engineering Mechanics	2	2	-	3	40	60	100
5	ES	50202	Basic Electrical & Electronics Engineering	3	2	-	4	40	60	100
6	HS	50H02	English language Lab	-	-	4	2	40	60	100
7	BS	50B04	Applied Physics Lab	-	-	4	2	40	60	100
8	ES	50304	Engineering Mechanics & AutoCAD Lab	-	-	4	2	40	60	100
9	AC	50A02	Computational Mathematics Lab	-	-	4	-	-	-	-
Total				12	8	16	**22**	**Contact Hours:36**		

III SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	BS	50B08	Elementary Calculus & Transforms	3	2	-	4	40	60	100
2	ES	50101	Strength of Materials	2	2	-	3	40	60	100
3	PC	50102	Surveying	2	2	-	3	40	60	100
4	ES	50103	Fluid Mechanics	2	2	-	3	40	60	100
5	PC	50104	Building Materials Construction & Planning	2	-	-	2	40	60	100
6	HS	50H12	Engineering Economics and Accountancy	2	2	-	3	40	60	100
7	ES	50105	Strength of Materials Lab	-	-	4	2	40	60	100
8	PC	50106	Surveying Lab	-	-	4	2	40	60	100
9	MC	50H11	Human Values and Professional Ethics	-	2	-	-	40	60	100
			Total	13	12	8	22	**Contact Periods : 33**		

IV SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	HS	50H16	Environmental Sciences	2	-	-	2	40	60	100
2	BS	50B09	Probability & Statistics	3	2	-	4	40	60	100
3	PC	50107	Engineering Geology	2	2	-	3	40	60	100
4	PC	50108	Advanced Solid Mechanics	2	2	-	3	40	60	100
5	PC	50109	Concrete Technology	2	2	-	3	40	60	100
6	ES	50110	Hydraulics and Hydraulic Machinery	2	2	-	3	40	60	100
7	ES	50111	Fluid Mechanics & Hydraulic Machinery Lab	-	-	4	2	40	60	100
8	PC	50112	Engineering Geology Lab	-	-	4	2	40	60	100
9	HS	50H17	Gender Sensitization	-	-	4	2	40	60	100
10	AC	50A03	Law for Engineers	-	2	-	-	-	-	-
Total				13	12	12	24	**Contact Periods : 37**		

V SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PC	50113	Design of Reinforced Concrete Structures	2	2	-	3	40	60	100
2	PC	50114	Geotechnical Engineering	2	2	-	3	40	60	100
3	PC	50115	Environmental Engineering	2	2	-	3	40	60	100
4	PC	50116	Structural Analysis	2	2	-	3	40	60	100
5	OE		Open Elective-1	2	2	-	3	40	60	100
6	HS	50H13	Management Science	2	-	-	2	40	60	100
7	PC	50117	Environmental Engineering Lab	-	-	4	2	40	60	100
8	PC	50118	Geotechnical Engineering Lab	-	-	4	2	40	60	100
9	PC	50119	Computer Aided Drafting of Building lab	-	-	4	2	40	60	100
10	PR	50H05	Soft Skills	-	-	2	1	40	60	100
Total				12	10	14	24	**Contact Periods : 36**		

VI SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PC	50120	Design of steel Structures	3	2	-	4	40	60	100
2	PC	50121	Water Resources Engineering	2	2	-	3	40	60	100
3	HS	50H03	Technical Communication and Presentation Skills	2	-	-	2	40	60	100
4	PC	50122	Transportation Engineering	2	2	-	3	40	60	100
5	PE-I	50123	Air pollution and control	2	2	-	3	40	60	100
		50124	Disaster Management							
		50125	Solid waste management							
6	PE-II	50126	Advanced Structural Analysis	2	2	-	3	40	60	100
		50127	Plastic Analysis and Design							
		50128	Rehabilitation and Retrofitting of Structures							
7	PC	50129	Transportation Engineering lab	-	-	4	2	40	60	100
8	HS	50H04	Technical Communication & Presentation Skills Lab	-	-	4	2	40	60	100
9	PR	50130	Technical Seminar	-	-	4	2	100	-	100
Total				13	10	12	24	**Contact Periods : 35**		

VII SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PC	50131	Estimating & Costing	3	2	-	4	40	60	100
2	PC	50132	Remote Sensing & GIS	3	2	-	4	40	60	100
3	PC	50133	Foundation Engineering	2	2	-	3	40	60	100
4	PE-III	50134	Principles of Bridge Engineering	2	2	-	3	40	60	100
		50135	Finite Element Methods							
		50136	Prestressed Concrete Structures							
5	PE-IV	50137	Water Resources Systems Analysis	2	2	-	3	40	60	100
		50138	Irrigational Structures and Water Power Engineering							
		50139	River Engineering							
6	OE		Open Elective-2	2	2	-	3	40	60	100
7	PC	50140	Concrete Technology lab	-	-	4	2	40	60	100
8	PR	50141	Minor Project	-	-	4	2	40	60	100
9	AC	50A04	Foreign Language/Fine Arts		2	-	-	-	-	-
Total				14	14	8	24	**Contact Periods : 36**		

VIII SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PE-V	50142	Construction Engineering & Management	2	2	-	3	40	60	100
		50143	Pavement Design							
		50144	Public Transportation							
2	PE-VI	50145	Rock Mechanics and Engineering	2	2	-	3	40	60	100
		50146	Ground Improvement Techniques							
		50147	Advanced Foundation Engineering							
3	OE		Open Elective-3	2	2	-	3	40	60	100
4	PR	50148	Major Project	-	-	20	10	40	160	200
5	PR	50149	Comprehensive Viva Voce	-	-	4	2	100	-	100
6	PR	50H15	Entrepreneurship Skills	-	2	-	1	40	60	100
Total				6	8	24	22	**Contact Periods : 38**		

OPEN ELECTIVES

S. No.	Branch	Course Code	Name of the course
1	EEE	50203	Network theory
2	EEE	50208	Control systems
3	EEE	50229	Energy auditing & conservation
4	EEE	50241	Principles of electrical engineering
5	ME	50307	Metallurgy and materials science
6	ME	50342	Renewable energy sources
7	ME	50344	Robotics
8	ME	50319	Metal cutting & machine tools
9	ME	50354	Design for manufacturing
10	ECE	50414	Micro Processors and Interfacing
11	ECE	50448	Principles of Communication Engineering
12	ECE	50449	Embedded System Design
13	CSE	50503	Data structures
14	CSE	50511	Database management systems
15	CSE	50571	Computer graphics
16	CSE	50512	Operating systems
17	CSE	50564	Artificial intelligence
18	MINING	52511	Mine construction engineering
19	MINING	52528	Introduction to mineral processing
20	MINING	52543	Tunneling engineering
21	ENGLISH	50H08	Interpretation of literature and analytical writing
22	ENGLISH	50H09	Business communication
23	ENGLISH	50H10	World literatures
24	MATHS	50B23	Advanced optimization techniques
25	MATHS	50B24	Mathematical modeling
26	MATHS	50B25	Differential equations and dynamical systems
27	PHYSICS	50B20	Advanced physics for engineers
28	PHYSICS	50B21	Nano materials: synthesis and characterization
29	PHYSICS	50B22	Ndt and vacuum technology
30	CHEMISTRY	50B17	Chemistry of engineering materials
31	CHEMISTRY	50B18	Nano chemistry

32	CHEMISTRY	50B19	Photochemistry and spectroscopy

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50B01 **Credits: 4**

B.Tech. – I Semester
ENGINEERING MATHEMATICS
(Common for CE, EEE, ME, ECE, CSE and Min.E)

Prerequisites: NIL

Objectives: This course provides knowledge of Matrices, Eigen values and Eigen Vectors, which are useful in signal processing and stability theory. The concept of Differential equation is essential to the learner to write the associated mathematical model and solving real time engineering problems using Laplace Transforms.

Module I Matrices and Linear systems of equations: [12 periods]
Rank of the matrix - Elementary transformations –Echelon form – Normal form – PAQ Form - Inverse of a Matrix by applying Elementary transformations.Solution of Linear Systems – Consistency of linear system of equations – Gauss elimination method – Gauss-Jacobi method - Gauss-seidal method- LU-Decomposition method –Solution of Tri-diagonal Systems (Thomas Algorithm).

Module II Eigen Values& Eigen Vectors
A: Eigen Values: [6 periods]
Linear transformation - Eigen values - Eigen vectors – properties – Linearly independent and dependent vectors - Cayley-Hamilton Theorem (without Proof) - Inverse and powers of a matrix by Cayley-Hamilton theorem.
B: Eigen Vectors: [6 periods]
Diagonalization of matrix-Calculation of powers of matrix – Modal and spectral matrices. Real matrices – Symmetric, Skew – symmetric.

Module III Differential Equations of first order and first degree: [12 periods]
A: Formation of Differential Equations - Solutions of First order Differential Equations: Homogeneous, Non-homogeneous,Exact,Non-exact.Leibnitz's Linear Equation - Bernoulli's
B:Differential Equation -Applications of First Order Differential Equations: Orthogonal trajectories - Newton's Law of cooling - Law of natural growth and decay.

Module IV Differential Equations of Second & Higher Order [12 periods]
A: Rules for finding Complementary function-Particular integral (Non-homogeneous term of the type e^{ax} , $Sin\ bx\ (or)\ Cos\ bx, x^n, e^{ax}V(x), x^nV(x) only$)
B: Method of variation of parameters, Equations reducible to constant coefficients - Cauchy - Euler and Legendre's differential equations - Applications to simple harmonic motion and LCR Circuits.

Module V Laplace Transforms **[12 periods]**

A:Definition - Condition for existence –Laplace transform of standard functions –Properties– Multiplication by 't' and division by 't' -Evaluation of Integrals. Inverse transforms:

B:Partial fractions Method – first shifting theorem – Inverse transforms of derivatives - Convolution theorem, Dirac's delta function – Unit step function. Application to ordinary differential equations

Text Books:

1) E. Kreyszig, "**Advanced engineering Mathematics**", John Wiley & Sons Publishers, 10th Edition and Reprint2010.

2) B.S. Grewal, "**Higher Engineering Mathematics**", Khanna Publishers, 43rd Edition, Reprint 2011.

References:

1) R.K. Jain & S.R.K. Iyengar, "**Advanced Engineering Mathematics**", Narosa Publications, 3rd Edition, 2002.
2) Kanti B. Datta , "**Mathematical Methods of Science and Engineering**", Cengage Learning, 1st Edition, 2012.
3) Alan Jeffrey, "**Mathematics for Engineers and Scientists**", Chapman & Hall/ CRC, 6th Edition, 2013
4) Michael Greenberg, "**Advanced Engineering Mathematics**", Pearson Education, 2nd Edition, 1998.
5) Richard Bellman, "**Introduction to Matrix Analysis**", Dover Publications, 2nd Edition, 1970.

Outcomes:

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

1. Do operations on Matrices like Row, Column operations, Rank of the Matrix etc.,
2. Able to check the Consistency and Inconsistency of the system of equations.
3. Find out Eigen values and Eigen vectors of the given Matrix.
4. Solve the first order first degree and higher order differential equations and apply them in real time environments.
5. Understand Laplace Transforms and perform various transformations and apply for linear differential equations and real-time signals.

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50B02 **Credits: 3**

B.Tech. - I Semester
APPLIED PHYSICS - I
(Common for CE, ME, EEE, ECE, CSE and Min. Engineering)

Prerequisites: NIL

Objectives: The objective is to provide clear understanding of LASER, Optical Fiber, Ultrasonic and basic concepts of Statistical Mechanics to apply for Engineering and Technology problems.

Module I: Optics **[9 Periods]**

Principle of superposition, Coherence - Spatial and Temporal; Introduction to Interference, Young's double slit experiment - Optical path difference and Fringe width - Interference in thin films (Reflected light) Cosine law – Newton's rings experiment - Determination of wavelength of light. Concept of diffraction, Diffraction grating as monochromator.

Module II: Laser and Optical Fibers:

A: Laser: **[8 Periods]**

Characteristics of LASER; Absorption, Spontaneous and Stimulated transitions; Einstein's Coefficients and Relations between them; Population Inversion; Pumping - Optical and Electrical; Meta-stable State; Three and Four level pumping schemes; Ruby LASER; Helium-Neon LASER; Semiconductor Diode LASER; Applications of LASER - drilling, welding, data storage, optical signal processing and nuclear fusion.

B: Optical Fibers **[4 Periods]**

Principle of Optical Fiber; Acceptance angle and Acceptance cone, Numerical Aperture; Step and Graded index Optical Fibers and their Refractive Index profiles; Attenuation in Optical Fibers, Application of Optical Fibers - Medical, Level sensor and Communication system.

Module III: Acoustics & Ultrasonics

A: Acoustics **[4 Periods]**

Reverberation & Reverberation time, basic requirements of acoustically good hall; absorption Coefficient, Determination of absorption coefficient based on the standard times of reverberation, Sabine's formula (Qualitative treatment); Factors affecting the architectural acoustics and their remedies.

B: Ultrasonics **[8 Periods]**

Introduction, Concept of Magnetostriciton, Piezo and inverse Piezo electric effects; Production of Ultrasonic waves - Magnetostriction method; Piezo electric crystal method; Properties of Ultrasonic waves; Detection of Ultrasonics - Piezo electric detector, Kundt's tube, Sensitive flame method, Thermal detector; Applications - Communication, Industrial, Biological and Medical;

Module IV: Waves and Vibrations **[9 Periods]**

Introduction, Differential equation for SHM and its solution; expression for energy of the

oscillator; superposition of two linear SHMs (with same frequencies) - Lissajous figures; Damped vibrations - differential equation and its solution; Critical damping, under damping and over damping, logarithmic decrement; Qualitative treatment of Forced vibrations, sharpness of resonance, analogy between mechanical and electrical oscillator.

Module V: Elements of Statistical Mechanics [8 Periods]

Introduction, Qualitative discussion on Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics, Properties of the Fermi-Dirac statistics, Photon Gas, Wien's displacement law, Rayleigh-Jeans Law, Planck's Law of black body radiation, Concept of Electron gas.

Text Books:

1. K Vijay Kumar, S Chandralingam, "**Modern Engineering Physics**'', S. Chand and Company, 1st Edition, 2010.
2. D K Bhattacharya, Poonam Tandon, "**Engineering Physics**", Oxford University Press, 1st Edition, 2015.

Reference Books:

1) Eugene Hecht and A R Ganeshan, "**Optics**", Pearson Education, 4th Edition, 2015.
2) P K Palanisamy, **"Engineering Physics"**, SciTech Publication, 4th Edition, 2014.
3) B K Pandey and S. Chaturvedi, "**Engineering Physics**" Cengage Learning India Revised Edition, 2014.
4) R K Gaur and SL Gupta, "**Engineering Physics**" Dhanpat Rai Publications, Eighth Revised Edition, 2006.

Outcomes:

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

1. Understand the concepts of Interference, diffraction, applications of LASER and Optical fibers.
2. Analyze the basic requirements of acoustically good hall, various production and Detection methods of ultrasonic besides the applications of ultrasonics.
3. Distinguish free, damped and forced vibrations.
4. Develop basic knowledge on the distribution functions and simple applications

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50B03 **Credits: 3**

I-B.Tech.
Applied Chemistry
(Common for CE, ME, CSE, ECE, EEE and Mining)

Objective:
The objective to make the learners aware of the standards and cleaning processes to maintain quality of water and to provide basic knowledge on electrochemistry, corrosion, polymers and energy science to apply for real-life situations.

Module I: Water **[10 Periods]**
A: Hardness of Water: causes of hardness, expression of hardness – units – types of hardness, Alkalinity of water specifications for drinking water (BIS and WHO standards); Estimation of temporary & permanent hardness of water by EDTA method - numerical problems. Boiler troubles – Scale &sludge, Priming and foaming, caustic embrittlement;
B: Treatment of boiler feed water – Internal treatment (Phosphate, carbonate and calgon conditioning).External treatment – Lime Soda process and ion exchange process, Numerical Problems. Disinfection of water by chlorination and ozonisation. Desalination by Reverse osmosis.

Module II: Electrochemistry and Corrosion
A: Electrochemistry **[6 Periods]**
Introduction-Conductance-Specific and Equivalent conductance. Electrochemical cells-EMF, Galvanic Cells, calomel Electrode; Nernst equation and its applications- Batteries: Primary cells (dry cells) and secondary cells (lead-Acid cell, Ni-Cd cell). Applications of batteries. Fuel cells – Hydrogen – Oxygen fuel cell; Applications.
B: Corrosion: **[6 Periods]**
Causes and effects of corrosion: Theories of corrosion – Chemical & Electrochemical corrosion; Factors affecting rate of corrosion – Nature of metal and Nature of Environment – Corrosion control methods – Cathodic protection (Sacrificial anodic). Surface coatings: Metallic coatings & methods of application of metallic coatings - hot dipping (Galvanization), Cementation, Electroplating (Copper plating).

Module III: Polymers **[12Periods]**
A:Types of Polymerization-Chain (Free radical Mechanism)&Step growth. Plastics: Thermoplastic & Thermo setting plastics, Compounding& fabrication of plastics (Compression and injection moulding). Preparation, properties, engineering applications of PVC, Teflon of Nylon – 6,6 and Bakelite. Conducting polymers: Polyacetylene, Polyaniline,
B: Mechanism of Conduction, doping; applications of Conducting polymers.Bio degradable polymers: poly lactic acid and poly vinyl acetate. Elastomers: Rubber-vulcanization.
Synthetic Rubber-preparatrion,properties and applications of BUNA-S,SBR.
Fibre-rerinforced polymers-properties and applications.

Module IV: Energy sciences & Combustion
A: Fuels **[6 Periods]**
Classification – solid fuels: coal – analysis of coal - proximate and ultimate analysis and their

significance. Liquid fuels – petroleum and its refining. cracking- fixed bed catalytic cracking. Knocking – octane and cetane rating. Bio-diesels-advantages. Gaseous fuels - constituents, characteristics and applications of natural gas, LPG and CNG.

B: Combustion **[6 Periods]**

Definition, Calorific value of fuel – HCV, LCV; Determination of calorific value by Junkers gas calorimeter – Numerical problems on combustion. Renewable energy sources-solar, wind, hydro power and biomass energy advantages, disadvantages and Applications

Module V: Composites, Nano Chemistry and Green Chemistry:

A: Composites: **[3 Periods]**

Basics of composites, composition and characteristics-types of composites –particle and fiber reinforced composites and their applications..Concept of Bio-fuels,Bio sensors,BiSurfactants.

B: Nano Chemistry: **[3 Periods]**

Introduction and classification of Nanomaterials (Fullerence, Carbon nano tubes and nanowires only) - Application of nanomaterials. Brief introduction to nanocomposites

C: Green Chemistry: **[4 Periods]**

Introduction, principles of green chemistry, introduction to ultrasonic and microwave assisted reactions. Concept of R4M4 (Reduce, Reuse, Recycle, Redesign; Multipurpose, Multidimensional, Multitasking and Multi-tracking).

Text Books:

1. P.C.Jain and Monica Jain, "**A text Book of Engineering Chemistry"**, DhanpatRai Publications, New Delhi, 12th Edition 2006.
2. Engineering chemistry by M.Thirumala Chary and E.Laxminarayana,Sci-Tech publications.
3. Engineering chemistry by R.P. Mani and B.Rama Devi by Cengage Learning India Pvt.Ltd.

Reference Books:

1. F.W. Billmeyer, "**Text Book of Polymer Science"**, John Wiley & Sons, 4th Edition, 1996.
2. M.G. Fontana, N. D. Greene, "**Corrosion Engineering"**, McGraw Hill Publications, New York, 3rd Edition, 1996.
3. B.R.Puri,L.R.Sharma&M.S.Pathania,"**Principlesof Physical Chemistry",** S.Nagin Chand &Co., New Delhi, 23rd Edition, 1993.
4. P.W. Atkins and de Paula Julio, "**Physical Chemistry**", Oxford University Press, 8th Edition, (Indian Student Edition), 2009.
5. G.A.Ozin and A.C. Arsenault,"**Nanochemistry: A Chemical Approach to Nanomaterials**", RSC Publishing, 3rd Edition, 2005.

Outcomes:

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

1. Understand Water treatment, specifically hardness of water.
2. Acquire knowledge on Electrochemical cell, fuel cells, batteries and its applications.
3. Understand the properties and uses of polymeric materials.
4. Analyze the combustion mechanism of various types of fuels(solid,liquid,gas)
5. Acquire basic knowledge on the concepts of Composites,Nano and Green Chemistry

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Course Code: 50501 **Credits: 3**

B.Tech. – I Semester

COMPUTER PROGRAMMING

(Common for CE, EEE, ME, ECE, CSE and Min.E)

Prerequisites: Nil.

Objective: To develop programming concepts using C language to solve engineering and technology related problems.

Module I: Fundamentals & Introduction to C Language

A: Fundamentals: **[4 Periods]**

Hardware, Software, Programming languages, Translators, Introduction to Operating System, Program Development steps-Algorithm, Flow chart, Number Systems.

B: Introduction to C Language **[8 Periods]**

History, Simple C Program, Identifiers, Basic data types, User-defined data types, Variables, Constants, Type qualifiers, Managing Input / Output, Operators, Precedence and Associativity, Expression Evaluation, Type conversions, Simple C Programming examples.

Module II: Control Statements & Arrays

A: Control Statements: **[6 Periods]**

Conditional statements- if and switch statements, ? operator; Loop Control Statements – while, for, do-while statements, C Programming examples, Other statements related to control statements – break, continue, goto, C Programming examples.

B: Arrays **[4 Periods]**

Basic concepts, One-dimensional arrays, Two–dimensional arrays, Multi-dimensional arrays, C programming examples.

Module III: Strings & Functions

A: Strings: **[5 Periods]**

Basic concepts, String Input / Output functions, Arrays of strings, String handling functions, C programming examples.

B: Functions: **[6 Periods]**

Basics, User defined functions, Interfunction communication, Standard functions, Storage Classes-auto, register, static, extern, Scope rules, Array and string manipulations using functions, Recursive functions, C programming examples.

Module IV: Derived types, Pointers & Preprocessor Directives

A: Derived types: **[3 Periods]**

Structures – Basic concepts, Nested structures, Arrays of structures, Structure manipulations using functions, Unions, bit fields, C programming examples.

B: Pointers: **[6 Periods]**

Basic concepts, Pointer arithmetic, Pointers and functions, Pointers and strings, Pointers and arrays, Pointers and structures, Self-referential structures, Dynamic Memory Allocation, C programming examples.

C: Preprocessor Directives: **[2 Periods]**

include, define.

Module V: File I/O & Searching and Sorting:

A: File I/O: **[5 Periods]**

Basic concepts, Text files and Binary files, File input / output operations, File status functions (errorhandling), Command-Line Arguments, C programming examples

B: Searching and Sorting: **[5 Periods]**

Sorting- selection sort, bubble sort, insertion sort, Searching-linear and binary search methods.

Text Books:

1. Pradip Dey, Manas Ghosh, **"Programming in C**", Oxford University Press, 2nd Edition, 2011.
2. E Balagurusamy, "**Computer Programming"**, Tata McGraw Hill,. 1st Edition, 2013.

References:

1. Brian W. Kernighan, Dennis M. Ritchie, "**The C Programming Language"**, PHI, 2nd Edition, 1990.
2. Greg Perry and Dean Miller, "**C Programming Absolute beginner's guide**", QUE Publishers, 3rd Edition, 2013.
3. Paul Deitel and Harvey Deitel, "**C How to Program"**, PHI, 7th Edition, 2012.
4. Behrouz A. Forouzan, E.V.Prasad, Richard F.Gilberg, "**C programming: A Problem- Solving Approach**", Cengage Learning Press, 1st Edition, 2011

Outcomes:

After completion of this course, student will be able to:

1. Write, compile and debug programs in C language.
2. Design programs involving decision structures, loops, arrays and functions.
3. Explain the difference between call-by-value and call-by-reference
4. Understand the dynamic allocation of memory by using pointers.
5. Use different file operations to create/update basic data files.
6. Use simple searching and sorting methods.

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Course Code: 50301 **Credits: 3**

B.Tech. – I Semester
ENGINEERING GRAPHICS
(Common for CE, ME and Min.E)

Prerequisites: Mathematical Geometry.
Objectives: Ability to transform data into drawing to communicate with engineers manually and with the help of AutoCAD software.

Module I: Introduction to Engineering Drawing **[Periods: 6T+12P]**
Principles of Engineering Drawing – Drawing instruments – BIS Conventions - Lettering and Dimensioning practices.
Curves: Constructions of Curves used in Engineering Practice:
a) Conic Sections- General method only
b) Cycloid, Epicycloid and Hypocycloid
c) Involutes
Scales: Construction of different types of Scales- Plain, Diagonal and Vernier scale.

Module II: Orthographic Projections: **[Periods: 5T+10P]**
Projection: Principles of Orthographic Projections – Conventions – First Angle projections.
Projection of Points- Including Points in all four quadrants.
Projection of Lines - Parallel, perpendicular, inclined to one reference plane and inclined to both reference planes. True length and true angle of a line.

Module III : Projection of Planes & Projection of Solids
A: Projection of Planes : **[Periods: 3T+6P]**
Plane parallel, perpendicular, inclined to one reference plane and Plane inclined to both the reference planes.
B: Projection of Solids: **[Periods: 3T+6P]**
Projections of regular solids, cube, prism, pyramid, tetrahedron, cylinder and cone. Axis inclined to both the reference planes.

Module IV:
Development of Surfaces & **Isometric Projections**
A: Development of Surfaces : **[Periods: 3T+6P]**
Development of Surfaces of Right Regular Solids – Prism, Pyramid, Cylinder, and Cone. Frustum and Truncated solids.
B:Isometric Projections: **[Periods: 3T+6P]**
Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions –Plane Figures, Simple and Compound Solids

Module V:
Transformation of Projections & Introduction to Auto CAD:
A: **Transformation of Projections :** **[Periods: 4T+8P]**
Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.
B:Introduction to AutoCAD: **[Periods: 1T+2P]**
Basic Display, Construction, Editing and dimensioning Commands.

Text Books:

1. N.D. Bhat,"**Engineering Drawing"**, Charotar Publishing House, 53rd Edition, 2014.
2. BasantAgrawal**, "Engineering Drawing"** – Tata McGraw Hill, 2nd Edition, 2013.

Reference Books:

1. K.L.Narayana, P. Kannaiah, "**Engineering Drawing"**, SciTech Publishers. 2nd Edition, 2013
2. K. Venugopal, "**Engineering Drawing"**, New Age International Publishers, 3rd Edition, 2014.
3. Trymbaka Murthy, "**Computer Aided Engineering Drawing"**, I.K. international Publishing House, 3rd Edition, 2011.

Outcomes:

After completion of the course, students will be able to

1. Understand the importance of curves, Projection of lines, planes and solids in Engineering applications
2. Convert orthographic views to isometric views and vice-versa.
3. Familiarize with AutoCAD two dimensional Commands.

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50B05 **Credits: 2**

I-B.Tech.
Applied Chemistry LAB
(Common for CE,ME,CSE,ECE,EEE and Mining)

List of Experiments:

1. Calibration of Volumetric apparatus.
2. Estimation of Hardness of water by EDTA Method.
3. Estimation of acid by pH metry.
4. Estimation of alkalinity of water.
5. Estimation of strong acid by Conductometry.
6. Estimation of strong acid by Potentiometry.
7. Determination of ferrous iron in cement by colorimetry.
8. Determination viscosity of given liquids.
9. Preparation of Bakelite.
10. Preparation of Thiokol Rubber.
11. Determination of surface tension of given sample using stalagnometer.
12. To Study the inversion of cane sugar by polarimeter.

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Course Code:50502 **Credits: 2**

B.Tech. – I Semester
COMPUTER PROGRAMMING LAB
(Common for CE, EEE, ME, ECE, CSE and Min.E)

1.

a) Practice various Menu items and debugging techniques in IDE.
b) Practicing sample C programs using Conversion specification.
c) Implement various programs logics using algorithms and flowcharts.

2.

a) Write a C program to find smallest and largest of given three numbers.
b) Write a C program to find the roots of a quadratic equation.
c) Write a C program to implement basic arithmetic operations.

3.

a) Write a C program to find the sum of individual digits of a positive integer.
b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c) Write a C program to find whether the given number is palindrome, perfect, Armstrong or strong.
d) Write a C program to generate all the prime numbers between n1 and n2, where n1 and n2 are values supplied by the user.

4.

Write C programs that use both recursive and non-recursive functions
a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

5.

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

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a) Write a C program that uses functions to perform the following operations:
   i) To insert a sub-string into given main string from a given position.
   ii) To delete n characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not
c) Write a C program to find substring in a given string.
d) Write a C program to count the lines, words and characters in a given text.

7.

a) Write a C program to construct a pyramid of numbers.
b) Write a C program to generate Pascal‘s triangle.

8.

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.

9.

a) 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.

b) Write a C program to convert a Roman numeral to its decimal equivalent.

10.

a) 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.)

b) Write a C program to find grades of a student's using structures and unions.

11.

a) Write a C program which copies one file to another.

b) 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)

12.

a) Write a C program that uses non-recursive function to search for a Key value in a given list of integers using Linear search.

b) Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using Binary search.

13.

a) Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.

b) Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

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Course Code: 50302 **Credits: 2**

B.Tech. – I Semester
ENGINEERING WORKSHOP
(Common for CE, ME and Min.E)

I. Trades for Exercises:

At least two exercises from each trade:

a) Carpentry
b) Fitting
c) Tin-Smithy
d) House-wiring
e) Foundry
f) IT workshop – Hardware identification and connectivity, assembling, disassembling and OS Installation.

II. Trades for Demonstration

a) Machine shop
b) Plumbing
c) Identification of Electronic Components.

Text Books:

1. P. Kanniah, K. L. Narayana, "**Work Shop Manual"**, SciTech Publishers, 2nd Edition, 2009.
2. K. Venkat Reddy, "**Work Shop Practice Manual"** by, B.S. Publications, 6th Edition, 2015.

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Course Code: 50A01 **Audit Course**

B.Tech. – I Semester
NSS & SPORTS
(Common for CE, EEE, ME, ECE, CSE and Min.E)

Course objectives:

- To develop physical skills and fitness specific to a particular sport.
- It also is intended to help them appreciate the sport while being able to execute the strategies while playing the game/sport.
- Provide them the training and coaching towards achieving their group goals.
- To give the students health and physical fitness to ensure mental and emotional balance.
- NSS (**National Service Scheme)** provides ample opportunities for the students to participate in the community service programs
- To encourage them to become socially and environmentally sensitive, empathetic and responsible individuals of the nation.

Module I: Introduction of physical education: [2 Periods]
Importance of physical education, Athletics (Track events and combined events), Basket ball, Throw ball, Foot ball.

Module II: Youth and yoga: **[2 Periods]**
A: yoga as a tool for healthy lifestyle, Yoga as a preventive, promotive & curative method. Pranayam and Different Yoga traditions and their impacts.
B: Various competitions at different levels- Athletics (field events), volleyball, handball, cricket. Indoor games: Table Tennis, Caroms, chess

Module III : Introduction and Basic concepts of NSS: [4 Periods]
A:History, Philosophy, aims & Objectives of NSS, Emblem, Motto, Song and Other Components of NSS, **NSS Programmes and Activities- Concept of regular activities,** Special camping, Day camps. Basis of adoption of villages/ slums & methodology of survey.

Module IV: Volunteerism and Shramdan- [6 Periods]
A: Needs &Importance of Volunteerism, Motivation and Constraints of Volunteerism, Shramdan as a part of Volunteerism. **Environmental Issues-** Natural Resource Management (Rain water Harvesting, energy conservation etc.). Waste Management, Disaster Management- Role of youth in Disaster Management.
Civil / Self Defense- Aims and objectives of Civil defense and need for self defense training.
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Reference Books:

1. Pamela Grundy & Susan Shackleford, "**Shattering the Glass: The Remarkable History of Women in Basketball**" Published 15th May, 2007.
2. Roger Kahn, " **The Boys of Summer**" , 1st Edition, May 9th 1973.
3. Jaci Burton, "**Perfect Play"**, 1st Edition, Feb 1st 2011, series 1.
4. Silva Mehta, Mira Mehta and Shyam Mehta, **"Yoga: The Iyengar Way",** Published by Knopp, 7th April, 1990.
5. Vishnu-Devananda, **"The Complete Illustrated Book of Yoga",** 18th April, 1995.
6. Timothy McCall, **"Yoga as Medicine: The Yogic Prescription for Health and Healing",** published by Harmony, 31st July 2007.

7. Christopher G. Petre, **"Social Work with Children and Their Families: Pragmatic Foundations "**, Journal Vol:24, No.3, September 18th, 2003, 2nd Edition.
8. Rashmi Bansal, "**Stay Hungry Stay Foolish",** 1st December 2008.
9. Beverly Schwartz, "**Rippling: How Social Entrepreneurs Spread Innovation Throughout the World"**, Published by Jossey – Bass, May 27th 2012

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Course Code: 50H01 **Credits: 2**

B.Tech – II Semester
ENGLISH
(Common for CE, ME and Min.E)

Objectives:

To facilitate for the improvement of the English language competency of the students in English with emphasis on all language components namely grammar, vocabulary, listening skills, speaking skills, reading skills and writing skills.

To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.

Module I: **[6 Periods]**

Chapter entitled '**Going Places: Travel'** from *Resonance: English for Engineers and Technologists* published by Foundation Books

Speech **:** Grammar of Anarchy by Dr. B. R. Ambedkar
Vocabulary **:** Formation of words, prefixes, suffixes and root words
Grammar **:** Tense, aspect and concord
Reading **:** Skimming and Scanning
Writing **:** Introduction to writing skills, characteristics of effective writing

Module II: **[6 Periods]**

Chapter entitled **'Reaching Out: Mass Media**' from *Resonance: English for Engineers and Technologists* published by Foundation Books

Speech **:** Need of Discipline and Visionary Young India by Dr.APJ Abdul Kalam
Vocabulary **:** Homonyms, homophones, homographs
Grammar **:** Direct and Indirect Speech
Reading **:** Intensive Reading and Extensive Reading
Writing **:** Paragraph writing- use of cohesive devices; arranging jumbled sentences into Paragraph

Module III : **[6 Periods]**

Chapter entitled **'Ushering in a New Era: Networking'** from *Resonance: English for Engineers and Technologists* published by Foundation Books

Short Story **:** Death of a Hero by Jai Nimbkar
Grammar **:** Question Tags; Degrees of Comparison
Vocabulary **:** Idiomatic Expressions; Phrasal Verbs
Reading **:** Reading for theme and gist.
Writing **:** Essay Writing

Module IV: **[6 Periods]**

Chapters entitled '**Morphed Universe: Technology as a Double- edged Sword'** from *Resonance: English for Engineers and Technologists* published by Foundation Books

Short Story **:** The Doctor's Word by R.K. Narayan
Grammar **:** Voice – exercises
Vocabulary **:** One word substitutions; synonyms and antonyms
Reading **:** Reading for interpretation
Writing **:** Letter writing- both formal and informal

Module V: **[6 Periods]**

Chapter entitled **' The Indomitable Human Spirit: Facing Disasters'** from *Resonance: English for Engineers and Technologists* published by Foundation Books

Short story : Once There was a King by Rabindranath Tagore
Grammar : Types of Sentences, Conditionals
Vocabulary : Gender sensitive language, integrated exercises in vocabulary
Reading : Reading for specific purposes
Writing : Summarizing

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

Text Books:

In order to improve the proficiency of the student in the acquisition of grammar, error free language, the following text and course content, divided into Five Units, is prescribed.

1. Elango, et all **,** ***Resonance: "English for Engineers and Technologists",*** published by Foundation Books, 2nd Edition, 2012.
2. Sudha Rani, et all, ***"The Enriched Reading",*** published by Pearson Publications, New Delhi, 1st edition, 2015.

For Grammar practice

1. Sudha Rani Et all, ***"A Work Book on English Grammar and Composition",*** published by Tata Mac Graw –Hill, New Delhi, 2nd Edition, 2012.

Reference Books:

1. Azar, Betty and Stacy A. Hagen ***: "Understanding and Using English Grammar***", Foundation Books, 4th Edition, 2009.
2. Chaudhuri , Santanu Sinha: ***"Learn English: A Fun Book of Functional Language, Grammar, and Vocabulary",*** Tata McGraw Hill Education, New Delhi, Paper Back Edition. 2013.
3. Eastwod, John: "***Oxford Guide to English Grammar",*** Oxford University Press, 4th Edition, 1994.
4. Field, Marion**: "*Improve Your Written English"***, Kindle books, 5th Edition, 2009.
5. G. Leech and J. Svartvik (1975), "***A Communicative Grammar of English"***, London: Longman, 3rd Edition, 2002.
6. Murphy, Raymond**: "*Intermediate English Grammar"***, Foundation Books Pvt Limited, 2nd Edition, 2013.
7. Murphy, Raymond: "***Essential English Grammar: A Self-Study Reference and Practice Book for Intermediate Students of English with Answers",*** Cambridge University Press, 2nd Edition, 2007.
8. Swan, Michael: "***Basic English Usage",*** Oxford University Press, 1st Edition, 1984.

Related Websites:

1. http://www.slideshare.net/aszardini/word-formationroot-words-prefixes-and-suffixes
2. http://www.scribd.com/doc/37085980/Circulars-Circular-Letters-Notices-Memo#scribd
3. http://www.zsme.tarnow.pl/jezykiobce/wp-content/uploads/2013/11/writing-letters1.pdf.

Outcomes:

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

1. Use of English Language, written and spoken.
2. Enrichment of language accuracy and fluency.
3. Gaining confidence in using English language and skills for writing in real life situations.
4. Ready to employ extensive and intensive reading skills

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Course Code: 50B06 **Credits: 4**

B.Tech – II Semester
COMPUTATIONAL MATHEMATICS
(Common for CE, ME, CSE & MINING)

Objective: The course introduces various numerical techniques which are indispensible tools to solve many algebraic and transcendental equations. Mathematical methods are useful to reduce the global error involved in approximations.

Module I: Algebraic and Transcendental Equations [12 Periods]
A:Introduction - Errors, types of errors, approximations, truncation error Solution of Algebraic and Transcendental Equations: The Bisection Method.
B:The Method of False Position - The Iteration Method – Newton-Raphson Method – Ramanujan's method to find smallest root of an equation.

Module II: Interpolation: [12 Periods]
A:Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences – Symbolic relations and separation of symbols, Differences of a polynomial-Newton's formulae for interpolation
B:Central difference interpolation Formulae – Gauss Central Difference Formulae – Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

Module III: Curve Fitting, Numerical Differentiation & Integration [12 Periods]
A:Curve fitting: Fitting a first degree (linear) and second degree (parabola), exponential, power curves for a data by the Method of least squares.
B:Numerical Differentiation & Integration: Evaluation of derivatives – Evaluation of maximum & minimum for a given data.
Numerical Integration: Trapezoidal Rule, Simpson's $1/3^{rd}$, 3/8 Rule.

Module IV: Numerical solution of Ordinary Differential Equations [12 Periods]
A:Solution by Taylor's series method - Picard's Method of successive Approximations - Euler's Method-Modified Euler's Method –
B: Runge-Kutta Methods - Predictor-Corrector Methods: Milne's method - Adams- Bashforth Method.

Module V: Numerical solution of PDE [12 Periods]
A: Classification of second order equations – Finite difference approximations to derivatives - standard 5 point formula – diagonal 5 point formula – solution of Laplace equation.
B: Solution of poission's equation. Solution of one dimensional heat, wave equations (by Crank-Nicolson explicit/implicit formula only).

Text Books:

1) Introductory Methods of Numerical Analysis by S.S. Sastry, Prentice-Hall of India Private Limited.2003
2) NUMERICAL METHODS IN ENGINEERING & SCIENCE (WITH PROGRAMS IN C, C++ &MATLAB) BY B.S. GREWAL, KHANNA PUBLISHER. 2014

3) Numerical Methods for Scientists and Engineers by Sankara Rao K., Prentice-Hall. 7th Edition, 2008

References:

1) Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Pub. House, Delhi.
2) Mathematical Methods of Science and Engineering by Kanti B.Datta ,Cengage Learning
3) Mathematics for Engineers and Scientists, Alan Jeffrey, 6ht Edi, 2013, Chapman & Hall/ CRC
4) Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.

Outcomes:

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

1. Distinguish the error in exact and approximate methods and able to solve the algebraic and Transcendental equations.
2. Interpolate and predict the given data specifically using methods like Newton's , Gauss Siedal etc.
3. Fit the given data linear or Non-linear like first , second order and exponential
4. To find out the Numerical Differentiation and Integration from the given Tabular data.
5. To provide solutions to various ODE and PDE using various methods like Runge-Kutta methods, Adams- Bash forth, Method of Separation of Variables.

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Course Code: 50B07 **Credits: 3**

B.Tech. - II Semester
APPLIED PHYSICS - II
(Common for CE, EEE, ME, ECE, CSE and Min.E)

Prerequisites: NIL

Objective:
The objective to provide clear understanding of magnetism and super conductivity, quantum Mechanics and nanomaterial to apply for Engineering and Technical problems

Module I: Magnetism & Superconductivity **[9 Periods]**
A:Magnetic field and Magnetization, magnetic susceptibility, paramagnetism in transition, rare earth elements; magnetization and total angular momentum (definition and relationship); Ferromagnetism, Anti ferromagnetism and Ferrimagnetism; Curie temperature, Hysteresis;
B:Concept of Perfect Diamagnetism; Meissner effect ; Type I and II Superconductors; BCS theory (qualitative); Applications of Superconductors - Smart magnets, SQUIDs, transmission lines, Mag-Lev Train.

Module II: Quantum Mechanics: **[8 Periods]**
Louis De-Broglie's concept of Matter Waves; Davisson and Germer's experiment; Heisenberg's Uncertainty Principle, Illustration - Why an electron cannot exist in the nucleus?; Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function; Energy of a particle in a one dimensional infinite potential well; Concept of Potential barrier (Tunneling effect)

Module III: Band Theory of Solids & Semiconductor Physics
A: Band Theory of Solids: **[8 Periods]**
Qualitative discussion of Classical free electron theory, Fermi - Dirac distribution,
Qualitative discussion of Quantum free electron theory; Electron in a periodic Potential (Bloch Theorem), Kronig-Penny Model (Qualitative Treatment), Origin of energy Band formation in solids, Classification of materials into Conductors, Semi-Conductors &Insulators, Concept of effective mass of an electron.
B: Semiconductor Physics **[9 Periods]**
Direct and Indirect band gap semiconductors, Expression for Charge carrier concentration in Intrinsic semiconductors; Fermi Level in Intrinsic Semiconductors (Derivation) and Extrinsic semiconductor (dependence on temperature and doping concentration); concept of drift and diffusion currents, Continuity equation, Hall Effect; Photo conductivity, optical response, LED materials, Construction of LED; LCD- characteristics of Liquid crystal materials; actionof LCD display device; numeric displays;

Module IV: Physics of Nanomaterials [9 Periods]

Introduction - Nano scale, Surface to volume ratio and Quantum confinement; Optical Properties, Electrical properties; brief description of different methods of synthesis of nano materials - physical (LASER ablation, Ball milling), chemical (Vapor deposition, Sol - gel); Carbon nanotubes - properties and applications**,** Applications of nano materials - automobiles, electronics, medical, cosmetics, textile.

Module V: Electromagnetic Theory [7 Periods]

Gradient of Scalar field and its Physical Significance; Divergence and Curl of Vector field; Qualitative treatment of Gauss's Law of electrostatics and Gauss law of magnetostatics, Ampere's law, Faraday's law of electromagnetic induction, Induced E.M.F in a conductor, Lenz's Law , Displacement current, Maxwell equations in differential form, wave equation for free space.

Text Books:

1. K Vijay Kumar, S Chandralingam, "**Modern Engineering Physics**'', S. Chand and Company, 1st Edition 2010.
2. D K Bhattacharya, Poonam Tandon, "**Engineering Physics**", Oxford University Press, 1st Edition, 2015.
3. David J Griffiths "**Introduction to Electrodynamics**" Prentice Hall, 4th Edition, 2012.

References:

1. Callister W D Jr, "**Material Science and Engineering: An introduction**", John Wiley & Sons Publications, 8th Edition, 2010.
2. P K Palanisamy, "**Engineering Physics"**, 4th Edition, SciTech Publications, 2014.
3. Ghatak Ajay and Lokanatham, "**Quantum Mechanics"**, Springer Publications, 1st Edition, 2014.
4. G Prasad and Bhimashankaram, "**Engineering Physics"**, B S Publications, 3rd Edition, 2008.
5. Sulabha K. Kulkarni, "**Nano technology - Principles and practices"**, Springer Publications. 3rd Edition, 2014.
6. A K Sawhney, "**Electrical and Electronic Measurements and Instrumentation"**, Dhanpatrai and Sons publications, 19th revised Edition, 2014.

Outcomes:

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

1. Distinguish ferro, ferri and anti-ferro magnetic materials and understands different types of superconductors.
2. Understand the Kronig penny model after having learnt one dimensional infinite Potential well problem. This knowledge will further help them to understand the concepts related to semi conductors.
3. The various synthesis methods of nano materials and different applications.
4. Students able to get basic knowledge on electromagnetic theory.

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Course Code: 50303 **Credits: 3**

B.Tech. – II Semester
ENGINEERING MECHANICS
(Common for CE, ME and Min.E)

Prerequisites: Fundamental concepts of Physics
Objective: The objective of this subject is to provide the basic concepts of effect of system of forces on rigid bodies, Geometrical Properties of Planes and Solids, problem solving in kinematics and kinetics using different methods.

Module I: Introduction & Systems of Forces
A: Introduction: **[Periods 2]**
Basic Concepts, Laws of Motion, Force-types, characteristics- Principle of transmissibility.
B: Systems of Forces: **[Periods 10]**
Classification**,** Coplanar Concurrent Forces – Components of force– Resultant- Triangle law of Forces-Polygon law of Forces- Parallelogram Law of Forces-Resolution and composition of Forces– Coplanar Non-Concurrent System of Forces, Resultant of Parallel system of Forces -Moment of Force and its Application – Varignon's theorem, Couples.

Module II: Equilibrium of Systems of Forces: **[Periods 10]**
Free Body Diagrams, Types of Supports and their reactions, Internal and External Forces - Types of Equilibrium, Equations of Equilibrium, Conditions of Equilibrium, Equilibrium of bodies under Coplanar concurrent system of forces – Lami's Theorem, Converse of the Triangle law of forces, converse of the polygon law of forces.

Module III: Centroid, Centre of Gravity, Area Moment of Inertia and Mass Moment of Inertia
A: Centroid : **[Periods 3]**
Centroids of Lines and Areas (from basic principles) –simple figures– Centroid of Composite Figures- Centroid of L, T, I, Z and channel Sections.
B: Centre of Gravity : **[Periods 3]**
Centre of gravity of simple solids (from basic principles), centre of gravity of composite solids, Pappu's-Guldinus theorems.
C: Area moment of Inertia : **[Periods 3]**
Definition –Moment of Inertia of plane areas, Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Moment of Inertia of L, T, I, and channel Sections.
D: Mass Moment of Inertia: **[Periods 3]**
Moment of Inertia of Simple solids, Transfer Formula for Mass Moments of Inertia, Mass Moment of Inertia of composite bodies.

Module IV: Kinematics & Kinetics
A: Kinematics: **[Periods 5]**
Rectilinear motion – Motion of Rigid Body under uniform and variable accelerations – motion under gravity-curvilinear motion -Projectiles-rotary motion, kinematics of general plane motion.
B: Kinetics: **[Periods 5]**

Analysis as a Particle and Analysis as a Rigid Body in Translation – D'Alemberts Principle – Connected bodies- Kinetics of rotating bodies- Equations of Plane Motion– Rolling Bodies.

Module V: Work, Power and Energy & Impulse-Momentum principle

A: Work, Power and Energy: [Periods 7]

Work-energy equation for translation-connected bodies on horizontal and inclined planes-pulleys-Work done by a spring-Work-energy equation to rotary motion and general plane motion.

B: Impulse-Momentum principle: [Periods 3]

Linear impulse and momentum-connected bodies-pile & hammer.

Text Books:

1. S.Timoshenko, DH Young, JV Rao, SukumarPati, "**Engineering Mechanics"**, McGraw Hill Education Publisher,5th Edition(Special Indian Edition), 2013.
2. S.S. Bhavikatti, "**A Textbook of Engineering Mechanics"**, New Age International publishers, 1st Edition,2008.
3. D.S.Kumar Patil, "**Engineering Mechanics"**, SK Kataria & Sons Publishers, 2nd Edition, 2009.

References:

1. Fedinand . L. Singer, **"Engineering Mechanics"**, Harper & Row Publishers, 3rd Edition, 1975.
2. K.Vijaya Kumar Reddy, J. Suresh Kumar**, "Engineering Mechanics"**, B S Publications, 3rd Edition, 2013.
3. R.S. Khurmi, "**A Text Book of Engineering Mechanics"**, S.Chand Publications, 21st Edition, 2007.
4. K L Kumar, "**Engineering Mechanics"**, TataMcGrawHillEducation,4th Edition, 2011.

Outcomes:

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

1. Understand the basic concepts and types of forces.
2. Analyze centroid & centre of gravity, moment of inertia of different Planes and solids.
3. Apply De Alembert's principle, work-energy method and Impulse Momentum principle to solve dynamics problems.

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Course Code: 50202 **Credits: 4**

B.Tech. – II Semester

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Common for CE, ME and Min.E)

Prerequisites: NIL

Objectives: The objective of this Course is to provide an introductory and broad treatment of Electrical and Electronics Engineering.

Module I: Introduction to Electrical circuits [12 Periods]

A:Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel and series-parallel circuits excited by independent voltage sources-passive elements-Electromagnetism-Faradays Laws, Lenz's Law, concepts of self- inductance, mutual inductance and coefficient of coupling

B:Network theorems- superposition theorem, maximum power transfer theorem, Thevenin's theorem (Statement only)

Module II: Single Phase A.C. Circuits [10 Periods]

Generation of sinusoidal voltage- definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current phasor representation of alternating quantities; series RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor

Module III: Single phase transformers & 3-Phase Induction Motors [14 Periods]

A: Single phase transformers:

Principle of operation- construction details (core and shell types) - EMF equation, losses, efficiency

Alternators (or) Synchronous Generators:

Principle of operation; Types and constructional features; EMF equation-voltage regulation – EMF method

B: 3-PhaseInduction Motors

Principle of operation, types- Slip - Applications of squirrel cage and slip ring motors - speed-torque characteristics, speed control of 3-phase induction motor (stator voltage control technique only).

Module IV: Electronic Devices & Rectifiers

A: Electronic Devices [6 Periods]

PN Junction diode – symbol -principle of operation – characteristics, applications of diode Transistor- types- characteristics- Input and Output characteristics of transistor- Common Base, Common Emitter, and Common collector configurations- applications of a transistor - MOSFET – types- (Enhancement and depletion mode)- characteristics.

B: Rectifiers [5 Periods]

Half wave rectifier and full wave Rectifier with and without filter– ripple factor

Module V:Amplifiers &Basic Digital Electronics [5 Periods]

A: Amplifiers:

Principle of operation – types of amplifiers- h-parameter representation of a transistor- voltage gain, current gain, Input impedance and Output impedance- Introduction to feedback Amplifier.

B: Basic Digital Electronics **[5 Periods]**

Binary Number Systems and Codes; Basic Logic Gates and Truth Tables, Boolean Algebra, De Morgan‟s Theorems, Logic circuits, Flip-Flops –SR, JK, D type

Text Books:

1. Nagrath I.J. and D. P. Kothari, "**Basic Electrical Engineering"**, Tata McGraw Hill, 3rd Edition, 2010.
2. R. S. Sedha, "**A Text Book of Electronic Devices and Circuits"**, S.Chand& Co., 7th Edition, 2008.
3. Thomas L. Floyd and R. P. Jain, "**Digital Fundamentals"**, Pearson Education, 10th Edition, 2011.

References:

1. R.L.Boylestad & Louis Nashlesky, "**Electronic Devices &Circuit Theory"**, Pearson Education, 10th Edition, 2009.
2. P.S.Bimra, "**Electrical Machinery"**, Dhanapatrai Publications, 7th Edition, 2012.

Outcomes:

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

1. Learn how to develop and employ circuit models for elementary electrical components, e.g., sources, resistors, inductors, capacitors.
2. Determine voltages, currents, turns-ratios and power for single-phase transformers and synchronous generators.
3. Calculate motor horsepower, speed, slip, efficiency, power factor, and torque of three phase induction motor and applications.
4. Understand different electronic devices and application .of diodes in rectifiers.
5. Design digital control circuits to suite for engineering problems.

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Course Code: 50H02 **Credits: 2**

B.Tech. – II Semester
ENGLISH LANGUAGE LAB
(Common for CE, ME and Min.E)

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 sensitize the students to the intelligibility in their pronunciation of English, speech sounds, word accent, intonation and rhythm

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

To facilitate honing of listening and speaking skills of students

To train students to understand nuances of both verbal and non verbal communication during all activities

To develop confidence to face the audience and participate in activities

To help the students shed inhibitions and communicate with clarity

Listening Skills:

Objectives:

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation

2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language to be able to recognise them, awareness regarding stress and recognise 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 to express themselves fluently and appropriately in social and professional contexts.

• Oral practice
• Describing objects/situations/people
• Just A Minute(JAM) Sessions.

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

Module I:
CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session
Listening: listening for sounds in context, for ideas.
Speaking: ideation and translation of ideas into sentences.

Module 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.
Listening: listening for specific purposes, for details.
Speaking: speaking in the above situations with clarity, connectivity, maintaining voice characters.

Module III:
CALL Lab: Word accent and Listening Comprehension-reading(aloud) meaningfully.
ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.
Listening: listening for intelligible English
Speaking: formal and informal conversations, register.

Module IV:
CALL Lab: Intonation and Common errors in Pronunciation- reading aloud(evaluating through recording).
ICS Lab: Extempore- Public Speaking , Oral Presentation Skills
Listening: note taking and listening for speaker's tone/attitude
Speaking: organizing , connecting ideas and sentences, short forms in spoken English, errors in spoken English

Module V:
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Information Transfer, Debate
Minimum Requirement of infra structural 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.

A: System Requirement (Hardware component):
Computer network with Lan with minimum 60 multimedia systems with the following specifications:
a) P – IV Processor b) Speed – 2.8 GHZ, c) RAM – 512 MB Minimum
d) Hard Disk – 80 GB, e) Headphones of High quality
B: 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.
Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):
Prescribed Lab Manual: Rani Sudha, "***English Language Communication Skills laboratory"*** *Manual* Published by **Pearson Publication**, 5 edition, New Delhi 2014

References:

1. Gairns ,Ruth and Redman , Stuart: "***Oxford Word Skills"***, *Learn and Practice English Vocabulary*, 2nd Edition, 2008.
2. Hughes , John and Mallett , Andrew: "***Successful Presentations":*** DVD and Student's Book Pack: "**A Video Series Teaching Business Communication Skills"** for Adult Professionals
3. Karia , Akash: "***Public Speaking Mastery, Speak Like a Winner*** ", Kindle Edition, 2013.
4. Lucas, Stephen: "***The Art of Public Speaking"*** : Tata McGraw Hill, 11th Edition, 2011.

Websites:

1. http://www.mindtools.com/CommSkll/ActiveListening.htm
2. http://www.slideshare.net/alisonkis/dialogue-and-roleplay-activity
3. http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a22/An%20article%20for%20Monika%20(2010).pdf

Outcomes:

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

1. Better Understanding of nuances of language through audio- visual experience and group activities
2. Neutralization of accent for intelligibility
3. Speaking with clarity and confidence thereby enhancing employability skills of the students
4. Good understanding of listening skills and speaking skills and their application in real life situations.
5. Good understanding of non-verbal communication and developing confidence to face audience, shed inhibitions.

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Credits: 2

Course Code: 50B04

B.Tech. – II Semester
APPLIED PHYSICS LAB
(Common for CE, ME and Min.E)

List of Experiments:

1. Dispersion of Light –Dispersive power of material of a given glass and calcite prism.
2. Diffraction grating – Determination of the wavelength of a Sodium vapour lamp.
3. Melde's Experiment – Longitudinal and Transverse modes.
4. The RLC series circuit – Determination of resonant frequency, bandwidth and quality factor.
5. Magnetic field along the axis of current carrying circular coil- Stewart and Gee's experiment.
6. LASER- Diffraction due to single slit.
7. Evaluation of Numerical aperture of the given fiber.
8. Energy band –gap of a material of a P-N junction diode.
9. Torsional Pendulum- Determination of Rigidity modulus of two different wires.
10. Sonometer- Frequency of A.C supply.
11. Newton's Rings (Demonstration only).
12. Michelson interferometer (Demonstration only).

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Credits:2

Course Code: 50304

B.Tech. – II Semester

ENGINEERING MECHANICS & AutoCAD LAB

(Common for CE, ME and Min.E)

Any **six** experiments from

Module A

A: Engineering Mechanics Lab

1. Verification of triangle law and polygon law of forces.
2. Equilibrium of coplanar concurrent force system-forces in the jib crane.
3. To determine the support reaction for a beam.
4. To determine the moment of inertia of a flywheel.
5. Verifying the law of moments by disc apparatus.
6. To determine the coefficient of friction.
7. To study equilibrium of Non Concurrent forces.
8. To verify the equilibrium of forces using force table.

B: AutoCAD Lab

Drafting: Development of part drawings for various components in the form of orthographic and isometric using AutoCAD software. Representation of dimensioning and tolerances scanning and plotting(2D Drawing).

The student must be in a position to execute the basic commands using AutoCAD package after completion of Module-B

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Credits: -

Course Code: 50A02

B.Tech. – II Semester
COMPUTATIONAL MATHEMATICS LAB
(Common for CE, ME, CSE and Min.E)

Following Programming is to be done in C/ Matlab Language:

Module I **F**ind the roots of

i. non-linear equation using Bisection method
ii. non-linear equation using iteration method
iii. Newton-Raphson method
iv. Regula - falsi method

Module II

i. Find the smallest root of non-linear equation using Ramanujam's method
ii. Solve the system of non-homogeneous tri-diagonal equations using Thomas Algorithm
iii. Solve the system of non-homogeneous linear equations using Gauss-iedal method
iv. Interpolate with unevenly spaced points using Lagrangian method for 4 paired values.

Module III

i. Numerical integration using Trapezoidal rule.
ii. Numerical integration using Simpsons' $1/3^{rd}$ and $3/8^{th}$ rules
iii. Numerical solution of first order ordinary differential equation using Euler's method
iv. Numerical solution of first order ordinary differential equation using 4^{th} order Runge-Kutta method.

Manual:

NUMERICAL METHODS IN ENGINEERING & SCIENCE (WITH PROGRAMS IN C, C++ &MATLAB) BY B.S. GREWAL, KHANNA PUBLISHER. 2014

References:

1) Introductory Methods of Numerical Analysis by S.S. Sastry, Prentice-Hall of India Private Limited.2003
2) Numerical Methods for Scientists and Engineers by Sankara Rao K., Prentice-Hall. 7^{th} Edition, 2008

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50B08 **Credits: 4**

B.Tech. – III Semester
ELEMENTARY CALCULUS AND TRANSFORMS

Prerequisites: Basics of Mathematics.

Objective: The main objective of the course is to teach transforms based calculus like Laplace transforms and its applications to real life problems. Particularly while solving the differential equations transforms are the powerful aid to simplify the labor involved in calculation part. For time –invariant systems z-Transforms are useful. Fourier Transforms plays important role to solve some partial differential equations. Curve tracing is a draftsman art to identify the curve nature and by using it one can evaluate multiple integrals in the specified domain.

Module I: Fourier series and transforms [12 Periods]

A:Fourier series: Determination of Fourier coefficients – Fourier series – even and odd functions – Half-range Fourier sine and cosine expansions.

Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

B:Fourier Transforms: Fourier integral theorem - Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms - Finite Fourier transforms – Parsvel's Identity

Module II: Z-Transforms &Partial Differential Equations [12 Periods]

A: Introduction: Definition, Region of convergence, Linearity property, Damping rule, shifting theorems multiplication theorem, initial value theorem, final value theorem.

B: Inverse z-transforms: power series method, partial fraction method, convolution theorem, Introduction to Partial differential equations, Formation, Linear partial differential equation (Lagrangian Equation) , Non-Linear Partial Differential equation of first order (standard forms).

Module III: Curve Tracing and Multiple Integrals [12Periods]

Tracing of curves in Cartesian and Polar forms.

Multiple integrals, double and triple integrals, Change of order of integration, change of variables, polar , spherical, cylindrical coordinates.

Module IV: Differential Calculus [12 Periods]

A:Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's mean value Theorem, Generalized Mean Value theorem. (Only statements with geometrical interpretation)

B:Differentiability of multivariable functions: Jacobian, Functional dependence, Maxima and Minima of functions of two variables with constraints and without constraints (Lagrange's method of multipliers).

Module V: Vector Calculus: [12 Periods]

A:Point function, Gradient, Divergence, Curl, Directional derivative, angle between two surfaces. Line integral – Application to work done by a force, Circulation, Potential function. Surface integrals, volume integrals.Vector integral theorems: Green's theorem-Stoke's and Gauss's Divergence Theorem (without proof). verification.

Text Books:

1. Kreyszig, **"Advanced engineering Mathematics"**, John Wiley & Sons, 10th Edition, 2010. (Modules I, II, III, IV & V)
2. B.S. Grewal, **"Higher Engineering Mathematics"**, Khanna Publishers, 43rd Edition, 2014. (Modules I, II, III, IV & V)
3. Ian Sneddon, **"Elements of Partial Differential equations"**, Dover Publishers, 4th Edition, 2006. (Module II)

References:

1. R.K. Jain & S.R.K. Iyengar, **"Advanced Engineering Mathematics"**, Narosa Publications, 4th Edition, 2014.
2. Kanti B. Datta, **"Mathematical Methods of Science and Engineering"**, Cengage Learning, 1st Edition, 2011.
3. T.K. V. Iyengar, **"Engineering Mathematics – I "**,S Chand, 13th Edition, 2014.
4. D. S. Chandrasekhar, **"Engineering Mathematics – I"**, Prism Books pvt. LTD, 5th Edition, 1999.

Outcomes:

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

1. Learn the basic rules in Laplace transformations and able to find associated transformations of the defined function.
2. Solve ordinary differential equations by using Laplace Transformations.
3. Learn the concept of region of convergence for the time-invariant systems and associated transformations.
4. Learn the basic rules to form the partial differential equation and solution techniques.
5. Learn the concept of slope of a curve which can be mapped to functions to evaluate mean values.
6. Learn the concept of curve tracing which can use in evaluating the multiple integrals
7. Find the Gradient, Divergence and Curl of a vector valued function in order to evaluate work done by a force, Angular velocity.
8. Know the concept of Line integral, surface integral and volume integral which are used in verifying the Green's and Gauss and Stokes theorems.

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Course Code: 50101 **Credits: 3**

B.Tech. – III Semester
STRENGTH OF MATERIALS

Prerequisites: Engineering Mechanics

Objectives:
To provide basic knowledge in mechanics of materials so that the students can solve real engineering problems and design engineering systems by understanding the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation and material constitutive behavior. The basic mechanical principles underlying modern approach for design of various types of structural members subjected to axial, torsion, bending, transverse, and shear and combined loadings.

Module I:
A: Simple Stresses And Strains **[6 Periods]**
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
B: Principal Stresses And Strains **[6 Periods]**
Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions

Module II:
A: Strain Energy **[7 Periods]**
Resilience – Gradual, sudden, impact and shock loadings – simple applications
B: Shear Force and Bending Moment **[7 Periods]**
Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

Module III:
A: Flexural Stresses **[6 Periods]**
Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.
B: Shear Stresses **[6 Periods]**
Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections

Module IV: Deflection Of Beams (Determinant Beams) **[12 Periods]**
Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam: Double Integration method, Macaulay's method, Area Moment method, Conjugate beam method.

Module V:

A: theroies of failures **[6 Periods]**

Introduction Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory (Von Mises Theory).

B: Torsion, Shafts And Springs **[6 Periods]**

Torsion of circular and hollow shafts, Elastic Theory of torsion, Stresses and Deflection in circular solid and hollow shafts. Combined bending moment and torsion of shafts – Strain energy due to torsion- Modulus of Rupture – Power transmitted to shaft- shaft in series and parallel- Closed and open coiled helical springs- Leaf springs- Springs in series and parallel- Design of buffer springs.

Text Books:

1. R.K.Bansal, **"Introduction to Strength of materials"** Laxmi publications Pvt. Ltd., 2nd Edition-2010, New Delhi.
2. U.C. Jindal, **"Introduction to Strength of Materials"** Galgotia publications 1st Edition 2006.
3. R. Subramanian **"Strength of materials",** Oxford university press, 2nd Edition 2010 New Delhi

References:

1. S. Ramakrishna and R.Narayan, **"Strength of Materials"**, Dhanpat Rai publications 1st Edition - 2007.
2. R.K.Rajput , **"Strength of materials"** by, S.Chand & Co, 2nd Edition 2011 New Delhi.
3. L.S.Srinath et al., **"Strength of Materials"** by Macmillan India Ltd 1st Edition 2004. Delhi.
4. BhaviKatti , **"Strength of Materials"** by, Vikas Publising House pvt ltd, Edition 2009.

Web References:

- http://nptel.ac.in/courses/105105108/
- https://www.youtube.com/playlist?list=PL27C4A6AEA552F9E6
- https://archive.org/details/atextbookoncivi01schogoog
- http://www.aboutcivil.org/solid-mechanics.html
- http://en.wikipedia.org/wiki/Strength_of_materials

Outcomes:

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

1. Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
2. Calculate the stresses and strains in axially loaded members, circular torsion members and members subject to flexural loadings.

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Course Code: 50102 **Credits: 3**

B.Tech. – III Semester
SURVEYING

Prerequisites: Nil

Objectives:

Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, Leveling and to calculate Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the area of ground profile

Module I:

A: Introduction Basic Concepts [6 Periods]

Introduction, Objectives, classifications and Principles of surveying, Scales, Shrinkage of maps, conventional symbols and code of signals, Surveying Accessories, phases of surveying.

B: Measurement Of Distances And Directions [6 Periods]

Linear distances: Approximate methods, Direct methods-chains – tapes, ranging- tape corrections, Indirect methods- optical methods –E.D.M methods.

Prismatic Compass: Bearings, Included Angles, Local Attraction, Magnetic Declination and Dip.

Module II:

A: Leveling [6 Periods]

Basic definitions, types of levels and leveling staves, Temporary and permanent adjustments-method of leveling. Booking and determination of levels-HI method – Rise and fall method, effect of curvature if earth and refraction

B: Contouring [6 Periods]

Characteristics and Uses of contours, Direct and indirect methods of contour surveying, interpolation and sketching of Contours.

Module III:

A: Computation Of Areas And Volumes [6 Periods]

Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries, Planimeter. Volumes: Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

B: Theodolite Surveying [6 Periods]

Types of Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling when the base is accessible and in accessible

Module IV:

A: Traversing [6 Periods]

Methods of traversing traverse computation and adjustments , gale's traverse table, omitted measurements

B: Tacheometric Surveying [6 Periods]

Principles of tacheometry, Stadia and tangential methods of Tacheometry.

Module V:

A: Curves **[6 Periods]**

Types of curves, design and setting out – simple and compound curves.

B: Introduction To Modern Surveying Methods **[6 Periods]**

Total Station, Global positioning system and Geographic information system (GIS).

Text Books:

1. B.C.Punmia Ashok Kumar Jain and Arun Kumar Jain "**Surveying**" (Vol – 1, 2 & 3), Laxmi Publications (P) ltd., 14th Edition, 2014.
2. Duggal S K, "**Surveying**" (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. 4th Edition, 2004.

References:

1. Arror K R "**Surveying Vol 1, 2 & 3"**, Standard Book House, Delhi, 4th Edition, 2004
2. Chandra A M, "**Plane Surveying**", New age International Pvt. Ltd., Publishers, New Delhi, 4th Edition 2002.
3. Chandra A M, "**Higher Surveying**", New age International Pvt. Ltd., Publishers, New Delhi, 4th Edition 2002.

Web References:

1. http://v5.books.elsevier.com/bookscat/samples/9780750669498/9780750669498.PDF
2. http://www.whycos.org/fck_editor/upload/File/Pacific
3. HYCOS/Surface_Waters/Levelling_and_surveying.pdf

Outcomes:

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

1. Prepare Map and Plan for required site with suitable scale
2. Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
3. Prepare LS & CS, contour maps and carryout surveying works related to land and civil engineering projects

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Course Code: 50103 **Credits: 3**

B.Tech. – III Semester
FLUID MECHANICS

Prerequisites: Nil

Objectives:
Develop an understanding of fluid dynamics in civil engineering as well as a variety of other fields. To introduce fluid mechanics and establish its relevant in civil engineering develop the fundamental principles demonstrates how these are used in engineering, especially in civil engineering field.

Module I:
A: Introduction [6 Periods]
Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion, Pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers.
B: Hydrostatic Forces [6 Periods]
Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems.

Module II:
A: Fluid Kinematics [6 Periods]
Description of fluid flow, Stream line, path line and streak lines and stream tube.
B: Classification Of Flows [6 Periods]
Steady, unsteady, uniform, nonuniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flownet analysis.

Module III:
A: Fluid Dynamics [6 Periods]
Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow.
B: Applications Of Bernoulli's Equation [6 Periods]
ventury meter, orifice meter, pitot tube, Navier – stokes equations (Explanationary) Momentum equation and its application – forces on pipe bend.

Module IV:
A: Boundary Layer Theory [6 Periods]
Approximate Solutions of Navier Stoke's Equations – Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers,BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect.
B: Laminar And Turbulent Flow [6 Periods]
Reynold's experiment – Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

Module V:

A: Closed Conduit Flow **[6 Periods]**

Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Pipe network problems, variation of friction factor with Reynold's number – Moody's Chart.

B: Measurement Of Flow **[6 Periods]**

Pitot tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular and trapezoidal and Stepped notches - –Broad crested weirs.

Text Books:

1. Modi and Seth "**Fluid Mechanics**", Standard book house.15th Edition, 2002.
2. S.K.Som & G.Biswas "**Introduction to Fluid Machines**" (Tata Mc.Grawhill publishers Pvt. Ltd.), 3rd Edition, 2011.
3. Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer "**Introduction to Fluid Machines**", Oxford University Press, New Delhi, 1st Edition, 2004.

References:

1. .F.Douglas, J.M. Gaserek and J.A.Swaffirld", **Fluid Mechanics**" Prentice Hall 4th Edition, 2000.
2. A.K. Mohanty, "**Fluid Mechanics**", Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition 2004.
3. Subramanya "**Fluid Mechanics**", Tata McGraw-Hill Education, 2nd Edition, 2011
4. R.K.Rajput "**Fluid Mechanics**" S. Chand, 2nd Edition, 2008

Web References:

1. http://nptel.ac.in/courses.php?disciplineId=105.
2. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv078-Page1.htm
3. http://nptel.ac.in/courses/105101082/

Outcomes:

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

1. Apply fundamental knowledge of mathematics to modeling and analysis of fluid flow problems in civil and environmental engineering.
2. Understand or become aware of disasters caused by an incorrect analysis in hydraulic engineering system.
3. Apply fundamental principles of fluid mechanics for the solution of practical civil engineering problems of water conveyance in pipes,pipe networks, orifices, mouthpieces, notches weirs and open Channels.

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Course Code: 50104 **Credits: 2**

B.Tech. – III Semester

BUILDING MATERIALS, CONSTRUCTION & PLANNING

Prerequisites: Nil

Objectives:

To provide basic knowledge in engineering materials which includes role of materials in civil engineering based on Physical, chemical and Mechanical properties which will be useful for all engineering works and enable the students to develop knowledge of material science and behavior of various building materials used in construction and to identify the construction materials required for the assigned work and to provide procedural Knowledge of the simple testing methods of cement, Lime and concrete etc.

Module I:

A: Stones And Bricks, Tiles **[4 Periods]**

Building stones – classifications and quarrying – properties – structural requirements – dressing and robo sand.

B: Bricks **[4 Periods]**

Composition of Brick earth – manufacture and structural requirements.

C: Wood, Aluminum, Glass And Paints **[4 Periods]**

Wood - structure – types and properties – seasoning – defects; alternate materials for wood – GI / fibre –reinforced glass bricks, steel & aluminum.

Module II:

Cement & Admixtures **[10 Periods]**

Ingredients of cement – manufacture – field & lab tests , Admixtures – mineral & chemical admixtures – uses.

Module III:

A: Building Components **[6 Periods]**

Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ;foundations – types ; Damp Proof Course ; Joinery – doors – windows – materials – types.

B: Building Services **[6 Periods]**

Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption –Acoustic design; Fire protection – FireHarzards – Classification of fire resistant materials and constructions.

Module IV:

A: Masonry And Finishings **[6 Periods]**

Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP

B: Form Work **[6 Periods]**

Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

Module – V:

Green Buildings **[10 Periods]**

Introduction to green buildings, green materials, sources of green materials, high-performance green buildings Impacts of building construction, operation, and disposal Methods and tools for building assessment, Green Globes.

Text Books:

1. S.C.Rangwala, "**Building Materials"**, Charotar Publishing House, 41st Edition, 2014.
2. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, "**Building Construction"** Laxmi Publications (P) ltd., New Delhi, 10th Edition, 2008.
3. Gambhir.M.L, "**Concrete Technology**", Tata Mc Graw Hill Education, 3rd Edition 2004.

References:

1. S.K. Duggal, "**Building Materials"** New Age International publishers, 4th Edition, 2014.
2. PC Verghese**, "Building Construction",** PHI learning pvt.Ltd., 3rd Edition, 2009.
3. National Building code-2002
4. Jagdish. K.S, "**Alternative Building Materials Technology**", New Age International, 2007.

Web References:

1. http://www.dewa.gov.ae/images/greenbuilding_eng.pdf
2. www.engr.utk.edu/mse/Textiles/Geotextiles.htm
3. http://Building materials and construction planning.pdf
4. en.wikipedia.org/wiki/Construction

Outcomes:

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

1. Manage the principal resources of the construction industry to include human and material.
2. Understand the prevention of damage measures and good workmanship.
3. Know the importance of experimental verification of material properities.

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Course Code: 50H12 **Credits: 3**

B.Tech. – III Semester
ENGINEERING ECONOMICS AND ACCOUNTANCY

Prerequisites: Nil

Objective: EEAA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager's responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis

Module I: Managerial Economics and Demand [12 Periods]

Introduction to Managerial Economics:

A:Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

B:Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

Module II: Theory of Production and Cost Analysis [11 Periods]

A:Theory of Production: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

B:Cost Analysis: Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)- Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

Module III: Market structures and Pricing Policies [11 Periods]

A:Introduction to Markets & Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

B:Pricing Policies & Methods: Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

Module IV: Business Environment and Capital Budgeting [11 Periods]

A:Business & New Economic Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

B:Capital And Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals,

Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

Module V: Financial Accounting and Ratios [11 Periods]

A:Introduction to Financial Accounting: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

B:Financial Analysis Through Ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

Text Books:

1. Aryasri, **"Managerial Economics and Financial Analysis"**, TMH, 2nd Edition, 2005. (Modules I, II, III, IV & V)
2. Varshney & Maheswari, **"Managerial Economics"**, Sultan Chand, 5th Edition, 2003. (Modules I, II & III)

Reference Books:

1. H. Craig Peterson & W. Cris Lewis, **"Managerial Economics"**, PHI, 4th Edition.
2. Domnick Salvatore, **"Managerial Economics In a Global Economy"**, Thomson, 4th Edition.
3. Raghunatha Reddy & Narasimhachary, **"Managerial Economics& Financial Analysis"**, Scitech, 4th Edition.
4. S. N. Maheswari & S. K. Maheswari, **"Financial Accounting"**, Vikas, 6th Edition.
5. Dwivedi, **"Managerial Economics"**, Vikas, 6th Edition.

Outcomes:

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

1. Think in the terms of a managerial economist.
2. Appraise economic articles in newspapers such as Economic Times.
3. Solve quantitative problems in a business environment.
4. Acquire an ability to apply knowledge of economic concepts, accounting concepts.
5. Identify, formulate, and solve financial problems.
6. Gain knowledge of Financial Concepts as applied to Business Management.

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Course Code: 50105 **Credits: 2**

B.Tech. – III Semester
STRENGTH OF MATERIALS LAB

List of Experiments:

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

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Course Code: 50106 **Credits: 2**

B.Tech. – III Semester
SURVEYING LAB

List of Exercises:

1. Survey of an area by chain survey (closed traverse) & Plotting
2. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment.
3. Radiation method, intersection methods by plane Table survey
4. Fly leveling (differential leveling)
5. An exercise of L.S and C.S and plotting
6. Two exercises on contouring.
7. Measurement of horizontal angles by method of repetition and reiteration.
8. Heights and distance using Principles of tacheometric surveying (Two Exercises)
9. State-out using total station
10. Determine of area using total station
11. Determination of remote height using total station
12. Distance, gradient, Diff, height between to inaccessible points using total stations.

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Course Code: 50H11

B.Tech. – III Semester
HUMAN VALUES AND PROFESSIONAL ETHICS

Introduction:

The term 'ethics' is derived from the Greek word ***ethos*** which can mean custom, habit, character or disposition. Ethical awareness is an integral part of professional attitude and it is necessary to take time for reflection-on-action. Building professional attitude begins by understanding what it means to be a professional and how a professional should relate and react to her work environment The Course, Professional Ethics and Human Values will be a part of Value Education leading towards sensitizing the students on Values of Life and preparing them for life. The colleges are centers of excellence for the education of students. Many of these students will be the professionals of tomorrow: Engineers, Business administrators, and so forth. Their expertise, knowledge and power will exercise a crucial influence on the quality of life of millions of citizens. The question is whether they will be sufficiently prepared to recognize the ethical aspects of their professional decisions and to understand the social consequences of their work. The institutions prepare them to become experts in a very limited field, to find technical solutions to specific problems. But often they do not learn how to resolve ethical problems or to make themselves into responsible persons.

The term 'ethics' is derived from the Greek word ***ethos*** which can mean custom, habit, character or disposition. Ethical awareness is an integral part of professional attitude and it is necessary to take time for reflection-on-action. Building professional attitude begins by understanding what it means to be a professional and how a professional should relate and react to her work environment

Objectives:

- To create an awareness on Professional Ethics and Human Values.
- To understand social responsibility of any profession
- To appreciate ethical dilemma while discharging duties in professional life.
- To help the students appreciate the essential complementarily between Values and Skills to ensure sustained happiness and prosperity which are the core aspirations of all human beings
- To develop Holistic Perspectives towards life
- To enable students to lead a practical life adding value to human relations
- To generate capacity for making intelligent and independent value judgments in real life situations.

Module I:

Human Values: [08 Periods]

Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Character.

Module II:

Professional Ethics: [10 Periods]

Variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

Module III:

Human values, Ethics, Life Skills: [08 Periods]

Goals in life – Goal setting – Differentiating Right and Wrong – Integrity – Adaptability – Sense of Humor - Valuing Time – Co-operation – Commitment

Module IV:

Harmony in Human Beings Vs Harmony in self: [08 Periods]

Understanding self and body – Human Interactions – Human-Human relationships – Respect and Differentiation – Humanistic education, Humanistic Constitution, Humanistic Universal Order

Module V:

A: Responsibilities and Rights: [12 Periods]

Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) – discrimination.

B: Global Issues:

Multinational corporations - Environmental ethics - computer ethics - moral leadership

References:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
4. Naagarazan. R.S "A Textbook on Professional Ethics and Human Values", New Age International Publishers, 2001
5. A N Tripathy, "Human values", New Age International Publishers, 2003
6. George Reynolds, "Ethics in Information Technology", Cengage Learning, 2002

Outcomes:

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

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Course Code: 50H16 **Credits: 2**

B.Tech. – IV Semester
ENVIRONMENTAL SCIENCES

Prerequisites: Environment

Objective: An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problems of environment.

Module I:

A: Ecosystems **[07 Periods]**

Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy.

Module II: Natural resources, Biodiversity and biotic resources **[09 Periods]**

A:Natural resources: Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources – case studies. Growing energy needs-Energy resources: renewable and non renewable energy sources.

B:Biodiversity and biotic resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values.

Module III:

A:Environmental pollution and control **[09 Periods]**

Classification of pollution and pollutants, causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutants of water and their sources, drinking water quality standards, Soil Pollution: Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, coastal pollution due to sewage and marine disposal of industrial effluents.

Module IV:

A:Global environmental problems and global efforts **[06 Periods]**

Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

Module V:

A:Towards Sustainable Future **[08 Periods]**

Concept of Sustainable Development, Threats to Sustainability, Population and its

explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism (CDM).

Text Books:

1. R. Rajagopalan, **"Environmental studies From crisis to cure"**, Oxford University Press, 2nd Edition, 2005. (Modules I, II, III, IV)
2. Anubha Kaushik, C. P. Kaushik, **"Environmental studies"** New age International Publishers, 4th Edition, 2012. (Modules I, II, III, IV & V)
3. Erach Bharucha, **"Environmental studies"** University Grants Commission, and University Press, 1st Edition, 2005. (Modules I, II, III, IV & V)

Reference Books:

1. M. Anji Reddy "**Text book of Environmental Science and Technology"** 3rd Edition, 2007.
2. Richard T. Wright, **"Environmental Science: towards a sustainable future"** PHL Learning, Private Ltd. New Delhi, 2nd Edition, 2008.
3. Gilbert McMasters and Wendell P. Ela, **"Environmental Engineering and science"**, 3rd Edition, PHI Learning Pvt. Ltd., 2008.

Outcomes:

At the end of the course students are able to:

1. Enable the students to realize the importance of the sustainable use of natural resources.
2. Make the students aware of the impacts of human actions on environment and measures to minimize and mitigate them.
3. Enable the students to become aware of the current issues and problems pertaining to the environment.

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Course Code:50B09 **Credits: 4**

B.Tech. – IV Semester
PROBABILITY & STATISTICS

Objectives: The main objective of the course probability& Statistics is to revise elementary concepts and techniques encountered in the Set theory. Extended to teach the basics of probability, axioms to familiarize the knowledge on the concept of random variables. Introduced new techniques for carrying out probability calculations and identifying probability distributions. To motivate the use of statistical inference in practical data analysis by introducing so many tests which are fit for small and large data. The process of queuing theory is also introduced to learn the concept of optimize the system service rate by reducing the idle time. By enlarge we are focused on elementary concepts and techniques in statistical methodology to solve their project work.

Module I: **[12 Periods]**

Introduction to Probability, events, sample space, mutually exclusive events. Exhaustive events. Addition theorem for 2& n events and their related problems. Dependent and Independent events, conditional probability, multiplication theorem. Boole's inequality, Baye's Theorem.

Module II: **[12 Periods]**

Random variables – Discrete Probability distributions. Bernoul, Binomial, poission, geometric, mean, variance, moment generating function–related problems. Continuous probability distribution, Normal distribution, Exponential, Rectangular, Weibull distribution, Beta and Gamma distributions, mean, variance, moment generating function–related problems.

Module III: **[12 Periods]**

A:Sampling Distributions: Definitions of population-sampling-statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimations – likelihood estimate, point estimation and interval estimation.

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

Large sample tests:

(i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances)

(ii) Tests of significance of difference between sample S.D and population S.D.

(iii) Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

Module IV: Small sample tests: **[12 Periods]**

Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples, Snedecor's F

,distribution and it's properties. Test of equality of two population variances, Chi-square distribution, its properties, Chi-square test of goodness of fit

Module V: **[12 Periods]**

A:Correlation & Regression: Correlation, Coefficient of correlation, the rank correlation. Regression, Regression Coefficient, The lines of regression: simple regression, regression for 3 independent variables.

B:Queuing Theory: Structure of a queuing system , Operating Characteristics of queuing system, Transient and Steady states, Terminology of Queuing systems, Arrival and service processes, Pure Birth-Death process Deterministic queuing models, (M/M/1):(∞:FIFO) Model, (M/M/1):(N:FIFO) Model .

Text Books:

1) Probability & Statistics for Engineers & Scientists –Walpole Myers Myers Ye.
2) Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers
3) Probability and Statistics for Engineers and Scientists by Sheldon M.Ross, Academic Press
4) Operations Research by S.D. Sarma.
5) Operations Research by Taha

References:

1) Mathematics for Engineers by K.B.Datta and M.A S.Srinivas, Cengage Publications
2) Probability and Statistics by T.K.V.Iyengar & B.Krishna Gandhi Et
3) Fundamentals of Mathematical Statistics by S C Gupta and V.K.Kapoor
4) Probability and Statistics for Engineers and Scientists by Jay l.Devore.

Outcomes:

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

1. Determine measure of probability, of a given problem. Introduction of random variables and construction of probability distribution function/density function.
2. Identify the distribution of a random variable (discrete or continuous) of interest in an experiment, and calculate the probability that the random variable can take on certain values.
3. Conduct hypothesis test and construct confidence intervals for the population mean, variance, or proportion (one sample and two samples).
4. Apply the principles of linear correlation and regression to predict the Outcomes of certain experiment parameters.
5. Apply the queuing theory concept to reduce the long queues in the form of fast service rate.

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Course Code: 50107 **Credits: 3**

B.Tech. – IV Semester
ENGINEERING GEOLOGY

Prerequisites: Nil

Objectives:
Ability to analyze representations of key concepts from geology (earth science), policy and values as they appear in geophysics, geochemistry and other natural sciences & technological sciences. To make clear key points of a complex article or research work in concrete technology, material sciences in building construction and management & conservation of natural building materials. Also, to understand the naturally occurring potable (surface and subsurface) water its origin, accumulation, migration and management of water resources.

Module I:
Introduction **[16 Periods]**
Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology. Weathering of rocks **:** Its effect over the properties of rocks, importance of weathering with REFERENCE to dams, reservoirs and tunnels. Weathering of common rock like "Granite"

Module II:
A: Mineralogy **[8 Periods]**
Definition of mineral, importance of study of minerals, different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite , Graphite, Magnesite, and Bauxite.

B: Petrology **[8 Periods]**
Definition of rock. Geological classification of rocks into igneous, sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. sedimentary & metamorphic rocks and their distinguishing features, Megascopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate. Rock excavation, stone aggregates.

Module III:
A: Structural Geology **[8 Periods]**
Indian stratigraphy and Geological Time Scale**,** Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities and joints - their important types.

B: Geophysical Studies **[8 Periods]**
Importance of Geophysical studies Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and

Geothermal method. Special importance of Electrical resistivity methods and seismic refraction methods. Improvement of competence of sites by grouting etc. Fundamental aspects of Rock Mechanics and Environmental Geology.

Module IV:

A: Geology Of Dams And Reservoirs [8 Periods]

Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs, Geo hazards, ground subsidence.

B: Tunnels [8 Periods]

Purposes of tunneling, Effects of Tunneling on the ground. Role of Geological Considerations (Lithological, structural and ground water) in tunneling, over break and lining in tunnels, Tunnels in rock, subsidence over old mines , mining substances.

Module V:

Ground Water [8 Periods]

Water table, common types of ground water, springs, cone of depression, ecological controls of ground water movement, ground water exploration. Earthquakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, landslides hazards, water in landslides their causes and effect measures to be taken to prevent their occurrence. Importance of study of ground water, earthquake and landslides.

Text Books:

1. N.Chennakesavulu "**Engineering Geology**", Mac-Millan Publishers India Ltd. 2nd Edition, 2010.
2. Parbin Singh, "**Engineering Geology and general geology**" S. K. Kataria & Sons, 8th Edition, New Delhi, 2010.

References:

1. F.G. Bell, "**Fundamental of Engineering Geology**" Butterworths Publications, New Delhi, 1992.
2. Krynine & Judd, Principles of "**Engineering Geology & Geotechnics**", CBS Publishers & Distribution, 2005.
3. Tony Waltham "**Foundations of Engineering Geology**" — Spon press/ Cry press Taylor & Francis, 2009.
4. S.K. Duggal, H.K. Pandey and N. Rawal, "**Engineering Geology**", - Mc Graw Hill Education (India) Private Limited, New Delhi,1st Edition, 2014.

Webreferences:

1. www.springer.com › Home › Earth Sciences & Geography › Geology
2. https://en.wikipedia.org/wiki/Tunnels_(novel)
3. www.icevirtuallibrary.com › Journals
4. www.groundwater.org/get-informed/basics/groundwater.html
5. www.soest.hawaii.edu/martel/Courses/GG303/

Outcomes:

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

1. Demonstrate an advanced knowledge of how geological principles can be applied to engineering practice

2. Critically assess data collected in the field and the laboratory and recognize their geological importance
3. Understand structure and composition of earth.
4. Understand how precious earth natural resources in the management of construction industry and mineral based industries.
5. Understand how human activities in construction of major projects such as dams, tunnels, highways and reservoirs and its impact on earth environment & its economics.

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Course Code: 50108 **Credits: 3**

B.Tech. – IV Semester
ADVANCED SOLID MECHANICS

Prerequisites: Strength of Materials

Objectives:
To provide the basic concepts of Columns and Struts and calculation of stresses and deformations under Direct, Bending Stresses and in beams subjected to unsymmetrical bending so that to apply the knowledge of solids on engineering applications and design problems.

Module I:
Columns And Struts **[14 Periods]**
Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

Module II:
Direct And Bending Stresses **[12 Periods]**
Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and bending moment about both axis.

Module III: Thin Cylinders & Thick Cylinders:
A: Thin Cylinders **[6 Periods]**
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 – Thin spherical shells.
B: Thick Cylinders **[7 Periods]**
Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders –Necessary difference of radii for shrinkage – Thick spherical shells.

Module IV:
A:Unsymmetrical Bending **[13 Periods]**
Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis - Deflection of beams under unsymmetrical bending.

Module V: Beams Curved In Plan & Shear Centre

A: Beams Curved In Plan **[6 Periods]**

Introduction – circular beams loaded uniformly and supported on symmetrically placed columns – Semi- circular beam simply-supported on three equally spaced supports.

B: Shear Centre **[7 Periods]**

Introduction-shear centre for symmetrical and unsymmetrical (Channel, I, T & L) Sections

Text Books:

1. R.K.Bansal "**Strength of materials**" Laxmi Publications (P) ltd., 6th Edition 2015.
2. Basavarajaiah and Mahadevappa "**Strength of materials**" University press 3rd Edition, 2011

References:

1. Ferdinandp Beer "**Mechanics of Solid**", Tata Mc.Grawhill Publications 1st Edition 2000.
2. S. Ramakrishna and R.Narayan "**Strength of Materials**" Dhanpat Rai publications., 1st Edition 2015.
3. A.R.Basu, Nai Sarah "**Strength of Materials**" Dhanpat Rai & Co., 2nd Edition , 2011.
4. L.S.Srinath "**Strength of Materials**" Macmillan India Ltd., 1st edition, 2014.

Web References:

1. http://nptel.ac.in/Aeronautical/Strength%20of%20Materials/course_strength%20of%20materials.pdf
2. http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/strength%20of%20materials/homepage.htm
3. http://cfd.annauniv.edu/coursematerial/strength%20of%20materials.pdf
4. https://www.youtube.com/watch?v=GkFgysZC4Vc&list=PL27C4A6AEA552F9E6

Outcomes:

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

1. Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behaviour of materials.
2. Analyze columns and pressure vessels under various loadings.
3. Conduct himself or herself professionally and with regard to his or her responsibilities toward society, especially with respect to designing machine parts and structures to prevent failure.

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Course Code: 50109 **Credits: 3**

B.Tech. – IV Semester
CONCRETE TECHNOLOGY

Prerequisites: Building Materials Construction & Planning

Objectives:
To provide the basic knowledge of science and engineering of concrete properties related to civil engineering problems. Going through the course one would develop adequate understanding on concrete production process and properties and uses of concrete as a modern material of construction.The courses will enable one to make appropriate decision regarding ingredient selection and use of concrete.

Module I: Cement & Admixtures

A- Cement **[8 Periods]**

Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement –Test on physical properties – Different grades of cement.

B- Admixtures **[6 Periods]**

Types of admixtures – mineral and chemical admixtures – properties – dosages – effects – usage

Module II: Aggregates **[12 Periods]**

Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

Module III: Fresh Concrete & Hardened Concrete

A:Fresh Concrete **[7 Periods]**

Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

B:Hardened Concrete **[6 Periods]**

Water / Cement ratio – Abram‘s Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

Module IV: Testing Of Hardened Concrete& Elasticity, Creep & Shrinkage

A:Testing Of Hardened Concrete **[6 Periods]**

Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Nondestructive testing methods – codal provisions for NDT

B:Elasticity, Creep & Shrinkage **[7 Periods]**

Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

Module V: Mix Design & Special Concretes

A:Mix Design [7 Periods]

Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design with Admixtures

B:Special Concretes [6 Periods]

Light weight aggregates – Light weight aggregate concrete – Cellular concrete – High density concrete – Fiber reinforced concrete – Polymer concrete – Types of Polymer concrete – High performance concrete – Self compacting concrete-Self Curing Concrete.

Text Books:

1. A.M.Neville "**Properties of Concrete**" Low priced Edition – 5th Edition 2012
2. M.S.Shetty "**Concrete Technology**" S.Chand & Co. Revised Edition; 2006

References:

1. M.L. Gambhir. "**Concrete Technology**" 5th Edition 2013 – Tata Mc. Graw Hill Publishers, New Delhi
2. A.R. Santha Kumar "**Concrete Technology**", Oxford university Press 2006, New Delhi
3. P.K.Mehta and J.M.Monteiro, "**Concrete: Micro structure, Properties and Materials**" –5th Edition 2014 Mc-Graw Hill Publishers.

Web References:

1. http://nptel.ac.in/courses/105102012/
2. http://www.indianconcreteinstitute.org/
3. http://nptel.ac.in/courses/105105104/

Outcomes:

After completion of the course student can able to

1. Understand the importance and to develop systematic knowledge of concrete technology.
2. Familiarize with the fundamental of concrete
3. Understand the design principles of concrete to achieve the desired strength.

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Course Code: 50110 **Credits: 3**

B.Tech. – IV Semester
HYDRAULICS AND HYDRAULIC MACHINERY

Prerequisites: Fluid Mechanics

Objectives
To get knowledge about open channel hydraulic and the working of hydraulic machinery, understand the application of momentum principle of impact of jets on plane and curved surfaces, centrifugal pumps, work done and efficiency of the different types centrifugal pumps and also study about performance of pumps & characteristics curves and specific speed and performance characteristics of different types of turbines.

Module I: Open Channel Flow [12 periods]
Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's; and Bazin formulae for uniform flow – Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows. Non uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method-Rapidly varied flow, hydraulic jump, energy dissipation.

Module II:Hydraulic Similitude [10 periods]
Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

Module III:
A.Basics Of Turbo Machinery [6 periods]
Hydrodynamic force of jets on stationary and moving flat inclined and curved vanes, jet striking centrally and at tip.
B.Turbo Machinery [6 periods]
Velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines.

Module IV:
Hydraulic Turbines [10 periods]
Layout of a typical Hydropower installation – Heads and efficiencies- Classification of turbines-pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and function efficiency.Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitations. Runway speed, Differences between types of turbines

Module V:
A.Centrifugal-Pump [6 periods]
Pump installation details-classification-work done- Manometric head-minimum starting speed-losses and efficiencies-specific speed multistage pumps-pumps in parallel-performance of pumps-characteristic curves- NPSH-cavitations.

B.Hydropower Engineering [6 periods]

Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

Text Books:

1. Modi & Seth "**Fluid Mechanics, Hydraulic and Hydraulic Machines**", Standard book house.20th Edition, 2015.
2. K,Subramanyam "**Open Channel flow**", Tata Mc.Grawhill Publishers, 3rd Edition, 2009.
3. Narayana pillai "**Fluid Mechanics & Fluid machines**", Universities press, 3rd Edition, 2009

References:

1. R.K. Bansal "**A text of Fluid Mechanics and Hydraulic Machines**" Laxmi Publications (P) ltd., New Delhi, 9th Edition, 2010.
2. Ranga Raju, "**Elements of Open channel flow**" Tata Mc.Graw Hill, Publications, 2nd Edition, 1993.

Web References:

1. http:// nptel.ac.in/courses/105103096/
2. http:// nptel.ac.in/courses/105103082/

Outcomes:

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

1. Understand and control for the benefit of society ,the occurrence ,movement and use of water, whether it is in lakes , rivers , pipes, drains , percolating through soils or pounding the coastline as destructive waves.
2. Modify the behavior of water calls inevitably for a large investment of time, resources and effort, thus hydraulic engineering has only appeared once a society is centralized under an organized government.
3. Learn various theories dealing with the flow phenomenon of fluid in an open channel.
4. Understand of basics of the hydro-machinery and the components , function and use of different types of turbines and pumps.

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Course Code: 50111 **Credits: 2**

B.Tech. – IV Semester

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

List of Expirements:

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice / mouthpiece by constant head method.
3. Calibration of contracted Rectangular Notch and / Triangular Notch
4. Determination of friction factor of a pipe.
5. Determination of Coefficient for minor losses.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Performance characteristics of a single stage/ multi-stage centrifugal pump.
12. Performance characteristics of a reciprocating pump.

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Course Code: 50112 **Credits: 2**

B.Tech. – IV Semester
ENGINEERING GEOLOGY LAB

List of Experimnets:

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic and microscopic description and identification of rocks referred under theory.
3. Megascopic and microscopic identification of rocks & minerals.
4. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
5. Simple Structural Geology problems.

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Course Code: 50H17 **Credits: 2**

B.Tech. – III Semester

GENDER SENSITIZATION
(An Activity-based Course)

OBJECTIVE:

- 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.

MODULE-I: UNDERSTANDING GENDER [6 Periods]

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.

Just Relationships: Being Together as Equals *(Towards* a *World of Equals:* Unit -*2)* Mary iKorn and Onler. Love and Acid just do not Mix. Love Letters. Mothers aniJ Fathers. Further Reading: Rosa Parks-The Brave Heart.

MODULE-II: GENDER AND BIOLOGY [6 Periods]

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.
Additional Reading: Our Bodies, Our Health *(Towards a World of Equals:* Unit -13)

MODULE-III: GENDER AND LABOUR [6 Periods]

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

MODULE-IV: ISSUES OF VIOLENCE [6 Periods]

Sexual Harassment: Say Nol *(Towards a World of Equals:* Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: *"Chdpulum.* Domestic Violence: Speaking Out *(Towards a World of Equals:* Unit -5)
Is Home a Safe Place? When Women Unite (Film" Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about Sexual Violence *(Towards a World of Equals:* Unit -11)
Blaming the Victim-1 Fought for my Life...." - Further Reading: The Caste Face of Violence.

MODULE-V: GENDER STUDIES [6 Periods]

Knowledge: Through the Lens of Gender *(Towards a Work/ of Equals:* Unit -5)
Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged Women Artists of Telangana.
Whose History? Questions for Historians and Others *(Towards a World of Equals:* Unit -9)
Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

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, Mina Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Thant

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.

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 ToIrmgana People's Struggle.* New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." ***Women's*** *Studios Journal* (14 November 2012) Available online at: http:// blogs.visj.com/ India real time/2012/11/14/by -the-numbers-where-Indan-womenworkP
3. K. Satyanarayana and Susie Thant (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada htto://harooreollins.co.in/BookDetailasp?Flook Cndet'3732
4. Vimata. "Vantillu (The Kitchen)". *Women Writing in India: 600 BC to the Present. Volume II:* The 20th Century. Ed. Susie Thaw and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5. Shatrughna, Veena et al. *Women's Work and its Impact on Child Health end Nutrition,* Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. 'We Were *Making I listory ....' 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: 6008C to the Present. Volume II:* The 20" Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995.596-597.
9. Javeed, Shayan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical Analysis.' *International Journal of Humanities and Social Science Invention* 2.4(2013)
10. Gautam, l.iela and Gila 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."Availableonline at: htte://www.thealternativeinilifestylefi-fouoht-for-mv-lifeand-won-sohaila-abdulall
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 Salt Gender, Community, and Postmodernism in Contemporary Ethics,* London: Routledge, 1992
15. Virginia Woolf. A *Room of One's Own.* Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a Human Fars,* Karachi: Oxford University Press 1997

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.

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Course Code: 50A03

B.Tech. – IV Semester
LAW FOR ENGINEERS

Objective: The objective of the course is to familiarize students (Prospective engineers) withelementary knowledge of laws that would be of utility in their profession. The syllabuscovers Constitution of India and new areas of law like Cyber, IPR, Human Rights, Right toInformation, Corporate and Labour.

Module I: **[6 periods]**
Constitutional Law covering the Preamble; Fundamental Rights, Fundamental Duties;
Human Rights and Public International Law - Theoretical foundation, human rights and international law; UNMechanism and specialized agencies, (UNICEF, UNESCO, WHO, ILO);
Module II: International NGOs – Amnesty International, Human Rights Watch, Greenpeace Foundation;Enforcement of Human Rights in India including Supreme Court, High Courts, StatutoryCommissions – NHRC, NCW, NCM, NC-SCST.

Module III : **[6 periods]**
Right to Information Act, 2005 - Evolution and concept; Practice andprocedures;
Labour Laws - Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923;(3 Lectures)
Corporate Laws - Law relating to public, private and multinationalcompanies, collaboration agreements fortechnology transfer

Module IV: **[6 periods]**
Introduction to IT laws & Cyber Crimes –Cyber Crime Investigation and Cyber Security.
Intellectual property – meaning, main forms of IP, Copyright, Trademarks, Patents and Designs,

Module V: **[6 periods]**
Secrets;Patentable inventions, Rights and obligations of patentee, Duration of patents – law andpolicy considerations, Infringement and related remedies;

Text Books:

1. H.M. Seervai - Constitutional Law of India - Tripathi Publications – 4th Edition, 1991
2. S.K. Kapur - Human Rights under International Law and Indian Law - Central Law Agency – 2001
3. Cornish W. R. - Intellectual Property Rights, Patents, Trademarks, Copyrights & Allied Rights - Sweet & Maxwell– 2008
4. Avtarsingh - Company Law - Eastern Book Co.–2007
5. James Graham - Cyber Security Essentials - CRC Press - 1st Ed., 2011

Outcomes:
After the course, the student will able to:
1. Understand Fundamental rights, duties and different organizations for human rights protection.
2. Know Labour laws, Corporate Law and Right to Information Act.
3. Learn about Intellectual property rights, cyber crimes and laws.

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Course Code: 50113 **Credits: 3**

B.Tech. – V Semester

DESIGN OF REINFORCED CONCRETE STRUCTURES

Prerequisites: Strength of Materials

Objectives

To give procedural knowledge to design a system, component or process as per needs and specifications of R C elements such as beams, slabs, columns and footings subjected to various load combinations with different boundary conditions and also the show the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to wrong design, use of poor quality of materials and faulty construction methods.

Module I: Concepts Of Rcc Design & Beams

A: Concepts Of Rcc Design **[8 Periods]**

Limit State method – Material Stress- Strain Curves – Safety factors – characteristic values. Stress Block parameters – IS – 456 – 2000 – Working Stress Method.

B: BEAMS: **[7 Periods]**

Limit state analysis design of singly reinforced, doubly reinforced, T and L beam sections.

Module II: Shear, Torsion & Bond

A: Shear, Torsion: **[6 Periods]**

Limit state analysis design of section for shear and torsion

B: Bond **[6 Periods]**

Concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams. Design of Canopy

Module III: Shortcolumns & Long Columns

A: Shortcolumns: **[6 Periods]**

Under axial loads, uniaxial bending and biaxial bending – I S Code provisions.

B: Long Columns: **[7 Periods]**

Design of braced and unbraced long columns I S Code provisions.

Module IV: Footings **[12 Periods]**

Different types of footings – Design of isolated, square, rectangular, circular footings and combined footings.

Module V: Slabs & Limit State Design For Serviceability

A: Slabs: **[6 Periods]**

Design of Two-way slabs, one way slab, and continuous slab Using I S Coefficients

B: Limit State Design For Serviceability **[6 Periods]**

Limit State Design For Serviceability for deflection, cracking and codal provision, Design dog legged stair

Note: All problems should be taught In Limit State Method IS CODE 456-2000

Text Books:

1. P.C.Varghese "**Limit state designed of reinforced concrete**" Prentice Hall of India, New Delhi, 2nd Edition ,2008.
2. N. Krishna Raju and R.N. Pranesh "**Reinforced concrete design**", New age International Publishers, New Delhi, 3rd Edition, 2009.

References:

1. M.L. Gambhir "**Fundamentals of Reinforced concrete design**", Printice Hall of India Private Ltd., New Delhi, 3rd Edition,2006.
2. P.Purushotham "**Reinforced concrete structural elements –behaviour, Analysis and design**", Tata c.Graw-Hill, 3rd Edition, 2014.
3. B.C.Punmia, Ashok Kumar Jain and Arun Kumar "**Reinforced concrete structures**", Vol.1, Laxmi publications Pvt. Ltd., 3rd Edition, 2011.
4. S.Unnikrishna Pillai & Devdas Menon, "**Reinforced concrete design**" Tata Mc.Graw Hill, New Delhi, 3rd Edition, 2009.

Web References:

1. http://www.nptel.ac.in/courses/105105105/
2. http://www.nptel.ac.in/courses/105105104/

Outcomes:

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

1. Know the needs and mode of the design of reinforced concrete structural elements like beams, columns, slabs, footings, piles and pile caps.
2. Have an idea on flexure, one way shear, two way shear, torsion, slenderness ratios, and usage of bearing capacity of soils in the design of footings.
3. Design and detailing of RCC structures as per code provisions.

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Course Code: 50114 **Credits: 3**

B.Tech. – V Semester
GEOTECHNICAL ENGINEERING

Prerequisite: Strength of Materials, Fluid Mechanics

Objectives:
To understand the formation of soils, their classification. To analyze the in-situ soil and stresses developed due to loads or surcharge in the soil at any depth and its practical significance. Also to predict the bearing capacities and possible settlements of structures founded on various soils.

Module I:
A: Introduction [6 Periods]
Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship – Relative density.
B: Index Properties Of Soils [6 Periods]
Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils.

Module II:
A:Permeability [6 Periods]
Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting permeability – laboratory determination of coefficient of permeability – Permeability of layered soils – Insitu permeability tests (Pumping in & Pumping out test).
B: Effective Stress & Seepage Through Soils [6 Periods]
Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

Module III:
A: Stress Distribution In Soils [6 Periods]
Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.
B: Compaction [10 Periods]
Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

Module IV:
A:Consolidation [12 Periods]
Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods.

Module V: Shear Strength Of Soils [12 Periods]

Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands - dilatancy – Critical Void Ratio – Liquefaction- shear strength of clays.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi. 6th Edition,2014
2. Principals of Geotechnical Engineering by Braja M.Das, Cengag e Learning Publishers, 7th Edition,2014
3. Geotechnical Engineering : Principles and practices of soil mechanics and foundation Engineering by VNS Murthy, Taylor & Francis Group,13th Edition ,2015

References:

1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt .Ltd, 7th Edition,2013.
2. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi, 12th Edition,2013.
3. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi., 12th Edition,2012
4. Soil Mechanics and Foundation by by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi, 13th Edition ,2015

Web References:

1. http://www.nptel.ac.in/courses/105105105/
2. http://www.nptel.ac.in/courses/105105104/

Outcomes:

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

1. Do basic testing of soils which can be used for design of foundations.
2. Find out the dry density and optimum moisture content which is very useful in the construction of embankments and pavements.
3. Classify the soils according to their basic properties.
4. Estimate the settlement of clays which is useful in the design of foundations

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Course Code: 50115 **Credits: 3**

B.Tech. – V Semester
ENVIRONMENTAL ENGINEERING

Objectives:

To create awareness in water supply engineering, learn about the importance of potable water and their distribution to the public. Also, to study about sewerage, management of surface water and groundwater quality, remediation of contaminated sites and solid waste management.

MODULE I: INTRODUCTION & SOURCES OF WATER

A:Introduction **[8 Periods]**

Waterborne diseases – protected water supply – Population forecasts, design period – water demand– Types of demand – factors affecting – fluctuations – fire demand – storage capacity – water quality and testing – drinking water standards.

B:Sources Of Water **[6 Periods]**

Comparison from quality and quantity and other considerations – intakes – infiltration galleries, confined and unconfined aquifers distribution systems. – Requirements – methods and layouts.

Module II: Layout And General Outline Of Water Treatment Units & Filtration

A. Layout And General Outline Of Water Treatment Units **[8 Periods]**

Sedimentation, uniform settling velocity– principles – design factors – surface loading – Jar test – optimum dosage of coagulant - coagulation- flocculation clarifier design – coagulants – feeding arrangements.

B. Filtration **[8 Periods]**

Theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – types of disinfection - theory of chlorination - chlorine demand - other disinfection treatment methods.

Module III:Distribution Systems [12 Periods]

Types of layouts of Distribution systems – design of distribution systems - Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house.

Module IV :Conservancy And Water Carriage Systems [12 Periods]

Sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations. Design of sewers – shapes and materials – sewer appurtenances manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – components requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming – dilution.

Module V:Planning Of Waste Water Effluent Treatment Plant [10 Periods]

Primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles and design of biological treatment – trickling filters – standard and high rate. Construction and design of oxidation ponds - Sludge digestion tanks – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

Text Books:

1. G.S. Birdi "**Water supply and sanitary Engineering**" by, Dhanpat Rai & Sons Publishers 2002.
2. B.C.Punmia, Ashok Jain & Arun Jain, Laxmi "**Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II**", Publications Pvt.Ltd, New Delhi 2002.
3. Peavy H.S, Rowe D.R and Tchobanoglous G, "**Environmental Engineering**" Tata McGraw Hill Publications, New Delhi, 2007.

REFERENCES:

1. Mark J Hammar and Mark J. Hammar **"Water and Waste Water Technology"** Jr. 2. Water and Waste Water Technology by Steel.
2. Metcalf and Eddy "**Waste water engineering**" by Metcalf and Eddy 2004.
3. Garg S. K, "**Environmental Engineering"**, Vol. I, Khanna Publications, 2001, New Delhi.

Web References:

1. http://www.nptel.ac.in/courses/105105105/
2. http://www.nptel.ac.in/courses/105105104/

Outcomes:

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

1. Learn the importance of protected water supply.
2. Consider a source of water for water supply to a town or city with respect to quality and quantity of water.
3. Understand the value of drinking water in future and be a part of judicious use of it.

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Course Code: 50116 **Credits: 3**

B.Tech. – V Semester
STRUCTURAL ANALYSIS

Prerequisite: Engineering Mechanics, Strength of Materials.

Objectives
To provide a good knowledge in the classical method of analysis. The members of a structure are subjected to internal forces like axial forces, shearing forces, ending and torsional moments while transferring the loads acting on it. Structural analysis deals with analysing these internal forces in the members of the structures.

Module I: Indeterminate Beams [12 Periods]
A:Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at centre and maximum at end) – theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams for continuous beams.

Module II: Moving Loads And Influence Lines [12 Periods]
A:Influence lines for reactions in statically determinate structures – influence lines for members
forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads..

Module III: Arches
A.Three Hinged Arches [6 Periods]
Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three Hinged- parabolic and circular arches – Settlement and temperature effects.
B.Two Hingedches [6 Periods]
Two hinged arches- Analysis of parabolic arches-Effect of yielding of supports- Effect of shortening o rib- Effect of temperature changes- Fixed arches

Module IV:Slope Deflection Method [12 Periods]
Continuous beams and rigid frames (with and without sway) – Symmetry and antisymmetry – Simplification for hinged end – Support displacements

Module V:Moment Distribution Metho [12 Periods]
Distribution and carry over of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway .

Text Books:

1. Vaidyanadhan, R and Perumal, P**, "Comprehensive Structural Analysis – Vol.1&Vol. 2",** Laxmi Publications, New Delhi, 3rd Edition, 2014.
2. BhaviKatti, S.S, "**Structural Analysis – Vol. 1 & Vol. 2**", Vikas Publishing Pvt Ltd., New Delhi, 4th Edition, 2014.

References:

1. S.B. Junnarkar "**Mechanics of structures**", charotar publishing house, 4th Edition, 2005.
2. Pandit & Gupta "**Theory of structures**", Tata Mc. Graw –Hill Publishing co. Ltd., New Delhi. 4th Edition, 2005.
3. B.C Punmia, Khanna "**Strength of materials**", Laxmi Publications, New Delhi, 5th Edition, 2003.

Web References:

1. http://www.nptel.ac.in/downloads/105101085/
2. https://www.youtube.com/watch?v=s4CN6aVKhPo
3. http://nptel.ac.in/courses/105106050/2
4. http://www.public.iastate.edu/~fanous/ce332/influence/homepage.html

Outcomes:

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

1. Understand how to solve different deflection related problems in beams, frames and arches.
2. Understand the concept of influence line
3. Understand the how to predict different mitigation problems by drawing shear force and bending moments.

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Course Code: 50H13 **Credits: 2**

B.Tech. – V Semester
MANAGEMENT SCIENCE

PREREQUISITES: Nil

OBJECTIVE: Through reading the text, references and discussion of cases students should be able to understand the fundamentals underlying the management of an organization.

MODULE – I: Management and Principles of Management [12 Periods]

A:Introduction to Management: Concepts of Management and organization-nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayols.

B:Principles of Management,: Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

MODULE – II: Organizational Structures and Types of Organizations [11 Periods]

A:Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types of mechanistic and organic structures of organization

B:Types of Organizations: Line organization, Line and staff organization, functional organization ,committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat Organization structure and their merits, demerits and suitability.

MODULE -III: Operations Management and Materials, Marketing Management [11 Periods]

A:Operations 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: chart, R chart, c chart, p chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

B:Materials Management: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.

C: Marketing Management: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of distribution

MODULE – IV: Hrm And Sm [11 Periods]

A:Human Resources Management (HRM) : Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

B: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

MODULE – V: Management Practices and PERT/CPM [11 Periods]

A: Contemporary Management Practices: Basic concepts of MIS, End User Computing, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels,

B:Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems)

Text Books:

1. Aryasri, **Management Science**, TMH, 4th Edition, 2004. (Modules I, II, III, IV & V)
2. Stoner, Freeman, Gilbert, **Management,** Pearson Education, New Delhi, 6th Edition, 2004. (Modules I & II)

References*:*

1. Kotler Philip & Keller Kevin Lane, **"Marketing Management"**, PHI, 12th edition, 2005.
2. Koontz & Weihrich, **"Essentials of Management"**, TMH, 6th edition, 2005.
3. Thomas N.Duening & John M. Ivancevich **"Management - Principles and Guidelines"**, Biztantra, 2003.
4. Memoria & S. V. Gauker, **"Personnel Management"**, Himalaya, 25th edition, 2005
5. Samuel C. Certo, **"Modern Management"**, PHI, 9th edition, 2005.

Outcomes:

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

1. Learn the history of management and the contributions of important management techniques.
2. Understand the relevance of environmental scanning, planning and how to take decisions.
3. Learn how to delegate authority and use power to influence people to get the work done through proper communication and control.
4. Learn HR strategies of recruitment and selections and Marketing strategies.

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Course Code: 50117 **Credits: 2**

B.Tech. – V Semester

ENVIRONMENTAL ENGINEERING LAB

LIST OF EXPERIMENTS:

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids (Organic and Inorganic)
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination of iron.
6. Determination of Dissolved Oxygen.
7. Determination of Nitrates.
8. Determination of Total Hardness.
9. Determination of Sulphates.
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive coliform test.

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Course Code: 50118 **Credits: 2**

B.Tech. – V Semester

GEOTECHNICAL ENGINEERING LAB

List of Experiments:

1. Atterberg's Limits (LL & PL)
2. Field density-core cutter and sand replacement method
3. Grain size analysis (Sieve and Hydrometer analysis)
4. Permeability of soil, constant and variable head test
5. Compaction test
6. CBR Test
7. Consolidation test
8. Unconfined compression test
9. Tri-axial Compression test
10. Direct shear test.
11. Vane shear test

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Course Code: 50119 **Credits: 2**

B.Tech. – V Semester
COMPUTER AIDED DRAFTING OF BUILDING LAB

List of Exercises:

1. Introduction to computer aided drafting
2. Software for CAD – Introduction to different software's
3. Practice exercises on CAD software
4. Drawing of plans of buildings using software
    a) Single storyed buildings
    b) Multi storyed buildings
5. Developing sections and elevations for
    a) Single storyed buildings
    b) Multi storyed buildings
6. Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD software's
7. Exercises on development of working of buildings

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Course Code: 50H05 **Credits: 1**

B.Tech. – V Semester

SOFT SKILLS

Introduction:

Today's dynamic business world seeks ways to help their work force learn as they progress through applicable information to help drive business. In keeping with the evolving need of firms and the recruiting process, this course aims at catering to the needs of the students fresh from the academic background ready to enter the world of work from the HR perspectives of any company. Perhaps it is noticed that an intelligent individual lacks the ability to work on team assignments, communicate with clients, or maintain professionalism. This course is a comprehensive preparation and a bridge course that would enable the students to be industry ready before they wind up their undergraduate course. The Modules that are chosen are the ones that the industry experts from Infosys emphasize upon. Apart from the technical skills, the course intends to enhance the employability skills and make them employment ready.

Objective:

- To broaden the perspective of job seekers and help them gain awareness on the standards and the expectations of the recruiters in the industry.
- To draw a link between the academics and the industry and emphasize the importance of the right attitude, grooming, etiquette, self motivation, empathy, commitment, responsibility, self awareness and patience while dealing with a variety of people
- Refining the communication skills of the students
- Sharpen the analytical skills for appropriate decision making
- To develop the art of communication; verbal and non verbal for effective inter and intra personal skills

Syllabus:

1. Spoken aspects of Communication
2. Work/Business etiquette- dressing and grooming, telephone etiquette, meeting etiquette, dining etiquette, small talk, dealing with people
3. Business communication-Fundamentals of effective communication, Barriers and filters
4. Work in teams-Team concept, advantages of working in teams, team players/leaders
5. Intra personal skills- handling negative emotions;attitude,self confidence, self esteem
6. Principles of goal setting
7. Effective Time management skills
8. Reading skills
9. Writing skills
10. Digital language

Reference Books:

- The Power of Habit: Why We Do What We Do in Life and Business by Charles Duhigg
- The Zen of Steve Jobs (Paperback) by Caleb Melby
- Software Systems Architecture: Working with Stakeholders Using Viewpoints and Perspectives by Nick Rozanski
- The Art of Focused Conversation: 100 Ways to Access Group Wisdom in the Workplace (Paperback) by R. Brian Stanfield
- The Little Book of Talent: 52 Tips for Improving Your Skills by Daniel Coyle
- The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change (Paperback) by Stephen R. Covey
- How to Win Friends and Influence People (Paperback) by Dale Carnegie
- Thinking, Fast and Slow by Daniel Kahneman
- Never Eat Alone: And Other Secrets to Success, One Relationship at a Time by Keith Ferrazzi
- Emotional Intelligence: Why It Can Matter More Than IQ by Daniel Goleman
- The Effective Executive: The Definitive Guide to Getting the Right Things Done (Paperback) by Peter F. Drucker
- How to Recruit and Hire Great Software Engineers: Building a Crack Development Team (Paperback) by Patrick McCuller
- Quiet: The Power of Introverts in a World That Can't Stop Talking by Susan Cain
- The $100 Startup: Reinvent the Way You Make a Living, Do What You Love, and Create a New Future by Chris Guillebeau
- The Presentation Secrets of Steve Jobsby Carmine Gallo Ackoff,Ressel Lincoln.The art of Problem solving.New York:Wiley.
- The Leader's Guide to Influence: How to Use Soft Skills to Get Hard Results (Paperback) by Mike Brent

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Course Code: 50120 **Credits: 4**

B.Tech. – VI Semester
DESIGN OF STEEL STRUCTURES

Objectives:
To provide basic knowledge in the areas of limit state method and the concept of design of structural steel elements. Identify, formulate and solve engineering problems in steel structural elements subjected to tension, compression and flexure loads. To give procedural knowledge to design a system, component or process as per needs and specifications of steel elements such as beams, tension members, compression members, bolted and welded connections subjected to various load combinations.

Module I: **[12 Periods]**
A:Introduction: Materials – Making of iron and steel – types of structural steel – mechanical properties of steel – Concepts of plasticity – yield strength. Loads and load combinations - local buckling behavior of steel. Concepts of limit State Design – Limit States of Strength/collapse – Limit state of Collapse serviceability.

Module II: **[20 Periods]**
A:Connections: Types of connections- Bolted connections– IS – 800 – 2007 - specifications – Design strengths – efficiency of joint – prying action. Welded connections – Types of welded joints – specifications - Design strengths & requirements. Design of eccentric connections in both bolting & welding –Design of Simple connections– [Framed/un-stiffened / Stiffened seat connection].

Module III: **[10 Periods]**
A: Tension Members: Design of tension members– Design strength – Design procedure of splice - lug angle.
B: Compression Members: **[10 Periods]**
Design of compression members – Buckling class – slenderness ratio / design strength – laced – battened columns – column splice – column bases.

Module IV: **[16 Periods]**
A:Beams: Design of Beams – Plastic moment – Bending and shear strength / buckling – Built-up sections – laterally supported beams..
B:Plate Girders: Design of plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffness bearing – intermediate stiffeners – Design of Web splice & Flange splice.

Module V: **[12 Periods]**
A:Roof Truss: Design of roof trusses – Types of roof trusses, loads on trusses – Purlin design – truss design, Design of joints and end bearings.

Text Books:

1. S.K. Duggal , **"Limit State Design of steel structures",** Tata McGraw-Hill, 2nd Edition-2010
2. S.S. Bhavikatti , **"Design of steel structures",** IK international Publication House, New Delhi, 2nd Edition-2010.

Reference Books:

1. Edwin H. Gaylord, Jr. Charles N. Gaylord , **"Design of Steel Structures"** 3rd Edition 1991
2. Ramchandra, **"Design of Steel Structures" Vol. 1 & 2** –Standard Publications, 1st Edition1992
3. N. Subramanian, **"Design of steel structures"** –, Oxford University Press – 2nd Edition 2009.

Reference Codes:

1. IS Code 800-2007
2. IS Code 875 Part 1-5
3. IS Code 808- Steel Tables

Web Refernces:

1. http://nptel.ac.in/courses/105103094/
2. http://elearning.vtu.ac.in/13/ENotes/DSS/MCN%2006CV72%20VTU%20notes.pdf
3. http://www.aboutcivil.org/steel-structure-lectures-class-notes.h

Outcomes:

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

1. Learn properties of steel and design basics.
2. Learn different types of connections in steel constructions.
3. Develop knowledge in designing of structural elements in steel.

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Course Code: 50121 **Credits: 3**

B.Tech. – VI Semester
WATER RESOURCES ENGINEERING

Prerequisites: Fluid mechanics, Hydraulics & Hydraulic machinery, Engineering Geology

Objectives
To impart basic knowledge of precipitation, hydrology, various components of hydrology and their applications and importance of surface and ground water resources and application of these principles to solve hydrologic problems and its significance in design of canals and mechanisms and pathways of water storage, transport and transformation in the landscape.

Module-I:Surface Water Hydrology
A.Surface Water Hydrology **[Periods 7]**
Water Resources in India, Hydrology in water Resource Planning – Hydrological cycle - Precipitation – Types, Measurement of rainfall, Average depth of rainfall over an area, Mean annual rainfall, consistency of rainfall record – Double mass curve, Infiltration Definition Factors affecting and its determination, Evaporation and Evapo – Transpiration: Definition Factors affecting and its determination .
B.Runoff **[Periods 7]**
Factors affecting runoff, methods of determination of runoff, stream gauging, Hydrograph analysis: Base flow separation, unit hydrograph – Hydrograph of different durations, Applications of unit hydrograph: S-hydrograph, Flood Forecasting Techniques.

Module II: Ground Water Hydrology **[Periods: 10]**
A: Ground water hydrology: Definitions, sub surface distribution of water, ground water movement, Darcy's law–permeability.
B: Well hydraulics – steady flow into different types of aquifers and wells – determination of hydraulic properties of aquifer, well losses, specific capacity of well, and well efficiency, pumping test and recovery test methods for determination of well yield.

Module III: Irrigation: **[Periods: 10]**
A: Irrigation: Definition, Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils.
B:Soil-water-plant relationship: Vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors affecting duty, - Determination of canal capacities for cropping patterns consumptive use, Methods of improving soil fertility –Crop Rotation, preparation of land for Irrigation, standards of quality for Irrigation water, Irrigational efficiencies.

Module IV:Canal Systems **[Periods: 10]**
A: Canal systems: Classification of irrigation canals – canal alignment, design of unlined canals, regime theories – Kennedy's and lacey's theories, design problems.

Module V: Reservoir Planning: **[Periods: 15]**
A:Reservoir planning: Definition, Types of reservoir investigations for reservoir planning, selection of site for a reservoir, zones of storage in a reservoir, purpose of reservoir, reservoir

yield, mass curve and demand curve, Determination of reservoir capacity, yield from a reservoir of given capacity, Reservoir sedimentation, control of reservoir sedimentation, Life of reservoir..

Text Books:

1. P. Jayarami Reddy, "**A Text book of Hydrology"**, Laxmi Publication, Delhi, 14th Edition 2009.
2. B.C. Punmia and Pande B.B.Lal, "**Irrigation and Water Power Engineering"**., Laxmi Publications Pvt. Ltd., New Delhi, 18th Edition, 2006.

References:

1. S.K. Garg, "**Irrigation Engineering and Hydrology Structures"**, Khanna Publishers, Delhi, 23rd Edition 2009
2. K. Subramanya, "**Engineering Hydrology"**, Tata-Mc Graw Hill Publishing, Delhi, 1st Edition,1996.
3. P.N.Modi, "**Irrigation, Water Resources and Water Power Engineering"**. Standard Book House, Delhi, 6th Edition, 2004.

Web References:

1. http://textofvideo.nptel.iitm.ac.in/1028/lec40.pdf
2. http://nptel.ac.in/courses/Webcourse
3. Contents/IIT%20Kharagpur/Water%20Resource%20Engg/pdf/m4l06.pdf

Outcomes:

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

1. Gain knowledge on hydrologic cycle and determination of runoff and their applications of surface and ground water resources
2. Understand the need and importance of irrigation and have knowledge occurrence of groundwater and its parameters
3. Understand the irrigation management practices of the past, present and future. And familiarizes about the availability of the water resource with special reference to irrigation.
4. Learn irrigation canals and their characteristics and catchment area peculiarities

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Course Code: 50H03 **Credits: 2**

B.Tech. – VI Semester

TECHNICAL COMMUNICATION AND PRESENTATION SKILLS

PREREQUISITES: Basic English.

Introduction: Identifying the importance of communication at work and the nuances of technical communication became imperative to technical graduates. This course intends to introduce the importance, characteristics and nuances of technical communication. Technical communication is all about exchange of information that helps people interact with technology and solve complex problems. Since the communication skills cannot be taught but be developed through practice the student will be competent communicator through application and the use of the concepts and activities in different units.

Objective: The learners need to be aware of the characteristics of technical communication. The learners are exposed different channels of technical communication**.** The learners should be an effective communicator.

Methodology: Facilitator's role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involve in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students
*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

Module I:

A: Technical Vocabulary **[6 Periods]**

Building vocabulary – identify formal and informal vocabulary – identify technical vocabulary – tips to enhance technical vocabulary, Basics of English Pronunciation.

Module II:

Technical writing **[6 Periods]**

A: Characteristics of writing – mechanics of writing – methodology of writing – format & style- structures of writing – circular writing – memo writing – instructions writing.

Module III:

Technical Report writing **[6 Periods]**

A:Types of report, Abstract Writing, Project report writing, importance of pictorial presentation- graphs, diagrams etc

Instruction: The students are required to work on a project. Field work and collection of information, prepare a project report.

Module - IV:

Oral Presentations **[6 Periods]**

A:Types of Presentations, 4Ps of Effective Presentation, Elements of effective presentations, Planning and preparing a model presentation, organizing, Barriers of making effective presentation.

Present the project in the form of Power Point Presentation and written document. This report will be given weightage during the external examination.
*This particular Module is for internal evaluation purpose(s).

Module V: Strategies of Reading Technical Text [6 Periods]
A: Note - making, SQR3, Reading and answering the technical texts, Reading for Specific Purposes.

Reference Books:

- Chrissie, "**Handbook of Practical Communication Skills",** Jaico Publishing house, 1999.
- Daniels, Aubrey, **"Bringing Out the Best in People"**, Tata McGraw-Hill: New York, 2003.Wright , Goulstone, Mark, **"Just Listen: Discover the Secret to getting through to absolutely anything"**, American Management Association, 2010.
- Leslie. T. Giblin, **"Skill with people"**, Publication details not known.
- Lewis, Norman, **"Word Power Made Easy",** Goyal Publications, New Delhi, 2009.
- Murthy, A.G, Krishna, **"Ten Much",** Tata McGraw-Hill, New Delhi, 2010.
- Pease , Barbara and Pease, Allan: **"The Definitive Book on Body Language",** Manjul Publishing House Pvt Limited, 2011
- Rizvi M Ashraf, **"Effective Technical Communication"**, Tata McGraw-Hill, New Delhi, 2010.
- Whitcomb, Susan Britton, **"Resume Magic: Trade Secrets of a Professional Resume"**, JIST Works, 2010.

Websites:

1. http://www.mindtools.com/pages/article/newTMC_05.htm
2. http://www.kent.ac.uk/careers/intervw.htm
3. http://www.wikihow.com/Write-a-Report

Outcomes:

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

1. Bring into play latest communication devices.
2. Equip with the nuances of technical communication

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Course Code: 50122 **Credits: 3**

B.Tech. – VI Semester
TRANSPORTATION ENGINEERING

Prerequisites: Building Construction materials and Planning

Objectives:

To provide the students with basic knowledge of history of roads and planning stages for highways and cross section elements along with the geometric features of highways and drainage problems and remedial measures for construction of safe, durable pavements and traffic signs, signals, markings to control the traffic and for safe flow of vehicles without accidents.

Module I:

A.Highway Development And Planning [6 Periods]

Highway development in India – Necessity for Highway Planning- Different Road Development Plans.

B.Highway Planning [6 Periods]

Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports, Road Projects initiation need based planning.

Module II:Highway Geometic Design [12Periods]

A:Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients-Vertical curves. Typical cross sections for different types of roads.

Module III

A.Traffic Engineering [6 Periods]

Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams. Traffic, infrastructural and safety audits.

B.Traffic Regulation And Management [6 Periods]

Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals –Webster Method –IRC Method, intelligent transportation systems typical architectures.

Module IV: intersection Design [12 Periods]

A:Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections-Channelization : Objectives –Traffic Islands and Design criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Impacts of Geometrics on intersection with reference safety, Operational capacity.

Module V:

A.Introduction To Railway Engineering [6 Periods]

Permanent way components – Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Ageing of Sleepers- Sleeper density.

B.Geometric Design Of Railway Track [6 Periods]

Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs.

C.Airport Engineering [6 Periods]

Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

Text Books:

1. Khanna S.K., and Justo, C.E.G. "**Highway Engineering**", Nem Chand and Brothers, Roorkee, 5th Edition, 1998.
2. Dr.L.R.Kadyali, "**Traffic Engineering & Transportation Planning**" –Khanna publications – 6th Edition 1997

References:

1. Partha Chakraborty and Animesh das, "**Principles of Transportation Engineering**", Prentice Hall, India– 6th Edition 1997
2. Flaherty, C.A.O. "**Highway Engineering**", Edward Arnold, London, – 6th Edition 1986.
3. Mannering, "**Principles of Highway Engineering & Traffic Analysis**", Wiley Publishers, New Delhi. , 5th Edition, 1998.
3. Sharma, S.K. "**Principles, Practice& Design of Highway Engineering**", S. Chand & Company Ltd., New Delhi, 5th Edition, 1985.

Outcomes:

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

1. Understand different modes of transportation and planning stages for highways
2. Design various highway geometric elements using the knowledge of mechanics and applying the principles of equilibrium conditions.
3. Understand different signal systems and design a signal based on traffic flow.
4. Understand the common maintenance problems of highways including drainage issues and suggest remedial measures for long life of pavements.

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Course Code: 50123 **Credits: 3**

B.Tech. – VI Semester
AIR POLLUTION AND CONTROL
(Professional Elective -I)

Pre-requisites: Environmental Studies

Objectives:
This course provides the knowledge and understanding of the problems associated with air pollution indoor and outdoor. It also describes the regulations pertinent to air pollution especially due to industries making the student to design proper air pollution control devices

Module I: Air Pollution [12 periods]
A:Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources. Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc., ambient air quality standards.

Module II: Thermodynamics And Kinetics Of Air-Pollution [12 periods]
A:Applications in the removal of gases like SOx, NOx, CO, HC etc., air-fuel ratio, Computation and Control of products of combustion.
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Module III: Meteorological Parameters And Wind Behaviour
A: METEOROLOGY [**6 periods]**
Properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams Lapse Rates, Pressure Systems
B: Plume Dispersion [6 periods]
Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

Module IV: Control Of Particulates [12 periods]
A:Control at Sources, Process Changes, Equipment modifications, Design and operation of control equipments – Settling Chambers, Centrifugal separators, Filters, Dry and Wet scrubbers, Electrostatic precipitators.

Module V: General Methods Of Control Of No_x And So_x Emissions [12 periods]
A:In-plant Control Measures, process changes, dry and wet methods of removal and recycling. Air Quality Management – Monitoring of SPM, SO; NO and CO Emission Standards.

Text Books:

1. M.N.Rao and H.V.N.Rao, **"Air pollution"**, Tata Mc.Graw Hill Company, 26th reprint 2007.
2. R.K. Trivedy and P.K. Goel, **"An introduction to Air pollution"**, B.S. Publications, 2nd revised edition, 2005.

References:

1. Wark and Warner, "**Air Pollution**" Harper & Row Publicatons, New York, 2nd edition, 1981.
2. S.C. Bhatia, "**Textbook of Air Pollution and Its Control",** Atlantic Publishers, 1st edition, 2007.
3. Karl B. Schnelle Jr.,Charles A. Brown, **" Air Pollution Control Technology Handbook"**, Published by CRC Press, 1st edition, 2002.

Web References:

1. http://www3.cec.org/islandora/en/item/2195-best-available-technology-air-pollution-control-en.pdf
2. http://www.eolss.net/sample-chapters/c09/e4-11-05.pdf
3. https://www.env.go.jp/earth/coop/coop/document/01-apctme/contents.html

Outcomes:

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

1. Understand in general terms, the major issues and challenges in Air pollution.
2. Design air pollution control equipment keeping in mind the stringent regulations laid by Pollution control board.

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Course Code: 50124 **Credits: 3**

B.Tech. – VI Semester
DISASTER MANAGEMENT
(PROFESSIONAL ELECTIVE –I)

Prerequisites: Nil

Objectives

This course provides the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences along with International Strategy for Disaster Reduction. It also has the potential to make the student design and implement disaster mitigation measures.

Module I: Concept Of Hazards And Disasters

A: Environmental Hazards & Disasters: [5 periods]

Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology – Landscape, Ecosystem and Perception approach - Human ecology & its application in geographical researches.

B: Types Of Environmental Hazards & Disasters: [5 periods]

Natural hazards and Disasters – Man induced hazards & Disasters - Natural Hazards-Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards-Endogenous Hazards - Exogenous Hazards

Module II: Classification Of Hazards

A: Endogenous Hazards [8 periods]

Volcanoes- Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions – Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake, Landslides- causes and impacts, Avalanches -causes and impacts.

B: Exogenous Hazards [12 periods]

Infrequent events: Cyclones – Lightning – Hailstorms, Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms [causes , distribution human adjustment, perception & mitigation], Cumulative atmospheric hazards/ disasters : Floods-Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards India- Flood control measures [Human adjustment, perception & mitigation], Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures, Extra Planetary Hazards/ Disasters-Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion Soil Erosion:-- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion-Conservation measures of Soil Erosion, Chemical hazards/ disasters:-- Release of toxic chemicals, nuclear explosion- Sedimentation processes, Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation, Biological hazards/ disasters:-Population Explosion.

Module III: Approaches And Measures In Disaster Management

A: Emerging Approaches [4 periods]

Three Stages: 1. Pre- disaster stage [preparedness] 2. Emergency Stage 3. Post Disaster stage-Rehabilitation .

B: Natural Disaster Reduction & Management [4 periods]

1] Provision of Immediate relief measures to disaster affected people 2] Prediction of Hazards & Disasters 3] Measures of adjustment to natural hazards

Module IV:

DISASTER MANAGEMENT [12 periods]

A:An integrated approach for disaster preparedness, mitigation & awareness.

Mitigation- Institutions- discuss the work of following Institution.

a. Meteorological observatory
b. Seismological observatory
c. Volcanological institution
d. Hydrology Laboratory
e. Industrial Safety inspectorate
f. Institution of urban & regional planners
g. Chambers of Architects
h. Engineering Council
i. National Standards Committee

Integrated Planning- Contingency management Preparedness –

a] Education on disasters
b] Community involvement
c] The adjustment of Human Population to Natural hazards & disasters Role of Media

Monitoring Management- Discuss the programme of disaster research & mitigation of disaster of following organizations.

a] International Council for Scientific Unions [ICSU]- Scientific committee on problems of the Environment [SCOPE], International Geosphere- Biosphere programme [IGBP]
b] World federation of Engineering Organizations [WFED]
c] National Academy of Sciences
d] World Meteorological organizations [WMO]
e] Geographical Information System [GIS]
f] International Association of Seismology & Physics of Earth's Interior [IASPEI]
g] Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

Module V: Disaster Management In India [10 periods]

A:A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India

B:Ecological planning for sustainability & sustainable development in India- Sustainable rural development: A Remedy to Disasters -Role of Panchayats in Disaster mitigations

C:Environmental policies & programmes in India- Institutions & National Centers for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & training.

Text Books:

1. Jagbir singh, **"Disaster management–Future challenges and opportunities"**, I.K. International publishing house, 1st edition, 2005.
2. Coppala P Damon, **"Introduction to International Disaster management",** ABD publishers**,** 2007**.**

References:

1. R.B.Singh [Ed], **"Environmental Geography"**, Heritage Publishers, New Delhi, 1st edition, 1990.
2. Kates,B.I & White. G.F, **"The Environment as Hazards"**, oxford publishers, 5th edition, New York, 1978.
3. R.B. Singh [Ed], **"Disaster Management"**, Rawat Publication, New Delhi, 1st edition, 2000.

Weblinks:

1. http://www.wcpt.org/disaster-management/what-is-disaster-management
2. http://study.com/academy/lesson/what-are-cyclones-types-causes-effects.html

Outcomes:
After completion of this course, students will be able to:

1. Analyze, evaluate and manage the environmental, social, cultural, economical, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
2. Assess the different public health aspects at local and global levels as a result of disaster, and can well plan to mitigate them.

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Course Code: 50125 **Credits: 3**

B.Tech. – VI Semester
SOLID WASTE MANAGEMENT
(PROFESSIONAL ELECTIVE-I)

Pre-requisites: Environmental Studies

Objectives
The main objective of this course is to provide in-depth knowledge about handling of solid waste from cradle to grave. It also provides the knowledge of designing and constructing the solid waste treatment systems.

Module I: Introduction To Municipal Solid Waste [12 periods]
A: Definition - Sources and Impacts of solid waste on environment, Classification of solid waste- composition and its determinants of Solid waste-factors influencing generation-quantity assessment of solid wastes-methods of sampling and characterization.

Module II: collection and transfer solid waste [12 periods]
A:Collection: Collection of Solid waste – collection services – collection system, equipments – time and frequency of collection – labour requirement – factors affecting collection – analysis of collection system – collection routes – preparation of master schedules. Transfer and Transport: Need for transfer operation – transfer stations – types – transport means and methods – location of transport stations - Manpower requirement – collection routes: Transfer stations – selection of location, types & design requirements, operation & maintenance.

Module III: waste processing and reuse
A: Processing Technologies [6 Periods]
Biological, chemical conversion technologies and Thermal conversion technologies
B: Reuse Of Solid Waste [6 Periods]
Energy recovery – Incineration – Solidification and stabilization of hazardous wastes – treatment of biomedical wastes.

Module IV: Waste Disposal Techniques [12 Periods]
A:Introduction, composting, principles of composting, factors affecting composting, vermi composting, waste to energy techniques- Landfill technique, and design and operating procedure of landfill

Module V: Solid Waste Management Techniques [12 Periods]
A:Solid waste management Hierarchy, waste avoidance /waste prevention, Definition of source Reduction, waste reduction at source using 5R's Technique, Solid waste management rules and regulations.

Text Books:

1. A. D.Bhide and B.B.Sundaresan, **"Solid Waste Management – Collection, Processing and disposal",** Mudrashilpa Offset Printers, Nagpur, 1st edition, 2001.
2. Techobanoglous Thiessen Ellasen, **"Solid Waste Engineering Principles and Management"**, McGraw - Hill 1997.

References:

1. K. Sasi Kumar & S. Gopi Krishna, **"Solid waste management"**.
2. Tchobanoglous, Theissen & Vigil, **"Integrated Solid Waste Management"**, McGraw Hill Publication, 1st edition, 1997.
3. R.E.Landrefh and P.A.Rebers, **"Municipal Solid Wastes-Problems & Solutions",** Lewis Publications, 1st edition, 1997.

Web References:

1. http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf
2. http://www.slideshare.net/ebchandar/solid-waste-management-5942441
3. http://www.iitk.ac.in/3inetwork/html/reports/IIR2006/Solid_Waste.pdf

Outcomes:

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

1. Understand the components of solid waste management and the laws governing it.
2. Acquire the knowledge of design, operation and maintenance of landfills, incinerators and composting units.

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Course Code: 50126 **Credits: 3**

B.Tech. – VI Semester
ADVANCED STRUCTURAL ANALYSIS
[PROFESSIONAL ELECTIVE-II]

Prerequisite: Engineering Mechanics, Strength of Materials, Structural Analysis.

Objectives

This course is in continuation of Structural Analysis. Here in advanced method of analysis like Matrix method and Plastic Analysis are covered to identify, formulate and solve problems in structural analysis.

Module I :Approximate Method Of Analysis [12 Periods]

Application to multi storey frames [i] Portal method [ii] Cantilever method [iii] Factor method

Module II :Kani's Method [12 Periods]

Analysis of continuous beams including settlement of supports. Analysis of frame including side sway. Shear force and Bending moment diagrams.

Module III:Matrix Method Of Analysis

A. Flexibility Method [12Periods]

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames [with redundancy restricted to two]

B. Stiffness Matrix Method [6 Periods]

Introduction, Stiffnes matrix, Analysis of continuous beam and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach.

Module IV: Plastic Analysis Of Structures [12 Periods]

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance– Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems

Module V:Influence Lines For Indeterminate Beams &Trusses [12 Periods]

ILD for two span continuous beam with constant and different moments of inertia. ILD for propped cantilever beam. Analysis of trusses having single and two degrees of internal and external indeterminacie

Text Books:

1. Vaidyanadhan, R and Perumal, P**, "Comprehensive Structural Analysis – Vol.1&Vol. 2",** Laxmi Publications, New Delhi, 3rd Edition, 2014.
2. BhaviKatti, S.S, "**Structural Analysis – Vol. 1 & Vol. 2**", Vikas Publishing Pvt Ltd., New Delhi, 4th Edition, 2014.

References:

1. S.B. Junnarkar "**Mechanics of structures**", charotar publishing house, 4th Edition, 2005.
2. Pandit & Gupta "**Theory of structures**", Tata Mc. Graw –Hill Publishing co. Ltd., New Delhi. 4th Edition, 2005.

3. B.C Punmia, Khanna "**Strength of materials**", Laxmi Publications, New Delhi, 5th Edition, 2003.

Web References:

1. http://www.nptel.ac.in/courses/105105109/pdf/m6l35.pdf
2. http://textofvideo.nptel.iitm.ac.in/105106050/lec26.pdf
3. http://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf

Outcomes:

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

1. Analyze the structural members using matrix methods and approximate methods.
2. Understand the concept of plastic analysis
3. Analyze the cables and suspension bridges.

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Course Code: 50127 **Credits: 3**

B.Tech. – VI Semester
PLASTIC ANALYSIS AND DESIGN
[PROFESSIONAL ELECTIVE-II]

Objective
To know the static and kinematic methods of plastic analysis and Analyze the continuous beams of uniform & different c/s. Analyze the single span frames and gable frames and to find out the deflections at working load & ultimate load.

Module I: **[12 Periods]**
A:Analysis Of Structures For Ultimate Load: Fundamental Principles – statical method of Analysis – Mechanism method of analysis – Method of analysis, Moment check – Carry over factor – Moment Balancing Method.

Module II: **[12 Periods]**
A:Design Of Continuous Beams: Continuous Beams of uniform section throughout – Continuous Beams with different cross-sections.

Module III: **[12 Periods]**
A:Secondary Design Problems: Introduction – Influence of Axial force on the plastic moment – influence of shear force – local buckling of flanges and webs – lateral buckling – column stability.

Module IV: **[12 Periods]**
A:Design Of Connections: Introduction – requirement for connections – straight corner connections
– Haunched connection – Interior Beam-Column connections.

Module V: **[12 Periods]**
A:Design Of Steel Frames: Introduction – Sinole span frames – simplified procedures for Sinole span frames – Design of Gable frames with Haunched Connection. Ultimate Deflections: Introduction – Deflection at ultimate load – Deflection at working load – Deflections of Beams and Sinole span frames.

References:

1. L.S.Beedle, “Plastic Design of Steel Frames”
2. B.G.Neal, “Plastic Analysis”
3. Horve , “Plastic Analysis**”**

Outcomes:
After completion of this course, students will be able to:

1. Identify the locations of plastic hinges and understands the beam, sway and combined mechanism.
2. Design the continuous beams, frames and gable frames of uniform c/s and varying c/s.
3. Design the straight corner and haunched connections, interior beam column connections.
4. Find out the deflections of beams and frames

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Course Code: 50128 **Credits: 3**

B.Tech. – VI Semester
REHABILITATION AND RETROFITING OF STRUCTURES
[PROFESSIONAL ELECTIVE-II]

Prerequisites: Concrete Technology

Objectives

To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structure and provides knowledge of Development of other advanced structural materials and technologies for execution for providing durable repairs and strengthening is the need of the day.

Module I: Deterioration & Damage Of Structures [12 Periods]

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage.

Module II: Corrosion Of Steel Reinforcement [12 Periods]

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desication.

Module III: Inspection And Testing & Damage Assessment

A: Inspection and Testing – Symptoms and Diagnosis of Distress **[6 Periods]**
B: Damage Assessment – NDT. **[6 Periods]**

Module IV:Repair Of Structure [12 Periods]

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures
Repairs in Under Water Structures – Guniting – Shot Create – Underpinning.

Module V:Strengthening Of Structures [12 Periods]

Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing. Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

Text Books:

1. W. H. Ranso, "**Concrete Repair and Maintenance Illustrated**", RS Means Company Inc ,1st Edition,1981.
2. B. A. Richardson "**Building Failures: Diagnosis and Avoidance**", EF & N Spon, London, 3rd Edition, 1991.

References:

1. A.R. Shantakumar, "**Concrete Technology**", Oxford University press, 2nd Edition, 2006.
2. Bungey, "**Non-Destructive Evaluation of Concrete Structures**", 2nd edition, 2003
3. B.L. Gupta and Amit Gupta, "**Maintenance and Repair of Civil Structures**", Standard Publications New Delhi, 2nd Edition,2007

Web References:

1. http://cpwd.gov.in/Units/handbook.pdf
2. http://www.jsce.or.jp/committee/concrete/e/newsletter/newsletter01/recommendation/FRP-sheet/3.pdf
3. http://www4.ncsu.edu/~srizkal/TechPapers2001/VariousFrpStrengtheningTechniquesForRetrofitting_hassan_Dec2001.pdf

Outcomes:

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

1. Understand the behavior of existing constructions.
2. Understand the main causes of structural failures carry out calculations on load bearing capacity of structures be able to draw, read and understand diagrams, normal force, shear force and bending moments.
3. Have skill to design repair interventions of different type of civil structures.

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Course Code: 50129 **Credits: 2**

B.Tech. – VI Semester
TRANSPORTATION ENGINEERING LAB

List of Exercises:

I. Road Aggregates:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

Ii. Bituminous Materials:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Benkelmen Beam Demo

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Course Code: 50H04 **Credits: 2**

B.Tech. – VI Semester
TECHNICAL COMMUNICATION AND PRESENTATION SKILLS LAB

Introduction: Effective Communication binds any progressive organization. At the B Tech third year level, the Technical Communication and Presentation skills laboratory is introduced to help students succeed in attaining a challenging and a professional career. Each unit aims to reinforce learning and helps the learners perform well before and after they enter the world of work. The course is designed to be practical, stimulating and challenging providing opportunities to the learners to go beyond the classrooms and get empowered in Technical Communication skills. The course enables the students understand the employers' expectations that are varied from company to company while giving them insight into the acceptable norms of attitude, behavior and etiquette. The course also focuses on the presentation skills of the learners

Objective: To help the students understand the requisites to successfully deliver as professionals and the challenges they need to encounter. To help them make a smooth transition from the academic world into the professional world. To refine their style of individual communication and develop a personal style. To broaden and raise awareness about the dynamics of technical communication in the work environment. To integrate the learning experience with the functional areas of communication. Helping the students to become industry ready

Methodology: Facilitator's role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involved in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students
*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

Module I:Oral Presentation **[6 Periods]**
A:Mechanics of Presentations – Methodology of Presentation, Importance of Non-verbal communication during presentations– Nuances of Presentation.
*This particular Module is for internal evaluation purpose(s).

Module II: Job hunt process **[8 Periods]**
A:SWOT analysis, correspondence and browsing the internet to search for a suitable job(s), job application-cover letter drafting, drafting a winning resume', types of resume's - electronic, video and printed resume's
Instruction: Students are required to prepare their video resume which will be assessed by the faculty member.

Module III: Group Discussion **[6 Periods]**
A:Initiators- Contributor-Informer-Team Leader-Motivator-Creative Contributor , Importance of , Non verbal communication -eye contact, voice characters, posture, gestures,

do's and don'ts, Role play and Simulation- Learners assuming the roles of characters and participating in Group discussion, analysis, or prediction with strictly defined goals.

Module IV: Interview skills & Office etiquette [8 Periods]

Preparing for the interview, types of interviews, interview session, importance of non verbal communication during the interview, do's and don'ts of interview, follow up and thanking letter. FAQ's. Formal Conversation, office attire- do's and don'ts, greetings and meetings, speaking to seniors and handshakes, offering and taking visiting cards.

Module V: E - Correspondence and Email etiquette [6 Periods]

Common web mail services, yahoo, gmail etc, fields to pay attention- To:, Cc:, Bcc:, Reply All, Subject, Salutation, Body, Signature, Font, Caps Lock , Highlight, The 'KISS' strategy (Keep It Simple and Short,)Points to remember while signing off, Introduction to Technical Vocabulary

- This unit is purely for internal assessment/evaluation

References:

1. Chrissie: **Handbook of Practical Communication Skills**: Jaico Publishing house, 1999.
2. Daniels, Aubrey: **Bringing Out the Best in People**: Tata McGraw-Hill: New York, 2003.Wright, Goulstone, Mark: **Just Listen: Discover the Secret to getting through to absolutely anything** : American Management Association, 2010.
3. Leslie. T. Giblin: **Skill with people** Publication details not known
4. Lewis, Norman: **Word Power Made Easy**: Goyal Publications: New Delhi, 2009.
5. Murthy, A.G, Krishna,: **Ten Much** : Tata McGraw-Hill :New Delhi, 2010.
6. Pease, Barbara and Pease, Allan: **The Definitive Book on Body Language**: Manjul Publishing House Pvt Limited, 2011
7. Rizvi M Ashraf: **Effective Technical Communication** : Tata McGraw-Hill: New Delhi, 2010.
8. Whitcomb, Susan Britton: **Resume Magic: Trade Secrets of a Professional Resume**: JIST Works, 2010.

Websites:

1. http://www.mindtools.com/pages/article/newTMC_05.htm
2. http://www.kent.ac.uk/careers/intervw.htm
3. http://www.wikihow.com/Write-a-Report

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Course Code: 50130 **Credits: 2**

B.Tech. – VI Semester

TECHNICAL SEMINAR

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Course Code: 50131 **Credits: 4**

B.Tech. – VII Semester
ESTIMATING AND COSTING

Prerequisites: Building Construction materials and Planning

Objectives

To understand that estimates of times and costs are fundamentals and sensitive to the factors and no of factors that influence estimates of various types of costs and their relationship between costs and schedules

Module I: **[12 Periods]**

A: General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

Module II: **[12 Periods]**

A:Detailed Estimates of RCC Buildings, Steel Structures, Composite Structures, Reinforcement bar bending and bar requirement schedules. Single pipe culvert and single cell rectangular box culvert

Module III: **[12 Periods]**

A: Contracts – Types of contracts – Contract Documents – Conditions of contract. Valuation of buildings.

B. Standard specifications- Specifications for different items of building construction. Tender, Tender forms, Tender notice, Tender Documents, E tender, Work order

Module IV: **[12 Periods]**

Earthwork for roads and canals

Module V: **[12 Periods]**

Rate Analysis – Working out data for various items of work over head and contingent charges.

Text Books:

1. B.N. Dutta, "**Estimating and Costing**" UBS publishers, 7th Edition 2000.
2. G.S. Birdie "Estimating and Costing" Dhanapati rai Publications, 6th Edition 2000

References:

1. M.chakraborthi "**Estimating and Costing & Specifications",** UBS Pulbications**,** 18th Edition 2005.
2. Kohli, D.D and Kohli, R.C., "**A Text book of estimating and costing**", S.Chand & Company Ltd., 10th Edition, 2004.

References Codes:

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. National Building codes.

Web References:

1. www.costeng-solutions.com/detailed_estimating.htm
2. study.com/academy/.../contract-law-terms-definitions-contract-types.html
3. www.bv-solutions.co.uk/building...validation/building-claims-validation-
4. nptel.ac.in/courses/105103093/15

Outcomes:

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

1. Have knowledge on various methods of valuations and different methods for estimating cost depreciations.
2. Estimate labor required stage wise
3. Have complete knowledge on various types of contracts and tenders

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Course Code: 50132 **Credits: 4**

B.Tech. – VII Semester
REMOTE SENSING & GIS

Prerequisites: Surveying

Objectives:
To understand the principles, applications, trends and pertinent issues of geographical information systems and sciences, including remote sensing [RS], photogrammetry, cartography, and global positioning system [GPS] in data and information acquisition, extraction, management and analysis; spatial and statistical modeling; mapping and visualization and apply vector and raster spatial data, particularly with regard to local/ state/national issues, emphasizing lands in and near it.

Module I:
A.Introduction To Photogrammetry [6 Periods]
Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, parallax measurements for height determinations.
B.Remote Sensing – I [6 Periods]
Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units

Module II:
A:Remote Sensing – II [12 Periods]
Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite, visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

Module III:
A:Geographical Information Systems [6 Periods]
Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.
B.Types Of Data Representation [6 Periods]
Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS- file management, spatial data- layer based GIS, Feature based mapping.

Module IV:
A:Gis Spatial Analysis [12 Periods]
Computational analysis methods [CAM], Visual analysis method, data storage- vector data storage, attribute data storage, overview of data manipulation and analysis, integrated analysis of spatial and attribute data.

Module V:
A: Applications Of Gis [12 Periods]
Land use/ land cover in water resources, surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds , flood and drought impact

assessment and monitoring, watershed management for sustainable development and watershed characteristics, reservoir sedimentation, fluvial geomorphology, water resources management and monitoring, ground water targeting, identification of sites for artificial recharge structures, drainage morphometry, inland water quality survey and management, water depth estimation and bathymetry.

Text Books:

1. LRA Narayana ., **"Remote sensing and its applications"**, University Press, 1st Editon, 1999.
2. Peter A Burrough and Rachael A. Mc Donnell, **"Principals of Geo physical information systems"** Oxford Publishers, 1st Editon , 2004.

Refernces:

1. C.P.Lo Albert, K.W. Yonng, **"Concepts & Techniques of GIS"**, Prentice Hall [India] Publications, 1st Editon, 2002.
2. M. Anji Reddy, **"Remote sensing and GIS"**, B.S.Publications, JNTU Hyderabad 1st Editon, 2001.
3. S.Kumar, **"Basics of Remote sensing and GIS"**, Laxmi publications, 1st Editon, 2005.

Web Refernces:

1. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf
2. http://www.pasda.psu.edu/tutorials/gisbasics.asp
3. http://www.crisp.nus.edu.sg/~research/tutorial/intro.htm

Outcomes:

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

1. Provide some of basics required for civil engineering and to solve the civil engineering problems.

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Course Code: 50133 **Credits: 3**

B.Tech. – VII Semester
FOUNDATION ENGINEERING

Prerequisite: Geotechnical Engineering and Engineering Mechanics

Objectives
To understand the significance of investigation of soil in the field. To design retaining walls, analyze and predict the possible instability of slopes. Design of shallow foundations and pile foundations.

Module I:
A:Soil Exploration **[9 Periods]**
Need – Methods of soil exploration – Boring and Sampling methods – Penetration Tests – Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.
B:Retaining Walls **[9 Periods]**
Types of retaining walls – stability of retaining walls against overturning, sliding, bearing capacity and drainage from backfill

Module II:
A: Slope Stability **[9 Periods]**
Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number- Stability of slopes of earth dams under different conditions.
B: Earth Pressure Theories **[9 Periods]**
Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method.

Module III:
A: Shallow Foundations - Bearing Capacity Criteria **[9 Periods]**
Types - choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi, Meyerhof, Skempton and IS Methods
B: Shallow Foundations - Settlement Criteria **[9 Periods]**
Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity - plate load test – allowable settlements of structures.

Module IV: **[10 Periods]**
Pile Foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

Module V: **[8 Periods]**
Well Foundations: Types – Different shapes of wells – Components of wells – functions and Design Criteria – Sinking of wells – Tilts and shifts.

Text Books:

1. Gopal Ranjan & ASR Rao. "**Basic and Applied Soil Mechanics**" by New Age International Pvt. Ltd, revised 2nd edition, 2006.
2. Das, B.M. **Principles of Foundation Engineering** –6th Edition [Indian edition]-2007
3. VNS Murthy. "**Geotechnical Engineering: Principles and practices of soil mechanics and foundation Engineering"**- 7th Edition, 2007.

References:

1. Swami Saran, "**Analysis and Design of Substructures**" –Oxford and IBH Publishing company Pvt Ltd, 1st Edition, 1998.
2. S. K.Gulhati & Manoj Datta "**Geotechnical Engineering**" Tata Mc.Graw Hill Publishing company New Delhi, 1st Edition, 2005.
3. K.R. Arora, "**Soil Mechanics and Foundation Engineering**", Standard Publishers and Distributors, Delhi. 1st Edition, 2000.
4. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, "**Soil Mechanics and Foundation**" Laxmi publications Pvt. Ltd., New Delhi, 1st Edition, 2000.

Outcomes:

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

1. Do basic testing of soils which can be used for design of foundations.
2. Find out the dry density and optimum moisture content which is very useful in the construction of embankments and pavements.
3. Classify the soils according to their basic properties.
4. Estimate the settlement of clays which is useful in the design of foundations

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Course Code: 50134 **Credits: 3**

B.Tech. – VII Semester
PRINCIPLES OF BRIDGE ENGINEERING
[PROFESSIONAL ELECTIVE-III]

Objectives:
Develop an understanding of basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality intuitive feeling about the sizing of bridge elements. Understand the load flow mechanism and identify loads on bridges.

Module I: **[12 Periods]**
A:Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces-Sesmic loads-Frictioal resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of raodway and footway-General Design Requirements.

Module II: **[12 Periods]**
A:Solid Slab Bridges: Introduction-Method of Analysis and Design

Module III: **[12 Periods]**
A:Girder Bridges: Introduction-Method of Analysis and Design-Courbon's Theory, Grillage analogy

Module IV: **[12 Periods]**
Pre-Stressed Concrete Bridges: Basic principles-General Design requirements-Mild steel reinforcement in prestessed concrete member-Concrete cover and spacing of pre-stressing steel-Slender beams-Composite Section-Propped-Design of Propped Composite Section-Unproped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.

Module V: **[12 Periods]**
Analysis Of Bridge Decks: Harmonic analysis and folded plate theory-Grillage analogy-Finite strip method and FEM. Sub-srtucture of bridges: Substructure- Beds block-Piers- Pier Dimensions- Design loads for piers-Abutments- Design loads for Abutments.

Text Books:
1. Victor D J, essentials of Bridge Engineering, Oxford & IBH
2. Raju N K, Design of Bridges, Oxford & IBH

Reference:
1. Concrete Bridge Design and Practice by V.K.Raina.
2. Ponnuswamy.S‖,Bridge Engineering,‖TataMc-Grawhill.
3. Jagadeesh.T.R.&Jayaram.M.A,‖Design of bridge structures, ―Prentice hall of india.

Web References:

- http://www.freeengineeringbooks.com/civil-books-download/Bridge-Engineering-Lecture-Notes.php
- http://teaching.ust.hk/~civl603c/
- http://www.pages.drexel.edu/~mitcheje/Mitchell_Courses/CAEE201/CAEE201_063/Home%20pp%20Dift%20Weeks/Bridge%20Eng%20Guest%20Lecture.pdf

Outcomes:

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

1. Apply knowledge of mathematics, science and engineering in desiging various compenets of bridge.

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Course Code: 50135 **Credits: 3**

B.Tech. – VII Semester
FINITE ELEMENT METHODS
[PROFESSIONAL ELECTIVE-III]

Prerequisites: Structural analysis

Objectives:
To provide the fundamental concepts of the theory of the Finite Element Methods and proficiency in the application of the Finite element Method to realistic engineering problems through the use of a major Connery general purpose Finite element method.

Module I:
A: Introduction To Finite Element Method [6 Periods]
Introduction - Basic Equations in Elasticity - equation – concept of plane stress – plane strain advantages and disadvantages of FEM.
B: Element Shapes [6 Periods]
Nodes – nodal degree of freedom – strain displacement relations.

Module II: [12 Periods]
A:Lfinite Element Analysis [Fea] of – one dimensional problems – Bar element – Shape functions stiffness matrix – stress – strain
FEA Two dimessional problem – CST – LST element – shape function – stress – strain

Module III: [12 Periods]
A:Fea Beam Elements – stiffness matrix - shape function – continuous beams. Lagrangian – Serenalipity elements – Hermit polynomials – regular, Irregular 2 D & 3D – Element –shape functions.

Module IV: [12 Periods]
A:Isoparametric Formulation – Concepts of, isoparametric elements for 2D analysis - formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements. Use of jacobian and gauss quadrature techniques load matrix for 8 noded rectangular isoperimetric element [for body forces and surface traction]

Module –V: [12 Periods]
A: Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

Text Book:

1. S.S. Bhavakatti "**Finite element analysis**", New age international publishers, 2nd Edition, 2010.
2. J N Reddy "**Introduction to Finite element method**" Tata Mc Graw Hills, 11th Edition, 2010.

References:

1. Chandrupatta, Belegunda "**Finite element method**", Prentice hall of India, 3rd Edition, 2004.
2. Robert D.Cook, David Malkus, Robert j witt "**Concepts and applications of Finite element method**", Prentice hall of India, 4th Edition, 2004.

Web References:

1. http:// nptel.ac.in/courses/105106051/
2. http:// nptel.ac.in/courses/105105041/

Outcomes:

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

1. Understand the use of the basic Finite element for structural application using truss, beam, frame, and plane element.
2. Develop a basic understanding of the limitations of FEM and understand the possible error sources in its use

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Course Code: 50136 **Credits: 3**

B.Tech. – VII Semester
PRESTRESSED CONCRETE STRUCTURS
[PROFESSIONAL ELECTIVE-III]

Objectives:
To understand types, systems and loss of prestressing. Design the flexural members for shear, bond and torsion and design the end blocks. Using the concept of linear transformation and cable profile. Analysis of composite section and their application in design of prestressed concrete bridges. To understand short term and long term deflections and their determination.

Module I: **[12 Periods]**
Introduction: Historic development – General principles of prestressing pre tensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel and their characteristics.

Module II:
A: Methods And Systems Of Prestressing **[06 Periods]**
Pre tensioning and post tensioning methods and systems of pre stressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System, Lee McCall system,
B: Loss Of Prestress **[06 Periods]**
Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

Module III:
A: Flexure **[06 Periods]**
Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons. Stress diagrams - Elastic design of simple PSC slabs and beams of rectangular and I-sections-kern line-cable profile and cable layout
B: Shear **[06 Periods]**
General considerations- principal tension and compression- improving shear resistance of concerete by horizontal and vertical pre stressing and by using inclined or parabolic cables-Analysis of rectangular and I-beams for shear- Design of shear reinforcement- I.S.Code Provisions.

Module IV: **[12 Periods]**
Transfer Of Prestress In Pre Tensioned Members: Tansmission of pre stressing force by bond-transmission length- flexural bond stresses- IS code provisions- Anchorage zone stresses in post tensioned members- stress distribution in end block- Analysis by Guyon's, Magnel, Zienlinski and Rowe's methods-Anchorage zone reinforcement- I.S.Code provisions.

Module V:
A: Composite Beams **[06 Periods]**
Different types- propped and unpropped – stress distribution-Differential shrinkage – Analysis of composite beams-General designs considerations.

B: Deflections **[06 Periods]**

Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members prediction of long term deflections-I.S.Code provisions.

Text Books:

1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

References:

1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.
2. Design of Prestressed concrete structures [Third Edition] by T.Y. Lin & Ned
3. H.Burns, John Wiley & Sons.

Reference Codes:

1. BIS code on prestressed concrete, IS 1343-2012

Web References:

- http://nptel.ac.in/courses/105105105/
- http://nptel.ac.in/courses/IIT-MADRAS/PreStressed_Concrete_Structures/

Outcomes:

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

1. Explain the principle, types and systems of prestressing and analyse the deflections.
2. Determine the flexural strength and design the flexural members, end blocks.
3. Analyse the statically indeterminate structures and design the continuous beam.
4. Design the tension and compression members and apply it for design of piles.
5. Analyse the stress, deflections, flexural and shear strength and apply it for the design of bridges.

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Course Code: 50137 **Credits: 3**

B.Tech. – VII Semester
WATER RESOURCES SYSTEMS ANALYSIS
[PROFESSIONAL ELECTIVE –IV]

Prerequisites: Fluid mechanics, Hydraulics & Hydraulic machinery, Engineering Geology, water resources engineering.

Objectives

The course will cover the topics of water planning and management by providing in depth coverage of the tools of analysis, namely optimization and simulation, and by providing the theoretical framework for analysis based on the economics of water and the design of water systems.

Module I:System Concepts **[10 Periods]**

A:System concepts: Definition, classification, and characteristics of systems - Scope and steps in systems engineering - Need for systems approach to water resources and irrigation.

Module II :Linear Programming

A:Linear Programming: **[07 Periods]**

Introduction to operations research - Linear programming, problem formulation, graphical solution, solution by simplex method - Sensitivity analysis.

B:Application: **[07 Periods]**

To design and operation of reservoir, single and multipurpose development plans - Case studies.

Module III:

Dynamic Programming

A:Dynamic Programming: **[07 Periods]**

Bellman's optimality criteria, problem formulation and solutions

B:Application: **[07 Periods]**

To design and operation of reservoirs, Single and multipurpose reservoir development plans - Case studies.

Module IV:Simulation **[15 Periods]**

A:Simulation: Basic principles and concepts - Random variant and random process - Monte Carlo techniques , Model development - Inputs and outputs - Single and multipurpose reservoir simulation models - Case studies.

Module V: Advanced Optimization Techniques **[10 Periods]**

A:Advanced optimization techniques: Integer and parametric linear programming - Goal programming models with applications discrete differential dynamic programming and incremental dynamic programming Linear decision rule models with application - Stochastic dynamic programming models.

Text Books:

1. Vedula & Mujumdar "**Water Resources System Analysis",** Tata Mc.Graw Hill Company Ltd.1st Edition, 2005.
2. James & Lee **"Water Resources Economics"**, Oxford Publishers, 1st Edition, 2005.

References:

1. Hiller F.S and Liebermann G.J., "**Operations Research",** CBS Publications and distributions. New Delhi, 1st Edition, 1992.
2. Chaturvedi. M.C., "**Water Resources Systems Planning and Management"**. Tata McGraw Hill, New Delhi, 1st Edition, 1997.
3. Mays L.W., and Tung YK, "**Hydro systems Engineering and Management"**. McGraw Hill Inc., New York, 1st Edition, 1992.
4. Goodman Alvin S., "**Principles of Water Resources Planning",** Prentice Hall Inc., Englewood Cliffs, New Jersey, 1st Edition, 1995.

Web References:

- *www.elsevier.com/.../analysis...water-resource-systems/.../978-0-444-989...*
- http://www.eolss.net/Sample-Chapters/C07/E2-16-03-01.pdf
- http://www.sciencedirect.com/sience/book/

Outcomes:

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

1. Understand current issues of importance in water resources management, including water scarcity, eco hydrology and climate change.
2. Understand the fundamentals of economic theory as applied to water resources, and can able practice optimization and simulation modeling and applications of water resources problems
3. Able to design and solve optimization models of water systems, and students can able to conduct model-based analysis of integrated water resource systems

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Course Code: 50138 **Credits: 3**

B.Tech. – VII Semester

IRRIGATIONAL STRUCTURES AND WATER POWER ENGINEERING
[PROFESSIONAL ELECTIVE –IV]

Prerequisites: Fluid mechanics, Hydraulics & Hydraulic machinery, Engineering Geology, water resources engineering.

Objectives:
Ability to design multi-purpose water retaining structures, to develop skills in the mathematical modeling of both natural and engineered water resource systems that are used to analyze system components.

Module I :Gravity Dams **[15 Periods]**
A:Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

Module II:**Earth Dams, Spillways**
A:Earth Dams **[07 Periods]**
Types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage
B:Spillways **[07 Periods]**
Types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.

Module III: Diversion Head Works
A:Diversion Head Works **[07 Periods]**
Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations,-Silt Ejectors and Silt Excluders.
B:Weirs On Permeable Foundations **[07 Periods]**
Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure-Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

Module IV:Canal **Falls, Cross Drainage Works**
A:Canal Falls **[07 Periods]**
Types of falls and their location, Design principles of Notch Fall and Sarada type fall. Canal regulation works, principles of design of distributory and head regulators, Canal Cross Regulators -canal outlets, types of canal Modules, proportionality, sensitivity and flexibility.
B:Cross Drainage Works **[07 Periods]**
Types, selection of site, Design principles of aqueduct, siphon aqueduct and super passage. Design of Type II Aqueduct (Under Tunnel).

Module V: Water Power Engineering **[08 Periods]**

A:Water power engineering: Development of hydro power in India, assessment of available power, Utilization factor, load factor, diversity factor, storage and pond age, types of hydro power schemes, Components of hydel schemes – fore bay, intake structure, trash racks, water hammer, surge tanks, substructure and super structure of power house

Text Books:

1. S.K. Garg, "Irrigation Engineering and Hydrology Structures", Khanna Publishers, Delhi, 23rd Edition, 2009.
2. K.R.Arora, "Irrigation, Water Power and Water Resources. Engineering", 3rd Edition, Standard Publishers Distributors, 2010.

References:

1. P.N.Modi, "Irrigation, Water Resources and Water Power Engineering", Standard Book House, Delhi-6, 6th Edition 2004.
2. B.C. Punmia and Pande B.B.Lal, "Irrigation and Water Power Engineering"., Laxmi Publications Pvt. Ltd., New Delhi, 18th Edition, 2006.
3. R.S.Varshney, S.C. Gupta, and R.L. Gupta, "Theory & Design of Irrigation Structures", Vol.II, Nem Chand & Bros., Roorkee, 6th Edition, 1993.

Web References:

- http://nptel.tvm.ernet.in/Syllabus.php?syl=Civil_Eng/WaterResEngg.php&sub=civil&sem=Semester%207
- *www.slb.com › ... › Water Services › Water Resources › Engineering*
- hyd.uod.ac/material/CE404_02_Seepage_Theories.pdf

Outcomes:

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

1. Understand the need and mode of irrigation and also knows the irrigation management practices of the past, present and future and ability to handle and plan any type of irrigation project.
2. Design hydraulic structures and water flow controlling and management devices
3. Gain knowledge about creep theories and design of structures on permeable foundations and their management.
4. Understand Design of man-made water carrying structures and their regulatory works.

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Course Code: 50139 **Credits: 3**

B.Tech. – VII Semester
RIVER ENGINEERING
[PROFESSIONAL ELECTIVE –IV]

Prerequisites: Fluid mechanics, Hydraulics & Hydraulic machinery, Engineering Geology, water resources engineering.

Objectives

To understand theoretical concepts of water and sediment movements in rivers and knowledge on hydraulics of river and to understand the modeling of river hydraulics

Module I: River Functions **[12 Periods]**

River functions: Primary function of a river – River uses and measures – Water and Sediment loads of river – Rivers in India, Himalaya and Peninsular.

Module II: River Hydraulics

A:Steady Flow In Rivers **[07 Periods]**

Physical Properties and Equations – Steady flow in rivers – uniform and non uniform – Turbulence and velocity profiles – resistance coefficients – Boundary conditions and back waters – Transitions – Rating Curve.

B:**Unsteady Flow In Rivers** **[07 Periods]**

Propagative of surface waves – Characteristics, flood waves – kinematic and diffusion analogy – velocity of propagation of flood waves – Flood wave –Maximum

Module III: River Mechanics

A:River Mechanics **[07 Periods]**

River Equilibrium: Stability of Channel – regime relations – river bend equilibrium – hydraulic geometry of downstream - Bars and meandering

B:River Dynamics **[07 Periods]**

Degradation and aggradations of river bed – Confluences and branches – River Data base.

Module IV: River Surveys And Model **[07 Periods]**

A:River surveys and model :Mapping – Stage and Discharge Measurements – Sediments – Bed and suspended load Physical hydraulic Similitude – Rigid and mobile bed – Mathematical – Finite one dimensional – multi – dimensional – Water Quality and ecological model.

Module V: River Management **[07 Periods]**

A:River management: River training works and river regulation works – Flood plain management – waves and tides in Estuaries - Interlinking of rivers – River Stabilization.

Text Books:

1. Janson PL.Ph., Lvan BendegamJvanden Berg, Mdevries A. Zanen [Editors], "**Principles of River Engineering"** – The non tidal alluvial rivers – Pitman, 1st Edition,1979.
2. P. Jaya Rami Reddy., "**Hydrology"**, Laximi Publications, New Delhi,12th Edition, 2004.

References:

1. Warren Viessman, et al., "**Introduction to hydrology"**, Thomas Y.Crowell , New York , 1st Edition, 1972
2. Ven Te chow [editors], "**Handbook of applied hydrology"**, McGraw Hill Book company, 1st Edition, 1964.
3. Subramanya K., "**Hydrology"**, Tata McGraw Hill Co., New Delhi, 1st Edition, 1994.
4. Patra.K.C, "**Hydrology and Water Resources Engineering"**, Narosa Publications, 2008, 2nd Edition, New Delhi.

Web References:

1. www.iihr.uiowa.edu/riverflow2016/
2. www.rivergages.com/

Outcomes:

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

1. Appreciate the complex behavior of rivers.
2. Gain the skills to take up research activities in river engineering.
3. Gain knowledge in river mechanics.

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Course Code:	**Credits: 3**		

B.Tech. – VII Semester
[OPEN ELECTIVE –II]

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Course Code: 50140 **Credits: 2**

B.Tech. – VII Semester
CONCRETE TECHNOLOGY LAB

LIST OF EXERCISES:

1. Normal Consistency of cement.
2. Initial setting time and final setting time of cement.
3. Fineness of cement.
4. Specific gravity of cement.
5. Soundness of cement.
6. Compressive strength of cement.
7. Workability test on concrete by compaction factor, slump and Vee-bee.
8. Young's modulus and compressive strength of concrete.
9. Bulking of sand.
10. Non-Destructive testing on concrete [for demonstration].
11. Concrete Mix Design.

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Course Code: 50141 **Credits: 2**

B.Tech. – VII Semester

MINOR PROJECT

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Course Code: 50A04 **Credits: Audit Course**

B.Tech. – VII Semester
FOREIGN LANGUAGE /FINE ARTS

Objectives:

To introduce a new language to the students.

To impart basic knowledge of foreign language to the students to be useful for everyday and Professional Purposes

Module I:

Basic introduction of the language and its importance.

Introduction to the script, words and sentences.

Module II:

Construction of simple sentences for everyday needs like,

a. Greeting
b. Apologies
c. Enquiry
d. Bargaining
e. Seeking directions etc.

Module III:

Language for workplace

a. Participating in meetings.
b. Party etiquette
c. Dining etiquette
d. Self-introductions
e. Introducing others etc…

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Course Code: 50142 **Credits: 3**

B.Tech. – VIII Semester
CONSTRUCTION ENGINEERING & MANAGEMENT
[PROFESSIONAL ELECTIVE-V]

Prerequisites: Building Materials, Construction and Planning

Objectives:
Develop advanced competencies in the technical, management, and leadership aspects of professional construction management and to broaden the career potential of individuals through applied learning experiences in construction, management; and technology; and Provide advanced preparation in the technical aspects and human factors of the construction industry; and Develop a broad perspective needed for those employed in or aspiring to middle and upper management positions within the construction industry.

Module I: **[12 Periods]**
A:Construction Planning And Management : Significance of Construction Management, Objectives and Functions of Construction Management, Types of Construction, Resources for Construction Industry, Various stages in Construction, Construction Management Team & Types of Organization.

Module II: **[10 Periods]**
A:Claim Management: Construction claims, Disputes and project closure- Source of claim, Claim Management, Dispute resolution, Arbitration and its advantages, Arbitration Clause, Construction closure, Contract closure

Module III:
A:Contract Management: **[6 Periods]**
Types of Construction Contracts and their advantages and disadvantages, Contract Document and conditions of contract. Estimation and its types. Significance of Safety & Quality in construction work.
B:Bidding **[4 Periods]**
Definition and Process, Various steps in Bidding, M Book- Muster Roll, Earnest money & Security Deposit,

Module IV: **[10 Periods]**
A:Construction Planning: Project Planning Techniques, Planning of Manpower, Materials, Equipment and Finance, Work Breakdown Structure, Scheduling by Bar Charts, Limitations of Bar Charts

Module V: **[12 Periods]**
A:Pert & Cpm : Time estimate- Optimistic time **e**stimate**,** Most likely time estimate, Pessimistic time estimate & Expected time. Project Scheduling, Resource Allocation/Leveling, Network Analysis, Cost- Time Analysis in Network Planning, Float- Total float, free float & Independent float.

Text Books:

1. P.S. GAHLOT, B.M. DHIR., "**Construction Planning and Management**" Wiley Eastern Limited, 1992.
2. Chitkara, K.K., "**Construction Project Management"**, Tata McGraw Hill Publishing Co, Ltd., New Delhi, 1998.
3. B.C Punmia "**Project Planning and control with PERT and CPM"**, Laxmi Publications, New Delhi, 1987.
4. Dr. P.N. Modi, Sanjeev Modi, Rajeev Modi, "**PERT AND CPM"**, Rajsons Publications Pvt. Ltd., Standard Book House [Since 1960].

Refernces:

1. Punmia B.C., and Khandelwal, "**PERT and CPM"**, Lakshmi Publications, 1990.
2. Mahesh Varma, Construction Planning and Equipment, Metropolitan Book Co. Pvt. Ltd., 1985.
3. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "**Fundamentals of Management**" 7 th Edition, Pearson Education, 2011.
4. Robert Kreitner & Mamata Mohapatra, " **Management**", Biztantra, 2008.
5. Harold Koontz & Heinz Weihrich "**Essentials of management**" Tata McGraw Hill,1998.
6. Tripathy PC & Reddy PN, "**Principles of Management**", Tata McGraw Hill, 1999.

Web Refernces:

1. nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/cpm/
2. https://www.vanameyde.com/Page/9/what-is-claims-management-
3. https://oa.mo.gov/purchasing/bidding-contracts
4. www.slideshare.net/ninoto/pert-cpm-intro

Outcomes:

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

1. Gain Critical thinking and creativity in problem solving and decision making in construction.
2. Understand Effectively and professional oral and written communications through the use of information and communication technology
3. Have Principles of leadership in business and management including advanced construction management practices, complex project decision making, and associated risk management.
4. Gain Professional ethics including application to construction situations and choices.

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Course Code: 50143 **Credits: 3**

B.Tech. – VIII Semester
PAVEMENT DESIGN
[PROFESSIONAL ELECTIVE-V]

Prerequisites: Transportation Engineering

Objectives:
To design, analyze and interpret data related to the pavement and to identify, formulates, solve engineering problems for the design of different types of pavements

Module I: **[12 Periods]**
A:Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

Module II:
A:Stresses In Pavements **[05 Periods]**
Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements
B:Stresses In Flexible Pavements **[05 Periods]**
Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts
C:Stresses In Rigid Pavements **[05 Periods]**
Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

Module III:
A:Design Of Flexible Pavements **[07 Periods]**
Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods,
B:Design Of Rigid Pavements **[08 Periods]**
Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

Module IV: **[12 Periods]**
Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex [Dynamic] Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics.

Module V:

A:Design Of Pavement For Low Volume Roads **[08 Periods]**

Pavement design for low volume roads, Rural road designs – code of practices.

B:Design Of Over Lays **[08 Periods]**

Types of Overlays, Suitability, Design of Overlays

Text Books:

1. Yoder.J. & Witzorac Mathew "**Principles of Pavement Design"**, , W. John Wiley & Sons Inc
2. Yang H. Huang "**Pavement Analysis & Design"**, Prentice Hall Inc.

References:

1. Nai C. Yang, "**Design of Functional Pavements**", McGraw Hill Publications
2. AF Stock, Elsevier, "**Concrete Pavements**", Applied Science Publishers

Reference Codes:

1. IRC: 37-2001. Guidelines for the Design of. Flexible Pavements
2. IRC: 58-2002. Guidelines for the Design of. Rigid Pavements
3. IRC: SP: 62-2004. Guidelines for low volume Rural road designs

Outcomes:

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

1. function on multidisciplinary areas
2. design a system to meet the needs within the realistic constraints such as environment, safety, sustainability and economic viability.
3. use the techniques, skills, and modern engineering tools necessary for engineering practice.

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Course Code: 50144 **Credits: 3**

B.Tech. – VIII Semester
PUBLIC TRANSPORTATION
[PROFESSIONAL ELECTIVE-V]

Prerequisites: Transportation Engineering

Objectives:
Student will understand and apply basic concepts and methods of urban transportation planning in the India.

Module I: **[12 Periods]**
A:Introduction: Role of transportation in the economic development of nations, overview of transport modes, growth trends, National Transport Policy of India – Case studies, transportation planning in the developing world; and comparative international transportation policies; Fundamentals of transportation , Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling trip generation, distribution, modal choice, assignment

Module II: **[12 Periods]**
A:Data Collection And Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

Module III: **[08 Periods]**
A:Travel Demand Issues: Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

Module IV: **[12 Periods]**
A:Demand Analysis And Supply Analysis Planning : Planning for sustainable urban mobility, positive and negative externalities in urban transport, congestion pricing, parking policy, demand management , Urban travel and transportation system characteristics - a systems perspective, Data management and use in decision making , Demand analysis , Urban activity analysis, Supply analysis; Plan Preparation And Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis

Module V: **[12 Periods]**
Metropolitan Cities: Design issues in urban mobility, integrating land use and transport planning; , Overview of urbanization process, city structure and urban activity and infrastructure systems, Economic and social significance of urban infrastructure systems; Transport's Role in tackling Social Inclusion, Economic Impacts of Transport Policy.

Text Books:

1. Dr.L.R.Kadyali, "Traffic Engineering & Transportation Planning" –Khanna Publications – 6th Edition 1997
2. M.J.Bruton" Introduction To Transportation Planning", Hutchinson Of London Ltd, 7th Edition 2000

References:

1. Partha Chakraborty and Animesh das, "Principles of Transportation Engineering", Prentice Hall, India– 6th Edition 1997
2. Flaherty, C.A.O. "Highway Engineering", Edward Arnold, London, – 6th Edition 1986.

Outcomes:

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

1. Design and conduct surveys to provide the data required for transportation planning. Learn and understand zonal demand generation and attraction regression models.
2. Learn and understand demand distribution models (gravity models) and modal split models for mode choice analysis.
3. Develop and calibrate trip generation rates for specific types of land use developments.
4. Make final decisions among planning alternatives that best integrate multiple objectives such as technical feasibility and cost minimization.

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Course Code: 50145 **Credits: 3**

B.Tech. – VIII Semester
ROCK MECHANICS AND ENGINEERING
[PROFESSIONAL ELECTIVE-VI]

Prerequisite: Strength of Materials, Engineering Geology, Geotechnical Engineering

Objectives
To create an ability to apply knowledge of Rock mechanics in the field to design and conduct experiments, as well as to analyze and interpret data related to the rock mechanics. To accentuate the understanding of the basic principles and exposes the student to the latest developments and applications

Module I :
A:Engineering Classification Of Rocks [12 Periods]
Classification of intact rocks, Rock mass classifications, Rock Quality Designation [RQD], Rock Structure Rating [RSR], Rock Mass Rating [RMR], Norwegian Geotechnical Classification [Q-system], Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geo engineering classification.

Module II:
A:Laboratory And In-Situ Testing Of Rocks [10 Periods]
Physical properties, Compressive strength, Tensile strength, Direct shear test, Triaxial shear test, Slake durability test, Schmidt rebound hardness test, Sound velocity test, In-Situ Tests: Seismic methods, Electrical resistivity method, In situ stresses, Plate loading test, Goodman jack test, Plate jacking test, In-situ shear test, Field permeability test.

Module III
A: Strength, Modulus [6 Periods]
Factors influencing rock response, Strength criteria for isotropic intact rocks, Modulus of intact rocks, effect of confining pressure, Uniaxial Compressive strength, Strength criteria for intact rocks, Strength due to induced anisotropy in rocks.
B: Stresses-Strain Responses Of Rocks [6 Periods]
Stress Strain Models: Constitutive relationships, Elastic, Elasto-plastic, Viscoelastic, Elasto-viscoplastic stress-strain models.

Module IV:
A:Stability Of Rock Slopes And Foundations On Rocks [12 Periods]
Rock slopes, Modes of failure, Rotational failure, Plane failure, Design charts, Wedge method of analysis, Buckling failure, Toppling failure, Improvement of slope stability and protection. Foundations on Rock: Introduction, Estimation of bearing capacity, Stress distribution, Sliding stability of dam foundations, strengthening measures, Settlements in rocks, Bearing capacity of pile/pier in rock, Remedial measures, Foundations located on edge of jointed slope.

Module V:
A:Underground And Open Excavations [12 Periods]
Blasting operational planning, Explosive products, Blast Design, Underground blast design,

Controlled blasting techniques, blasting damage and control, Safe practice with explosives and shots.

Text Books:

1. Goodman – "Introduction to Rock mechanics", Willey International , 5th Edition, 1980.
2. Ramamurthy, T. – "Engineering in Rocks for slopes", foundations and tunnels, Prenice Hall of India. ,6th Edition, 2012

References:

1 Jaeger, J. C. and Cook, N. G. W. – "Fundamentals of Rock Mechanics", Chapman and Hall, London, 8th Edition,2012

2 Hoek, E. and Brown, E. T. – "Underground Excavation in Rock", Institution of Mining and Metallurgy, 5th Edition, 1982.

3 Brady, B. H. G. and Brown, E. T. – "Rock Mechanics for Underground Mining", Chapman & Hall, 7th Edition, 1993.

Outcomes

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

1. Improve techniques, skills, and modern engineering tools necessary for necessary understanding in Rock mechanics.
2. Have awareness of the latest trends, modern standards and state-of-the-art techniques for understanding rock mechanics and engineering.
3. understand to function on multidisciplinary teams.

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Course Code: 50146 **Credits: 3**

B.Tech. – VIII Semester
GROUND IMPROVEMENT TECHNIQUES
[PROFESSIONAL ELECTIVE-VI]

Prerequisite: Geotechnical Engineering and Foundation Engineering

Objectives
Student is expected to identify basic deficiencies of various soil deposits. Student will be in a position to decide various ways and means of improving the soil and implementing techniques of improvement.

Module I:
A:Dewatering **[7 Periods]**
Methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points- Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis.
B:Grouting **[7 Periods]**
Objectives of grouting- grouts and their properties- grouting methods ascending, descending and stage grouting- hydraulic fracturing in soils and rockspost, grout test.

Module II:
A:In – Situ Densification Methods In Granular Soils **[7 Periods]**
Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.
B: In – Situ Densification Methods In Cohesive Soils **[7 Periods]**
Preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

Module III:
A:Geosynthetics **[7 Periods]**
Description, properties, functions and applications of geosynthetics
B: Geoenvironmental Application Of Geosynthetics **[7 Periods]**
Geomembranes for landfills and ponds, Geosynthetic clay liner, Designing with GCL;s, Filtration, Erosion control, slope protection.

Module IV: **[8 Periods]**
A:Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

Module V: **[8 Periods]**
A:Stabilization: Methods of stabilization-mechanical-cement- lime-bituminouschemical stabilization with calcium chloride, sodium silicate and gypsum. Expansive soils: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

Text Books:

1. Purushotham Raj. "Ground Improvement Techniques", Laxmi Publications, New Delhi, 2nd Edition , 2010
2. Hausmann M.R., "Engineering Principles of Ground Modification", McGraw-Hill Internationa, 1st Edition, 1990.

References:

1. Moseley M.P, "Ground Improvement", Blackie Academic and Professional, Boca Taton, Florida, USA. 1st Edition, 1993.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A "Ground Control and Improvement", John Wiley and Sons, New York, USA. 1st Edition, 1993.
3. Robert M. Koerner, "Designing with Geosynthetics", Prentice Hall New Jercy, USA, 1st Edition, 1993.

Outcomes:

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

1. Solve the field problems related to problematic soils and solve the problems using the above ground improvement techniques
2. Design drainage, dewatering for the field problems
3. Design and construct reinforced earth retaining structures

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Course Code: 50147 **Credits: 3**

B.Tech. – VIII Semester
ADVANCED FOUNDATION ENGINEERING
[PROFESSIONAL ELECTIVE-VI]

Prerequisite: Geotechnical Engineering and Foundation Engineering

Objectives
The students will learn the advanced foundation practices and improvised study about the foundation problems and their related solutions in shallow, deep and well foundations. Students will also learn about the foundation practices to be applied for the clay soils.

Module I: **[12 Periods]**
A:Introduction-Bearing capacity of Footings subjected to Eccentric and inclined loading – Meyerhoff's, Hansen's, Vesic theories – Foundations on layered soils.

Module II: **[12 Periods]**
A:Elastic settlement of Footings embedded in sands and clays of Infinite thickness – Footings on soils of Finite thickness-Schmertamaunn's method, Janbu method.

Module III : **[20 Periods]**
A:Lateral Earth Pressures-Rankine - Coloumb's and graphical methods – Stability of cantilever and counterfort retaining walls, Reinforced earth retaining walls.
B:Cantilever sheet piles and anchored bulkheads, Earth pressure diagram - Determination of Depth of embedment in sands and clays – Timbering of trenches- Earth pressure diagrams – Forces in struts.

Module IV: **[12 Periods]**
A:Pile Foundations – static and dynamic methods-pile groups-negative skin friction-under reamed piles.
Settlement of Pile groups resting in sands and clays –laterally loaded piles ultimate capacity of laterally loaded piles.

Module V: **[12 Periods]**
A:Caissons And Well Foundations: Types of caissons – well foundations - Different shapes of wells – Components of wells – functions and Design – Design Criteria – Sinking of wells – lateral stability by Terzaghi's analysis.
Foundations in Expansive soils – Problems in Expansive soils – Mechanism of swelling– Swell Pressure and Swelling potential–Heave–foundation practices–Sand cushion–CNS technique – under – reamed pile Foundations – Granular pile – anchor technique, stabilization of expansive soils.

Text Books:

1. Das, B.M. "Principles of Foundation Engineering" –PWS Publishing, Singapore -, 4th Edition, 1999.
2. Bowles, J.E. "Foundation Analysis and Design" –McGraw-Hill International, 4th Edition, 1988.
3. VNS Murthy. "Geotechnical Engineering: Principles and practices of soil mechanics and foundation Engineering"- 7th Edition –2007.

4. C. Venkataramah. "Geotechnical Engineering" New Age International Pvt.Ltd, Publishers 3rd Edition, 2006.

Reference Books:

1. Swami Saran, "Analysis and Design of Substructures" –Oxford & IBH Publishing Company Pvt.Ltd 4th Edition, 1988.
2. Gopal Ranjan & ASR Rao, "Basics and Applied Soil Mechanics" New Age International Pvt.Ltd, Publishers 3rd Edition, 2002.

Outcomes:

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

1. Find out the profiling of soils and the test to be carried out to explore the soils
2. take the soils samples for estimating the various properties of soils in laboratory
3. Design various shallow foundations for diffent loadings (eccentric & inclined).
4. Design various deep and well foundations for diffent loadings.
5. Design the foundation practices on various expansive soils.

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Course Code: **Credits: 3**

B.Tech. – VIII Semester
[OPEN ELECTIVE-III]

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Course Code: 50148 **Credits: 10**

B.Tech. – VIII Semester
MAJOR PROJECT

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Course Code: 50149 **Credits: 2**

B.Tech. – VIII Semester
COMPREHENSIVE VIVA VOCE

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Course Code: 50H15 **Credits: 1**

B.Tech. – VIII Semester
ENTREPRENEURSHIP SKILLS

PRE-REQUISITE: Nil

OBJECTIVE:
The aim of this course is to inspire students to become entrepreneurs so that they will emerge as job providers rather than job seekers.

MODULE -I: **[5 Periods]**

Understanding Entrepreneurial Mindset-characteristics of an entrepreneur -The evolution of entrepreneurship-Approaches to entrepreneurship- The challenges of new venture start-ups-Critical factors for new venture development.-Twenty first centaury trends in entrepreneurship-Difference between entrepreneur and entrepreneurship.

MODULE -II: **[5 Periods]**
The individual entrepreneurial mind-set and Personality-The entrepreneurial journey-Women entrepreneurship: growth problems in India-Entrepreneurial motivations. Corporate Entrepreneurial Mindset-the nature of corporate entrepreneur- -sustaining corporate entrepreneurship.

MODULE -III: **[5 Periods]**
Launching Entrepreneurial Ventures-opportunities identification-entrepreneurial Imagination and Creativity-the nature of the creativity process-Innovation and entrepreneurship. Methods to initiate Ventures-Creating new ventures-Acquiring an Established entrepreneurial venture - Intellectual property protection-Patents, Copyrights-Trademarks and Trade secrets.

Text Book:

1. D F Kuratko and T V Rao "Entrepreneurship-A South-Asian Perspective "Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)

References:

1. Vasant Desai "Small Scale industries and entrepreneurship" Himalaya publishing 2012.
2. Rajeev Roy "Entrepreneurship" 2e, Oxford, 2012.
3. B.Janakiramand M.Rizwana" Entrepreneurship Development :Text & Cases,Excel
4. Books,2011.
5. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
6. Robert Hisrich et al "Entrepreneurship" 6the, TMH, 2012.
7. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

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

1. understand the mindset of the entrepreneurs, identify ventures for launching, develop an idea on the legal framework and also understand strategic perspectives in entrepreneurship- Legal challenges of Entrepreneurship.

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Course Code: 50203 **Credits: 3**

B.Tech.

NETWORK THEORY

Prerequisites: Basic knowledge on Electrical circuits

Objective: This course introduces the concepts of circuit analysis which is the foundation for all courses of the Electrical and Electronics Engineering discipline.

Module I:

A:Network Theorems (Both AC & DC Networks) **[12 periods]**

Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's and Compensation and Tellegen's theorems- Statement of theorems and numerical problems.

Module II:

A:Three Phase Circuits **[10 periods]**

Introduction to three phase circuits – types of connection - Star and delta– Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase circuits –Measurement of active and reactive power of balanced and Unbalanced 3 phase circuits .

Module III:

A:Two Port Network Parameters **[12 periods]**

Open circuit impedance(Z) network parameters, Short circuit admittance(Y) network parameters –Transmission(ABCD), Inverse transmission($A^1B^1C^1D^1$) and hybrid parameters – Relationship between two port network parameters – Reciprocity and Symmetry concepts of two port network parameters.

Module IV:

A: DC Transient Analysis **[13 periods]**

Introduction - Initial conditions of all elements-Transient response of Series R-L, R-C and R-L-C circuits – Solution using differential equation approach and Laplace transform approach.

Module V:

A: AC Transient Analysis **[12 periods]**

Transient response of Series R-L, R-C and R-L-C circuits – Solution using differential equation approach and Laplace transform approach.

Text Books:

1. William Hayt and Jack E. Kimmerly, "Engineering circuit analysis", McGrawHill Company, 6th Edition, 2005.
2. Joseph Edminister & mahmood Nahvi, "Electric circuits", Schaum outline Series – Tata McGraw Hill, 3rd Edition, 1999.

References:

1. Vanvalkenburg, "Network Analysis", Prentice Hall of India, 3rd Edition, 1974.
2. A. Chakrabarthy, "Circuit Theory" by DhanipatRai & Co., 6th Edition, 2010.
3. N. N. Parker smith, "Problems in Electrical Engineering", 9th Edition, 1981.

Outcomes:

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

1. Analyze electrical circuits using network theorems.
2. Apply the concepts of three phase electrical circuits to electrical machines and power systems.
3. Calculate the different parameters of a given two port electrical network.
4. Draw the transient response of a network for the given input.
5. Build the electrical circuit for the given impedance, admittance functions.

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Course Code: 50208 **Credits: 3**

B.Tech.

CONTROL SYSTEMS

Prerequisites: Basic of Mathematics, Laplace Transforms and Matrices.

Objective: This course introduces the basics of control systems, types of control systems, mathematical modeling, block diagram representation, signal flow graph, Time domain and frequency domain specifications, stability and state space analysis

Module I: Introduction **[12 Periods]**

A:Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback, Mathematical models – Differential equations, Impulse Response and transfer functions.

B:Transfer Function Representation: Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

Module II:

A:Time Response Analysis **[12 Periods]**

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

Module III:

A:Stability Analysis In S-Domain **[12 Periods]**

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

B:Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

Module IV:

Frequency Response Analysis **[12 Periods]**

A:Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and Phase margin and Gain margin - Stability Analysis from Bode Plots. Polar Plots - Nyquist Plots.

B:Compensation techniques – Lag, Lead and Lead -Lag Controllers design in frequency Domain**.**

Module V:

A:State Space Analysis of Continuous Systems **[12 Periods]**

Concepts of state, state variables and state model, derivation of state models from block diagrams, diagonalization - Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and observability.

Text Books:

1. I. J. Nagrath and M. Gopal, "**Control Systems Engineering"**, New Age International Publishers, 5th edition, 2007. (Modules I, II, III & IV)
2. A.Nagoor kani, "**Control Systems**", RBA Publications, 2nd Edition, 2006. (Modules I, II, III, IV & V)

Reference Books:

1. Benjamin.C.Kuo, **"Automatic Control Systems"**, Prentice Hall of India, 7th Edition, 1995.
2. M.Gopal, **"Control System"** – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
3. Schaum's Outline Series, **"Feedback and Control Systems"**Tata McGraw-Hill, 2007.
4. John J.D'azzo & Constantine H.Houpis, **"Linear control system analysis and design"**, Tata McGraw-Hill, Inc., 1995.
5. Richard C. Dorf & Robert H. Bishop, **"Modern Control Systems"**, Addidon – Wesley, 1999.
6. http://nptel.ac.in/courses/108103007/8

Outcomes:

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

1. Grasp the basics of open loop and closed loop control systems, concept of feedback in control systems, mathematical modeling and transfer function derivations of Synchros, AC and DC servo motors.
2. Apply the basics of Transfer function representation through block diagram, signal flow graphs, time response analysis of different order systems through their characteristic equation with time-domain specifications, stability analysis of control systems in S-domain through R-H criteria and root-locus techniques, frequency response analysis through bode diagrams, Nyquist, polar plots.
3. Apply the above conceptual things to real-world electrical and electronics problems and applications with the basics of state space analysis, design of PID controllers, lag, lead, lag-lead compensators.

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Course Code: 50229 **Credits: 3**

B.Tech

ENERGY AUDITING & CONSERVATION

(Professional Elective-4)

Objective:

To have the knowledge about the concept of energy conservation, energy management, different approaches of energy conservation in industries, economic aspects of energy conservation project and energy audit in commercial and industrial sector will be achieved by this course

MODULE I:

A: BASIC Principles of Energy Audit [12 Periods]

Energy audit- definitions, concept , types of audit, energy index, cost index ,pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit

MODULE II:

A:Energy Management [12 Periods]

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting, Energy manger, Qualities and functions, language, Questionnaire - check list for top management

Module III:

A: Energy Efficient Motors [12 Periods]

Energy efficient motors , factors affecting efficiency, loss distribution , constructional details , characteristics - variable speed , variable duty cycle systems, RMS hp- voltage variation- voltage unbalance- over motoring- motor energy audit

MODULE IV:

A:Power Factor Improvement, Lighting & Energy [14 Periods]

Power factor – methods of improvement, location of capacitors, Pf with non linear loads, effect of harmonics on p.f. , p.f motor controllers - Good lighting system design and practice, lighting control ,lighting energy audit,

B:Energy Instruments- watt meter, data loggers, thermocouples, pyrometers,lux meters, tongue testers ,application of PLC's.

MODULE V:

A:Economic Aspects and Analysis & Its Computation [12 Periods]

Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method , replacement analysis, life cycle costing analysis - Energy efficient motors, Calculation of simple payback method, net present worth method- Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

Text Books:

1. **"Energy management"** by W.R. Murphy & G. Mckay Butter worth, Heinemann publications.
2. **"Energy efficient electric motors"** by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995-

References:

1. "Energy management" by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998
2. "Energy management hand book" by W.C.Turner, John wiley and sons
3. "Energy management and good lighting practice" : fuel efficiency- booklet12-EEO

Outcome: After completion of the course student will have the awareness of

- Different types of industries which are consisted of various energy intensive processes.
- Various energy intensive processes in different industries and to find out the energy conservation opportunities.
- Various methods of energy management and energy auditing on the site.
- Energy auditing and managing the energy demand in industry.

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Course Code: 50241 **Credits: 3**

B.Tech

PRINCIPLES OF ELECTRICAL ENGINEERING

Prerequisites: Electrical Circuits.

Objective: This course introduces the basic concepts of transient analysis of the circuits, the basic two-port network parameters, the design analysis of filters and attenuators and their use in circuit theory. The emphasis of this course is laid on the operation of the transformers and basic Principle of operation of three phase Induction Motor and Alternators.

Module I:

A: Transient Analysis (First and Second Order Circuits) [13 Periods]

Transient Response of RL , RC Series, RLC Circuits for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.

Module II:

A:Two Port Networks [13 Periods]

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameter to another, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems.

Module III:

A: Filters and Symmetrical Attenuators [10 Periods]

Classification of Filters, Filter Networks, Classification of Pass band and Stop band, Characteristic Impedance in the Pass and Stop Bands, Constant-k Low Pass Filter, High Pass Filter, m-derived T-Section, Band Pass filter and Band Elimination filter, Illustrative Problems. Symmetrical Attenuators – T-Type Attenuator, π–Type Attenuator, Bridged T type Attenuator, Lattice Attenuator.

Module IV:

A:Network Theorems (A.C. & D.C) [12 Periods]

Tellegen's, Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's and Compensation theorems for A.C & D.C excitations.

Module V:

A: Electrical Machines [12 Periods]

Principle of Operation of Single Phase transformer, Types, Constructional Features, Phasor Diagram on No Load and Load, Equivalent Circuit, Losses and Efficiency of Transformer and Regulation, OC and SC Tests (Simple Problems). Principle of operation of 3Ø Induction Motor and Alternators.

Text Books:

1. A. Chakrabarhty, **"Electric Circuits",** Dhanipat Rai & Sons.
2. B.L.Theraja, A.K.Theraja, **"ELECTRICAL TECHNOLOGY",** S.Chand Publications. Volume II
3. P. S. Subramanyam,**"Basic Concepts of Electrical Engineering"**, BS Publications.

Reference Books:

1. William Hayt and Jack E. Kemmerly, **"Engineering circuit analysis"**, Mc Graw Hill Company, 7th Edition.
2. S.N. Singh, **"Basic Electrical Engineering"**, PHI.
3. David A. Bell, **"Electrical Circuits"**, Oxford University Press.
4. K. S. Suresh Kumar, **"Electric Circuit Analysis"**, Pearson Education.

Outcomes:

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

1. Apply the above conceptual things to real-world electrical and electronics problems and applications with the basic transient analysis of circuits, filters, attenuators.
2. Apply their knowledge on operation of Single Phase Transformers & Basics of Induction Motors, Alternators with which, the student can able to do the conceptual things to real-world problems and applications.

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Course Code: 50307 **L T P**
2 2 -
Credits: 3

METALLURGY AND MATERIALS SCIENCE
OPEN ELECTIVE

Pre-requisite: Applied Chemistry

Objective: 1. The objective of this subject is to provide the basic concepts of composition of different materials
2. Provides the concepts of mechanical properties and applications.
3. Provides the concepts of Heat treatment and composite materials.

Module I: Crystallography & Constitution of Alloys [15 Periods]
A: Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numerical related to crystallography. Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations.
B: Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

Module II: Equilibrium of Diagrams [15 Periods]
A:Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cus-Sn and Fe-Fe3C.

Module III:Cast Irons & Steels [13 Periods]
A: Cast Irons: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons.
B: Steels: Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

Module IV: Heat treatment of Alloys & Non-ferrous Metals and Alloys [13 Periods]
A: Heat treatment of Alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.
B: Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminum and its alloys, Titanium and its alloys.

Module V: Ceramic materials & Composite materials [12 Periods]
A: Ceramic materials: Crystalline ceramics, glasses, cermaets, abrasive materials, nano materials –definition, properties and applications.
B: Composite materials: Classification of composites, various methods of component

manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

Text Books:

1. Sidney H. Avener **"Introduction to Physical Metallurgy",** Tata McGraw Hill publications, 2nd edition, 2013
2. Donald R.Askeland **"Essential of Materials science and engineering",** Thomson, 3rd edition, 2013
3. V. Rahghavan **"Elements of Material science",** PHI Publications, 6th edition, 2015.

Reference Books:

1. kodgire "**Material Science and Metallurgy"**, Everest Publishing House, 6th editions, 2011.
2. Agarwal "**Science of Engineering Materials"**, Tata McGrawHill, 8th edition, 2012.
3. William and collister "**Materials Science and Engineering",** 8th edition, 2010.
4. W.g.vinas & HL Mancini "**An introduction to Material science"**, 4th edition, 2011
5. C.D.Yesudian & harris Samuel "**Material science & Material"**, 3rd edition, 2014
6. R. A. Flinn and P K Trojan "**Engineering Materials and Their Applications",** Jaico Books, 7th edition, 1999
7. R.K.Rajput "**Engineering Materials and Metallurgy**" S.Chand Publisher, 3rd edition, 2012.
8. Pakirappa "**Materials Science and Engineering",** 6th edition, 2013

Outcomes:

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

1**.** This subject provides knowledge of Crystallography.
2. Provides knowledge of composition of various materials
3. Provides knowledge of heat treatment of different alloys

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MALLA REDDY ENGINEERING COLLEGE (Autonomous)

Course Code: 50342 **L T P**
2 2 -
Credits: 3

RENEWABLE ENERGY SOURCES
OPEN ELECTIVE

Pre-requisite: Thermal Engineering

Objective: The objective of this subject is to provide knowledge about different alternative energy sources.

Module I: Principles of Solar Radiation [14 Periods]
A: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.

Module II:
Solar Energy Collection & Solar Energy Storage and Applications [14 Periods]
A:Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
B: Solar Energy Storage and Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Module III: Wind Energy & Bio-Mass [14 Periods]
A: Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria
B: 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.

Module IV Geothermal Energy & Ocean Energy [14 Periods]
A: Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
B: Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

Module V: Direct Energy Conversion [15 Periods]
Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, seebeck, peltier and joul Thomson 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, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

Text Books:

1. Tiwari and Ghosal "**Renewable Energy Resources"**, Narosa Publishers
2. G.D. Rai "**Non-Conventional Energy Sources",** Khanna Publishers

Reference Books:

1. Twidell & Weir "**Renewable Energy Sources",** Taylor and Francis Group Publishers
2. Sukhatme **"Solar Energy",** TMH Publications
3. B.S Magal Frank Kreith & J.F Kreith "**Solar Power Engineering",** McGraw-Hill Publications
4. Frank Krieth & John F Kreider "**Principles of Solar Energy",** CRC Press Publications.
5. Ashok V Desai "**Non-Conventional Energy"**, Wiley Eastern Publishers
6. K Mittal "**Non-Conventional Energy Systems",**Wheeler Publishers
7. Ramesh & Kumar "**Renewable Energy Technologies",** Narosa Publications

Outcomes:

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

1. Know different types of energy sources which are available naturally.

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MALLA REDDY ENGINEERING COLLEGE (Autonomous)

Course Code: 50344 **L T P**
2 2 -
Credits: 3

ROBOTICS

OPEN ELECTIVE

Pre-requisite: Kinematics and dynamics of machinery

Objective: 1.The objective of this subject is to provide knowledge of automation ofIndustries
2.To provide knowledge of design of robot arm, kinematics and dynamics, Trajectory planning of robot and its applications.

Module I: Introduction **[15 Periods]**

A:Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.

Components of the Industrial Robotics:-Degrees of freedom-End effectors: Mechanical gripper-magnetic-vacuum cup and other types of grippers-General consideration on gripper selection and design.

Module II: Motion Analysis & Manipulator Kinematics **[13 Periods]**

A: Motion Analysis: Homogeneous transformations as applicable to rotation and translation – problems.

B: Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

Module III: Dynamics **[14 Periods]**

Differential transformation and manipulators, Jacobians – problems.

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

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.

Module IV: Robot actuators and Feedback components **[13 Periods]**

A: Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

Module V: **[12 Periods]**

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Text Books:

1. Groover M P “Industrial Robotics”, Pearson Edu.
2. Mittal R K & Nagrath I J “Robotics and Control”, TMH.

Reference Books:

1. Fu K S “Robotics”, McGraw Hill.
2. P. Coiffet and M. Chaironze “An Introduction to Robot Technology”, Kogam Page Ltd. 1983 London.
3. Richard D. Klafter “Robotic Engineering”, Prentice Hall Publishers
4. Asada and Slow time “Robot Analysis and Intelligence”, Wiley Inter-Science.
5. John J Craig “Introduction to Robotics”, Pearson Edu.
6. Mark W. Spong and M. Vidyasagar “Robot Dynamics & Control”, John Wiley & Sons (ASIA) Pvt Ltd.

Outcomes:

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

1. At the end of this course the students can understand what is Robot and how it works.
2. Students can understand kinematics & dynamics and robot applications in manufacturing.

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MALLA REDDY ENGINEERING COLLEGE (Autonomous)

Course Code: 50319 **L T P**
2 2 -
Credits: 3

METAL CUTTING & MACHINE TOOLS
OPEN ELECTIVE

Pre-requisite: Kinematics of Machinery, Production Technology

Objective: 1.The objective of this subject is to provide basic knowledge of all conventional Machine tools.
2. To know the importance of various tools and their cutting angles.
3. To measure cutting forces while machine, importance of cutting fluids.

Module I: Elementary Treatment of Metal Cutting Theory [13 Periods]
A:Elementary Treatment of Metal Cutting Theory: Element of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects chip breakers. Mechanics of orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials. Cutting tool temperature measuring methods.

Module II: Lathe Machines [14 Periods]
A:Lathe Machines: Principle of working, specification of lathe – types of lathe – work holders tool holders – Box tools Taper turning thread turning – for Lathes and attachments. Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes..

Module III:
Shaping, Slotting and Planing Machines & Drilling and Boring Machines. [14 Periods]
A:Shaping, Slotting and Planning Machines: Principles of working – Principal parts – specification classification, operations performed. Machining time calculations.
B: Drilling and Boring Machines: Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig Boring machine. Deep hole drilling machine.

Module IV: Milling machine & Grinding machine [15 Periods]
A: Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Types geometry of milling cutters – milling cutters – methods of indexing – Accessories to milling machines– milling cutters – methods of indexing.
B: Grinding machine – Fundamentals – Theory of grinding – classification of grinding machine – cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines – Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel.

Module V:

Lapping, Honing and Broaching Machines & Principles of design of Jigs and fixtures and uses [15 Periods]

A:Lapping, Honing and Broaching Machines: Lapping, honing and broaching machines – principle of working, specification of broaching machines, methods of broaching, broaching tools, Classification of Broaching machines, Broaching operations. comparison to grinding – lapping and honing. Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations

B:Principles of design of Jigs and fixtures and uses. Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices. Typical examples of jigs and fixtures.

Text Books:

1. **Production Technology,** H.M.T. (Hindustan Machine Tools), 5th edtion, 1986
2. R.K. Jain and S.C. Gupta **Production Technology,** Khanna Publications, 2014.
3. P N RAO Vol II **Manufacturing Technology,** Tata Mc Graw Hill Education, 2nd edition, 2011

Reference Books:

1. C.Elanchezhian and M. Vijayan **Machine Tools**, Anuradha Agencies Publishers, 2nd edition, 2008
2. B.S.Raghu Vamshi – Vol II **Workshop Technology,** Anuradha Agencies Publishers, Dhanpat rai & company, 10th revised, 2014,
3. PC Sharma **Production Technology (Machine Tools),** S.Chand Publishers,7th edition,2006

Outcomes:

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

1. Students shall be able to know the importance of various machines.
2. Students can measure the technique of measuring cutting forces
3. Students shall be able to select suitable machine for an appropriate operation.

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MALLA REDDY ENGINEERING COLLEGE (Autonomous)

Course Code: 50354 **L T P**
2 2 -
Credits: 3

DESIGN FOR MANUFACTURING
OPEN ELECTIVE

Module I: **[10 Periods]**
A:Introduction: Design philosophy- Steps in Design process- General Design rules for Manufacturability- Basic principles of designing for economical production- Creativity in design.

Module II: Materials & Machining Process **[13 Periods]**
A: Materials: Selection of Material for Design- Development in Material Technology- Criteria for Material Selection- Material selection interrelationship with process selection-process selection chart.
B: Machining Process: Overview of various machining process- general desgn rules for machining- Dimensional tolerance and surface roughness- Design for Machining ease-Redesigning of components for machining ease with suitable examples, General design recommendations for machined parts.

Module III: Metal Casting & Metal Joining **[13 Periods]**
A:Metal Casting: Appraisal of various casting process, Selection of casting process, General design considerations for casting-casting tolerances-use of solidification simulation in casting design-product design rules for sand casting.
B:Metal Joining: Appraisal of various welding processes, Factors in design of weldments-General design guidelines-pre and post treatment of welds-Effects of thermal stresses in weld joints-design of brazed joints.

Module IV: Forging & Extrusion, Sheet Metal Work & Plastics **[13 Periods]**
A: Forging: Design factors for forging-closed die forging design- parting lines of dies-drop forging die design-General design recommendations.
B: Extrusion, Sheet Metal Work & Plastics: Design guide lines for extruded sections-design principles for punching, blanking, bending, deep drawing-keeler Goodman forming limit diagram-component design for blanking.

Module V: Design for Assembly **[12 Periods]**
A:Design for Assembly: General design guidelines for manual assembly-Development of systematic DFA M Methodology. Assembly Efficiency-Classification system for Manual handling- Classification system for Manual Insertion and Fastening. Effect of part symmetry on handling time.

Text Books:

1. Geoffrey Boothroyd, **"Product Design for Manufacture and Assembly",** Marcel Dekker Inc.NY,2006
2. Kevin Otto and Kristin Wood **"Product design",** Pearson Education Publisher

Reference Book:

1. A.K Chitale and R.C.Gupta **"Product design and Manufacturing",**Prentice-Hall Publishers

Outcomes:

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

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Course Code: 50414 **Credits: 3**

B.Tech.

MICRO PROCESSORS AND INTERFACING

(Open Elective)

Prerequisites: Digital Electronics.

Objective: This course introduces microprocessor architecture and microcomputer systems, including memory and input/output interfacing. Topics includes the architecture, assembly language programming, bus architecture, bus cycle types, I/O systems, memory systems, interrupts, and other related topics of 8085 & 8086. It also includes the architectures of advanced microprocessors like 80186, 80286, 80386 and 80486.

Module I: 8085 Architecture [12 Periods]

A:Introduction to microprocessor, 8085 microprocessor architecture, address, data and control buses, 8085 pin functions, demultiplexing of buses, generation of control signals, instruction cycle, machine cycles, t-states, memory interfacing.

Instruction Set: classification of instructions, addressing modes, 8085 instruction set, instruction and data formats, writing, assembling & executing a program.

Module II: Assembly Language Programming [14 Periods]

A: Assembly Language Programming of 8085: Writing 8085 assembly language programs with decision making and looping using data transfer, arithmetic, logical and branch instructions. Stack & subroutines, developing counters and time delay routines.

Interfacing with 8085: Interfacing concepts, ports, interfacing of i/o devices, interrupts in 8085, programmable interrupt controller 8259a, programmable peripheral interface 8255a.

Module III: 8086 Architecture [10 Periods]

A: 8086 Architecture-functional diagram, register organization, memory segmentation, programming model, memory addresses, physical memory organization, architecture of 8086, signal descriptions of 8086- common function signals, timing diagrams, interrupts of 8086.

Instruction set and assembly language programming of 8086: instruction formats, addressing modes, instruction set, assembler directives, macros. Simple programs.

Module IV: Interfacing [14 Periods]

A:I/o interface: 8255 ppi, various modes of operation and interfacing to 8086, interfacing keyboard, display, d/a and a/d converter.

B:Communication interface: serial communication standards, serial data transfer schemes, 8251 USART architecture and interfacing.

C:Interfacing with advanced devices: memory interfacing to 8086, interrupt structure of 8086, vector interrupt table, interrupt service routine.

Module V: Advanced Microprocessors [10 Periods]

A:80186, 80286, 80386 and 80486 microprocessors: 80186 architecture, enhancements of 80186. 80286 architecture:real and virtual addressingmodes. 80386 architecture, special re gisters, memory management, memory paging mechanism, 80486architecture , enhancements , cache memorytechniques, exception handling,comparison ofmicroprocessors (8086 80186 –80286 – 80386 – 80486).

Text Books:

1. Ramesh Gaonkar, **"Microprocessor Architecture, Programing and Application with 8085"**, Penram, 5th Edition, 2002. (Modules I & II)
2. A.K.Ray, **"Advanced Microprocessors and Peripherals"**, Tata McGraw-Hill, 2nd Edition, 2006. (Modules III, IV & V)

Reference Books:

1. D. V. Hall, **"Microprocessors and Interfacing"**, TMH, 2nd Edition, 2006.
2. K. Uday Kumar, B.S.Umashankar, **"The 8085 Microprocessor: Architecture, programming and Interfacing"**, Pearson, 2008.

Outcomes:

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

1. Describe the basic architecture of 8085 & 8086 microprocessors.
2. Write assembly language programs for 8085 & 8086 microprocessors.
3. Describe a typical I/O and Memory interfacing microprocessor systems.
4. Know the architectures of advanced microprocessors.

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50448 **Credits: 3**

B.Tech.

PRINCIPLES OF COMMUNICATION ENGINEERING

(Open Elective)

Prerequisites: Basic Electronic Circuits.

Objective: This course introduces the need for Modulation of various analog and digital modulation and demodulation techniques. And also introduces the concepts of Digital data transmission. It also discusses the basics of satellite and optical communication.

Module I: Fundamentals of Analog Communication [15 Periods]

A:Principles of amplitude modulation, AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM Voltage distribution, AM power distribution, Angle modulation - FM and PM waveforms, phase deviation and modulation index, frequency deviation and percent modulation, Frequency analysis of angle modulated waves. Bandwidth requirements for Angle modulated waves.

Module II: Digital Communication [9 Periods]

A:Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying – binary phase shift keying – QPSK, Quadrature Amplitude modulation, bandwidth efficiency, carrier recovery – squaring loop, Costas loop, DPSK.

Module III: Digital Transmission [12 Periods]

A:Introduction, Pulse modulation, PCM – PCM sampling, sampling rate, signal to quantization noise rate, companding – analog and digital – percentage error, delta modulation, adaptive delta modulation, differential pulse code modulation, pulse transmission – Inter symbol interference, eye patterns

Module IV: Spread Spectrum and Multiple Access Techniques [16 Periods]

Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and CDMA in wireless communication systems, source coding of speech for wireless communications.

Module V: Satellite and Optical Communication [8 Periods]

A:Satellite Communication Systems-Keplers Law,LEO and GEO Orbits, footprint, Link model-Optical Communication Systems-Elements of Optical Fiber Transmission link, Types, Losses, Sources and Detectors.

Text Books:

1. Wayne Tomasi, "Advanced Electronic Communication Systems", 6th Edition, Pearson Education, 2007. (Modules IV & V)
2. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, 2001. (Modules I, II & III)

Reference Books:

1. H. Taub, D L Schilling, G Saha, "Principles of Communication", 3rd Edition, 2007.
2. B. P. Lathi, "Modern Analog And Digital Communication systems", Oxford University Press, 3rd Edition, 2007.
3. Blake, "Electronic Communication Systems", Thomson Delmar Publications, 2002.
4. Martin S. Roden, "Analog and Digital Communication System", PHI, 3rd Edition, 2002.
5. B. Sklar, "Digital Communication Fundamentals and Applications", Pearson Education, 2nd Edition, 2007.

Outcomes:

At the end of the course students are able to:

1. Know the concepts of various analog and digital modulation and demodulation techniques.
2. Know the concepts of Digital data transmission.
3. Understand the spread spectrum and multiple access techniques.
4. Understand Satellite and Optical communication.

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50449 **Credits: 3**

B.Tech.
EMBEDDED SYSTEM DESIGN
(Open Elective)

Prerequisites: Microprocessors and Microcontrollers.

Objective: This course introduces the difference between Embedded Systems and General purpose systems. This course familiarizes to compare different approaches in optimizing General purpose processors. This course provides the design tradeoffs made by different models of embedded systems.

Module I: Introduction to Embedded Systems [08 Periods]

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Module II: Typical Embedded System [14 Periods]

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Module III: Embedded Firmware [12 Periods]

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Module IV: RTOS Based Embedded System Design [12 Periods]

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Module V: Task Communication [14 Periods]

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Text Books:

1. Shibu K. V, **"Introduction to Embedded Systems"**, McGraw Hill, 2013. (Modules I, II, III, IV & V)

Reference Books:

1. Raj Kamal, **"Embedded Systems"**, TMH.
2. Frank Vahid, Tony Givargis, John Wiley, **"Embedded System Design"**.
3. Lyla**, "Embedded Systems"**, Pearson, 2013.
4. David E. Simon, **"An Embedded Software Primer"**, Pearson Education.

Outcomes:

At the end of the course students are able to:

1. Understand the basics of an embedded system.
2. Design, implement and test an embedded system.
3. Understand the design tradeoffs made by different models of embedded systems.

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Course Code: 50503 **Credits: 3**

B.Tech.

DATA STRUCTURES

(OPEN ELECTIVE)

Prerequisites: NIL

Objective: To develop skills to use and analyze simple linear and nonlinear data Structures and Strengthen the ability to identify and apply the suitable data structure for the given real world problem

Module I: Stacks and Queue

A: Operations on Stacks [04 Periods]

Basic stack operations, Representation of a stack using arrays, Stack Applications: Reversing list, factorial calculation, infix-to-postfix transformation, postfix expression evaluation

B: Operations on Queues [05 Periods]

Basic queue operations, Representation of a queue using array, Classification and implementation – Circular and Dequeues, Applications of Queues.

Module II: Lists

A: Linear lists [09 Periods]

Introduction, linked lists, single linked list, representation of a linked list in memory, operations on a single linked list, advantages and disadvantages of single linked list. Stacks and Queues representation using Single linked list

Module III: Searching and sorting

A: General Notations and complexities [02 Periods]

Algorithm specification, Time and Space complexities using Asymptotic notations

B: Searching [03 Periods]

Basic concepts, linear search, binary search

C: Sorting techniques [04 Periods]

Basic concepts, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort and their implementation programs

Module IV:Trees

A: Types of Trees [09 Periods]

Introduction, Basic terminology, Types of trees, Creating a binary tree from a general tree, Traversing a binary tree, Huffman's trees, applications of trees.

Module V: Graphs

A: Traversal of Graphs [09 Periods]

Introduction, Graph terminology, Directed graphs, Bi-connected components, representation of graphs, Graph traversal algorithms (BFS algorithm, DFS algorithm), applications of graphs.

Text Books:

1. Data Structures using C by Reema Thareja – Second Edition, Oxford University Press.
2. Data Structures: A Pseudocode Approach with C by R.F.Gilberg and B.A.Forouzan - Second Edition, Cengage Learning.
3. Beginning XML, Joe Fawcett, Danny Ayers, Liam R. E. QuinJoe Fawcett, Danny Ayers, Liam R. E. Quin, Wrox Press. 2012.
4. Eclipse: Programming Java Applications , Steve Holzner, O'Reilley, 2004.

References:

1. C& Data structures by P. Padmanabham - Third Edition, B.S. Publications.
2. Data Structures using C by A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein – Seventh Edition, Pearson Education
3. C Programming & Data Structures by E. Balagurusamy - TMH.
4. C& Data structures by E V Prasad and N B Venkateswarlu - S. Chand & Co.

Outcomes:

At the end of the course, students able to:

1. Use and analyze different data structures
2. Identity the appropriate data structure for given problem
3. Analyzes the programs for time and space complexities
4. Understand the basic concepts of searching and sorting methods
5. Use tree concepts and operations to solve problems
6. Applications of graphs in BFS, and DFS

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Course Code: 50511 **Credits: 3**

B.Tech.
DATABASE MANAGEMENT SYSTEMS
(OPEN ELECTIVE)

Prerequisite: NIL

Objective: To understand the data management and its relations, transactions, concurrency control**.**

Module I: Introduction to Databases and Database Management System

A: Basic Operations on Database System [04 Periods]

Database system Applications - Advantages of DBMS over File System - Data Models – Instances and schema - View of Data - Database Languages -DDL-DML - Database Users and Administrator - Database System Structure.

B: Database Design and ER diagrams [05 Periods]

Attributes and Entity Sets – Relationships and Relationship Sets – Constraints - Keys - Design Issues - Entity-Relationship Diagram-Weak Entity Sets - Extended E-R Features-Database Design with ER model - Database Design for Banking Enterprise

Module II: Relational Model and SQL

A: Introduction to the Relational Model [04 Periods]

Structure of RDBMS - Integrity Constraints over Relations – Enforcing Integrity Constraints – Querying Relational Data - Relational Algebra and Calculus.

B: Introduction to SQL [05 Periods]

Data Definition commands, Data Manipulation Commands, Basic Structure, Set operations Aggregate Operations - Join operations - Sub queries and correlated queries, SQL functions , views ,Triggers, Embedded SQL.

Module III: Dependencies

A: Functional Dependencies [09 Periods]

Introduction , Basic Definitions, Trivial and Non trivial dependencies, closure of a set of dependencies, closure of attributes, irreducible set of dependencies- Schema Refinement in Database Design- Problems Caused by Redundancy – Decompositions – Problem Related to Decomposition –- Lossless Join Decomposition – Dependency Preserving Decomposition - FIRST, SECOND, THIRD Normal Forms – BCNF — Multivalued Dependencies – Fourth Normal Form.

Module IV: Transactions and Recovery

A: Transaction concept [06 Periods]

Transaction state- Implementation of atomicity and Durability-Concurrent executions – Serializability, Recoverability Lock Based Protocols, Timestamp Based Protocols, Validation

Based Protocols, Multiple Granularity, Dead Lock Handling – Failure Classification – Storage Structure

B: Recovery and Atomicity [03 Periods]

Log Based recovery – Recovery with concurrent transactions– Checkpoints .

Module V: File Organization

A: Storage of files using Various Techniques [09 Periods]

Organization of records in file - Data Dictionary Storage – Indexing and Hashing – Basic Concepts , Ordered Indices, B^+ Tree Index files, B- tree index files– Static Hashing – Dynamic Hashing – Comparison of Indexing with Hashing.

Text Books:

1. Database System Concepts, Silberschatz, Korth , Fifth Edition, McGraw hill (1,2,3 & 5 Units)
2. Database Management Systems, Raghuramakrishnan, Johannes Gehrke, TATA Mc Graw Hill(1,2,3 & 5 Units)
3. Introduction to Database Systems, C.J.Date, Pearson Education (4^{th} Unit)

References:

1. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
2. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

Outcomes:

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

1. Understand the fundamental concepts of database management system. These concepts include aspects of database design, database languages, and database-system implementation.
2. The students will be able to design and query databases, as well as understand the internals of databases.
3. Define the basic functions of DBMS & RDBMS.

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Course Code: 50571 **Credits: 3**

B.Tech.
COMPUTER GRAPHICS
(Open Elective)

Prerequisites: NIL

Objective: To understand and use the application programming interface for the implementation of the graphics and its pipeline and modeling.

Module I: Introduction of Graphics

A: Basics of Graphics **[04 Periods]**

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.

B: Output primitives **[05 Periods]**

Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms.Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

Module II: Transforming and Viewing

A: 2-D geometrical transforms **[03 Periods]**

Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

B: 2-D viewing **[06 Periods]**

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.

Module III: 3D Objects

A: 3-D Object Representation **[09 Periods]**

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.

Module IV:3D Transforming and Viewing

A: 3-D Geometric transformations **[04 Periods]**

Translation, rotation, scaling, reflection and Shear transformations, composite transformations.

B: 3-D viewing **[05 Periods]**

Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

Module V: Surface detection Methods and Animation

A: Visible surface detection methods [05 Periods]

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

B: Computer Animation [04 Periods]

Design of animation sequence, generalcomputer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Text Books:

1."Computer Graphics *C version*", Donald Hearn and M.Pauline Baker, PearsonEducatio.

2."Computer Graphics Principles & practice", second edition in C, Foley,VanDam,Feiner andHughes, PearsonEducation.

References:

1. "Computer Graphics", second Edition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education.
2. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc- Graw hill edition.

Outcomes:

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

1. Upon successful completion of the course, students will- gain a proficiency with OpenGL, a standard specification defining a cross-language, cross-platform API for writing applications that produce 2D and 3D computer graphics.
2. Learn the principles and commonly used paradigms and techniques of computer graphics.
3. Develop a facility with the relevant mathematics of computer graphics
4. Be able to write basic graphics application programs including animation
5. Understand the basic aspects of 2D image representations and transformation

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Course Code: 50512 **Credits: 3**

B.Tech.
OPERATING SYSTEMS
(Open Elective)

Prerequisite: NIL

Objective: To learn the basics of operations of system and its processing and memory management with file system operations.

Module I: Computer System and Operating System Overview

A: Basic system and process operations [09 Periods]

Overview of Computer System hardware, Operating System Objectives and functions, Evolution of operating System, Example Systems. Operating System Services, System Calls, System Programs.Process Management: Process Description, Process Control, Process States, Cooperating Processes, Inter-process Communication.

Module II: Scheduling and Concurrency

A: CPU Scheduling [04 Periods]

Basic Concepts, Scheduling Criteria, Scheduling Algorithms and evaluation, Threads Overview, Threading issues.

B: Concurrency [05 Periods]

Principles of Concurrency, Mutual Exclusion, Software and hardware approaches, Semaphores, Monitors, Message Passing, Classic problems of synchronization.

Module III: Deadlocks

A: Principles of deadlock [09 Periods]

System Model, Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlocks, Dining philosopher's problem.

Module IV: Memeory

A: Memory Management [04 Periods]

Basic concepts, Swapping, Contiguous memory allocation, Paging, Segmentation, Virtual memory, Demand paging, Page-replacement algorithms, Thrashing.

B: Secondary storage structure [03 Periods]

Disk structure; Disk scheduling, Disk management, Swap-space Management, RAID structure, Stable-storage Implementation, Tertiary-Storage Structure

C: I/O systems [02 Periods]

I/O hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O request to hardware operations, STREAMS

Module V: Files

A: File Management **[07 Periods]**

File system-File concepts, Access methods, Directory structure, File system mounting, File sharing and Protection. Implementing file systems-File system structure and implementation, Directory implementation, Allocation methods, Free-space management, Efficiency and performance

B: Security **[02 Periods]**

Security threats, Protection, Intruders, Viruses, Trusted System.

Text Books:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems - Internal and Design Principles, Stallings, Fifth Edition-2005, Pearson education/PHI

References:

1. Operating System A Design Approach-Crowley,TMH.
2. Modern Operating Systems, Andrew S Tanenbaum 2nd edition Pearson/PHI.
3. "An Introduction to Operating Systems, Concepts and Practice", PHI, 2003 – Pramod Chandra P. Bhat.
4. Operating Systems – A concept based approach – DM Dhamdhere – 2nd Edition TMH

Outcomes:

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

1. Identify the System calls, protection and interrupts of any GOS.
2. Explain Input/output, disk access, file systems facilities any GOS()
3. Write application keeping Concurrency and synchronization Semaphores/monitors, shared memory, mutual exclusion Process scheduling services of an GOS in the mind.
4. The student will learn the responsibilities of OS in concerned with process management and memory management.

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Course Code: 50564 **Credits: 3**

B.Tech.
ARTIFICIAL INTELLIGENCE
(Open Elective)

Perquisite: NIL

Objective: This course contributes to the development of the following capabilities Enabling Knowledge, Problem Solving: and Critical Analysis.

Module I :
A:Introduction **[09 Periods]**
AI problems, AI Technique, defining problem as a static space search production systems, problem characteristics, production system characteristics. Heuristic **Search B:Techniques:** Generate –and –test, hill climbing, Best –First Search, problem reduction, constraint satisfaction, means-ends analysis.

Module II:
Knowledge Representation **[09 Periods]**
Issues, predicate logic, resolution, representing, knowledge using rules, forward versus Backward reasoning, Matching, control knowledge, weak slot –and –filler structures, semantic nets, frames, strong slot –and –filler structures, conceptual dependency, scripts

Module III:
Reasoning Techniques **[09 Periods]**
Nonmonotonic reasoning, Augmenting a problem solver, implementation of depth first search and Breadth first search, statistical reasoning, probability and Bayes theorem, certainty factors and rule - based systems, Bayesian Networks.

Module IV:
Game Playing **[09 Periods]**
Mini max search, alpha – beta cutoffs, planning system, Goal stack planning, hierarchical planning, understanding, understanding as constraint satisfaction, Waltz algorithm, natural language processing, syntactic processing, Augmented transition Networks, semantic analysis, case grammars.

Module V:
Learning **[09 Periods]**
Role learning, learning by taking advice, learning in problem solving, learning from examples, Winston's learning program, Decision trees, perception, vision, speech recognition, Navigation, manipulation, Robot architectures, Expert systems, shell, explanation, knowledge acquisition.

Text Books:

1. "Artificial Intelligence", 2nd Edition., E. Rich and K. Knight (TMH).
2. Neural Computing: Theory and practice – Waserman

References:

1. Artificial Intelligence Structures and Strategies complex problem Solving – George F. Lugar Pearson Education

Outcomes:

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

1. Describe the key components of the artificial intelligence (AI) field
2. Describe search strategies and solve problems by applying a suitable search method
3. Describe minimax search and alpha-beta pruning in game playing.
4. Describe and apply knowledge representation
5. Describe and list the key aspects of planning
6. Describe and apply probability theorem and Bayesian networks.
7. Describe the key aspects of intelligent agents

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Course Code: 52511 **Credits: 3-**

MINE CONSTRUCTION ENGINEERING

Pre-Requisite: Environmental Studies

Objectives : This course introduces site selection procedure, Shaft sinking methods, Mechanization, Loose ground shaft lining, Design of lining, Surface layouts, Open pit mines opening out trenches, Scheduling for mine constructions PERT/CPM.

Module I: **[12 Periods]**

Size of mine Environment and ecology, selection criteria for site of the openings geological investigation.

Module II: **[12 Periods]**

Underground mine shaft sinking methods through alluvium, soft and hard rock, Mechanization, consolidation of loose ground shaft lining , ground pressure, thickness of lining.

Module III:

PART-A: **[6 Periods]**

Design and procedure of laying the lining, construction of shaft collar heap stead.

PART-B: **[6 Periods]**

Design and construction of insets, shaft bottom, excavation for mechanized decking of cages, skip loading, pit bottom lay outs, installation of main haulages.Main sump size, construction under ground substation, first aid room and office.

Module IV: **[12 Periods]**

Surface inclines, drivage through soft and hard rock, construction and lining of inclines, lateral and vertical and vertical pressures. Underground development, drivage of roads in stone and coal, mechanization support systems opening of faces.

Surface layouts pit top circuits and coal handling and coal preparation plant, railway sifting and weigh bridges, surface and underground coal bunkers winding house substation, lamp room. Pit head bath, crèche dispensary: office, work-shop, material handling stowing installations, bunker, water tanks, mixing chamber.

ModuleV: **[12 Periods]**

Open pit mines opening out trenches, haul roads, construction of benches. Assembling and transporting of draglines, shovels etc. Scheduling for mine constructions PERT/CPM.

Text Books:

1. Design of Underground hard coal mine, J. Pazdziora, Elsevier.
2. Opencast Mining: MODULE Operations, V. V. Rzhevsky- Mir Publications.

Reference Books:

1. Working of Mineral Deposits—G. Popov, International Law & Taxation Publishers
2. Bokey ―Mining.

Outcomes:

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

1. Students can get knowledge of selection of suitable site for mines, different sinking methods, procedure of laying lining, Scheduling for mine construction.

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Course Code: 52528 **Credits: 3-**

INTRODUCTION TO MINERAL PROCESSING

Pre-requisite: Nil

Objectives: This course introduces Objectives of mineral processing, characteristics of minerals and coal, crushing methods, separation methods, methods of concentration, fields of application and limitations.

Module I: Introduction **[12 Periods]**

Scope, objectives and limitations of mineral processing, liberation and beneficiation characteristics of minerals and coal.

Comminution:

Theory and practies of crushing and grinding; different types of crushing an grinding equipments – their applications and limitations.

Module II: Size Separation **[12 Periods]**

Laboratory size analysis and interpretation; settling of solids in fluids; industrial screens,

Gravity Concentration Methods:

Jigging, Heavy media separation, flowing film concentrators – theory, applications and limitations.

Module III:

PART-A: **[6 Periods]**

Mechanical classifiers and hydro cyclones.

PART-B: Froth Floatation **[6 Periods]**

Physico-chemical principles, reagents, machines, floatation of sulphides, oxides and coal.

Module IV: Electrical Methods of Concentration **[12 Periods]**

Principles, fields of applications and limitations.

Module V: Flow Sheets **[12 Periods]**

Simplified flow sheets for coal, zinc, iron, and manganese ores.

Magnetic methods of concentration Principles, Fields of Application and Limitation.

Text Books:

1. Introduction to Mineral Processing – V. Malleswar Rao, Indian Academy of Geoscience
2. Mineral Processing – Barry AWills, Elsevier.

Reference Books:

1. Mineral Processing – S.K. Jain, CBS Publishers & Distributors

Outcomes:

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

1. Student can understand characteristics and processing of minerals and size separation after crushing, different methods of separation, flow charts for coal, zinc, iron and manganese.

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Course Code: 52543 **Credits: 3-**

TUNNELING ENGINEERING

Pre-Requisite: Nil

Objectives: This course introduces Geological concept of tunneling, Stresses and displacements associated with excavating tunneling, Design of supports of tunnels, Numerical techniques etc

Module I: **[12 Periods]**
Introduction to tunneling; geological concept of tunneling.

Module II: **[12 Periods]**
Influence of geological aspects on design & construction of tunnels.
Tunneling Methods: Conventional and special Drill & blast roadway drivage machines, tunnel boring machines (TBM)

Module III: **[6 Periods]**
PART-A:
Design of Tunnels: Rock conditions, RMR, Q-system, RSR, rock mass behaviour, stress strain behaviour, and stress analysis of tunnels.
PART-B: **[6 Periods]**
Maintenance: Dewatering, ventilation and illumination drivages tunnels.

Module IV: **[12 Periods]**
Stresses and displacements associated with excavating tunnels, Ground control or treatment in tunneling and drivages. Design of Supports of Tunnels; Steel supports, rock enforcements, new Australian tunneling methods (NATM)

Module V: **[12 Periods]**
Numerical techniques: Introductory use of FLAC, PLAXIS etc.(Finite element model, finite difference model, boundary element model, prediction of stress and deformation around tunnels)

Text Books:
1. Tunneling and Underground Construction Techniques, Richards Lee. Bullock, Proceedings 1981 Rapid Excavation and Tunneli Conference, San Francisco, California,
2. Hand Book of Mining and Tunnelling Machinery, Stack Barbara – John Wiley & Sons.

Reference Books:
1. Rock Tunneling with Steel Supports, R.V. Proctor, T.L. White,1961
2. Modern Trends in Tunneling and Blast Design John Johansen C.F. Mathiesen, John Johansen publishing.

Outcomes:
After completion of this course, students will be able to:
1. Student gets knowledge about design of tunnels, Stresses and displacements associated with excavating tunnels, Use of FLAC, PLAXIS etc

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Course Code: 50H08 **Credits: 3**

B.Tech

INTERPRETATION OF LITERATURE AND ANALYTICAL WRITING

Objectives :

- To determine how well the students can develop a compelling argument in writing for an academic audience.
- To involve them in critical thinking and persuasive writing exercises .
- To develop effective writing skills -to analyze , to evaluate the data and ideas for making sense
- Encourage students to learn strategies for becoming accurate readers and critical analysts.
- To help learners understand their abilities and strengths while laying a road map towards their career goals.

Introduction :

Developing Analytical writing skills through interpretation of literature and enabling the students to think critically. It assesses the ability to articulate and support complex ideas , construct and evaluate arguments and sustain a focused and coherent discussion. Interpreting the text triggers the students' analytical and critical thinking skills while expanding their outlook.

Methodology :

- Giving them exercises pertaining to translation of their thoughts into words.
- Giving them vocabulary exercises in different contexts.
- Find supporting evidence.
- Make an outline

Module I:

Introduction to interpretation skills

- Interpretation in different settings
- Interpretation of Literature
- Understanding the main ideas in the text
- Vocabulary by Theme

From the short novel: Animal Farm: George Orwell

Module II :

Critical Reading

- Introduction
- The Theme
- Figurative language and characterization
- Interpreter's role and ethics
- Interpretation of story.
- Interpretation of characters
- Animal characters
- Human characters
- Key events

- Things
- Places

Module III:

Critical Writing

- Introduction
- The Theme
- Figurative language and characterization
- Interpreter's role and ethics
- Interpretation of story.
- Interpretation of characters
- Animal characters
- Human characters
- Key events
- Things
- Places

From the short novel : Animal Farm : George Orwell

Module IV:

Analytical writing:

- Responding to various situations
- Entering into the role and responding
- Analyze an issue
- Analyze an Argument
- Verbal Reasoning
- Interpretive Reports.

From the short novel : Animal Farm : George Orwell

Module V:

Approaches to literary Criticism

Formalist Criticism
Biographical Criticism
Historical Criticism
Gender Criticism
Psychological Criticism
Sociological Criticism
Reader-Response Criticism
Mythological Criticism
Deconstructionist Criticism

Reference books:

GRE by CliffsTestPrep-7th edition
GRE Exam- A Comprehensive Program
MacMilan edition- Glossary of English Literary terms by – M H Abraham
Interpreting Literature- A Myth and a Reality- GD Barche

Outcomes:

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

1. Students are capable of critical thinking and analytical writing.
2. Learners would get real life experiences through interpretation of literature.
3. Students learn strategies for becoming accurate readers and critical analysts
4. Students are capable of logical thinking towards social, political, economical, legal and technological issues.
5. They are capable of drawing their career vision and mission independently

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Course Code: 50H09 **Credits: 3**

B.Tech

BUSINESS COMMUNICATION

Objectives

- To upgrade the learner's communication and presentation skills and to make the student's competent in communication at an advanced level.
- To groom the learners' personality
- To make the students self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills

Introduction

Effective communication and interpersonal skills are crucial to increase employment opportunities and to compete successfully in the Global market. The real key to the effectiveness of professionals is their ability to put their domain knowledge into effective practice. Every employer today, looks for an extra edge in their employees. The rapid change in the corporate world asks for proper communication skills in almost all kinds of fields. This course is designed to enhance overall communication skills and soft skills amongst the learners including "How to win interviews". The course content for Business Communication and Soft Skills has been developed keeping in mind the standard of Indian students and the industry requirements.

Module I : Communication skills **[5 Periods]**

Types of communication-Oral, aural and written, reading-Word Power-Vocabulary-technical vocabulary, Rate of speech- pitch, tone-clarity of voice.

Module II : Conversation skills **[6 Periods]**

Informal and Formal conversation , Verbal and Non-verbal communication. Barriers to effective communication- Kinesics

Module III: Reading skills **[5 Periods]**

Types of reading –reading for facts, guessing meaning from context, strategies of reading-scanning, skimming, inferring meaning, critical reading,.

Module IV: Writing and composition II **[5 Periods]**

Letter-writing-business letters-pro forma culture-format-style-effectiveness, promptness-Analysis of sample letters collected from industry-email, fax, Essay writing-nuances of essay writing, types of essays.

Module V: E- Correspondence **[5 Periods]**

e mail, etiquette, characteristics and types of social correspondence -advantages and disadvantage.

Reference Books:

1. Essentials of Business Communication, Rajendra Pal S KorlahaHi: Sultan Chand & Sons, New Delhi.
2. Basic Communication Skills for Technology, Andrew J.Rutherford: Pearson Education Asia, Patparganj, New Delhi-92.
3. Advanced Communication skills, V.Prasad, Atma Ram Publications, and New Delhi.

4. Raymond V.Lesikav; John D.Pettit Jr.; Business Communication: Theory & application, All India Traveler Bookseller, New Delhi-51
5. Business Cimmunication, RK Madhukar, Vikas Publishing House Pvt Ltd
6. K.R. Laxminarayana: English for Technical Communication-Vols.1 and 2.SCITECH Publications (India) Pvt.Ltd. T.Nagar, Chennai-6000 017
7. Edmond H. Weiss: Writing Remedies: Practical Exercises for Technical Writing, Universities Press, and Hyderabad.
8. Cliffs test Prep for GRE and TOFFEL: Computer Based, IDG Books. India (P) Ltd.New Delhi-002.
9. How to build a better vocabulary – Nurnberg Maxwell & Morris Rosenblum: Grand Central Publishing.
10. How to read better and faster: Norman Lewis, W.R. Goyal Publishers, New Delhi.

Outcomes

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

1. The learner will understand the importance of non-verbal signals in communication.
2. The learner will be confident to participate in business meetings
3. The learner will be encouraged in all- round development by focusing on soft skills
4. The learner will be aware of importance of soft skills in the real time situations.

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50H10 **Credits: 3**

B.Tech

WORLD LITERATURES

Objectives:

- The undergraduates need to know about the societies across the globe to understand their society better, and this course aims at bringing awareness about the societies across the globe.
- The students need to understand the cultures of different nations as they are going to enter into global careers and understanding these cultures of different nations will help them to cope with the culture shock.

Module I:

African literature

- **Wole Soyinka**
  Dedication (poem)
- **Chinua Achebe**
  A Mother in a Refugee Camp.(poem)
- **OyetSisto Ocean**
  In the Plantation (short story)
- **David Oyuke**
  Of days and nights of old (short story)

Module II:

Australian Literature

- **Christopher Kelen**
  Dark between Empires (poem)
- **Henry Lawson**
  Sons of the South (poem)
- **Ryan O'Neill**
  It's a Tuesday Morning(short story)
- **Linda Heuring**
  Roommates (Short Story)

Module III:

American Literature

- **Robert Frost**
  A Late Walk (poem)
- **Maya Angelou**
  Caged Bird (poem)
- **Stephen Crane**
  A Dark Brown Dog(Short Story)
- **Mark Twain**
  A True Story –word to word as I heard It (Short Story)

Module IV:
European Literature

- **Herta Muller**

  "Gri" (fragment) (poem)

- **William Wordsworth**

  I Wandered Lonely As A Cloud (Poem)

- **Grazia Deledda**

  The Portrait of a Country woman (Short Story)

- **Guy de Maupassant**

  Miss Harriet(Short Story)

Module V:
Asian Literature

- **Gieve Patel**
  How Do You Withstand, Body(poem)
- **Amrita Pritam**
  Empty Space(poem)
- **Mahasweta Devi**
  Our Non-veg Cow (short story)
- **Basil Fernando**
  Albert the Murderer (short story)

References:

Africa's Best Stories: An Anthology of Africa's Best Short Stories :ChimamandaNgoziAdichie, Wole Soyinka, E. C. OsonduStoryAfrica.inc, America, 2010
Our Non-veg Cow and Other Stories MahāśvetāDebī, Seagull Books, 1998
Original Short Stories of Maupassant by Guy de Maupassant The Floating Press, 2014

Unspeakable Women: Selected Short Stories Written by Italian Women during Fascism by Robin Pickering-Iazzi :The Feminist Press, New York, 1993

www.naosite.lb.nagasaki-u.ac.jp/dspace/bitstream/.../keieikeizai70_03_08.pdf
www.poetryfoundation.org
www.bigbridge.org/BB17/**poetry**/indian**poetry**anthology/**Gieve_Patel**.html
www.romanianstudies.org/.../**poetry**-in-translation
www.poemhunter.com
www.americanliterature.com
www.fishpublishing.com/**short-stories**-to-read-online.php
www.theliftedbrow.com/post/.../an-australian-**short-story**-by-**ryan-oneill**
www.universeof**poetry**.org/australia.shtml
www.famouspoetsandpoems.com › Poets › Wole Soyinka
www.goodreads.com
www.africanwriterstrust.org

Outcomes:

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

1. The students would have learnt about the literatures of different nations and continents.
2. The students are aware of the cultures of different societies of the world and are ready to cope with the culture shock they might experience when set to work in global environment.

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Course Code: 50B23 **Credits: 3**

B.Tech

ADVANCED OPTIMIZATION TECHNIQUES

Course Objectives:

- To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems
- To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology
- To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

Module I: Single Variable Non-Linear Unconstrained Optimition:
[8Periods]
One dimensional Optimization Methods:- Uni-modal function, elimination method, Fibonacci method, golden section method, interpolation methods- quadratic method.

Module II: Multi Variable Non-Linear Unconstrained Optimization: **[8 Periods]**
Direct search method – Univariant Method – pattern search methods – Powell's – Hook – Jeeves search

Module III: Geometric Programming: **[8 Periods]**

Polynomials – arithmetic – geometric inequality – unconstrained G.P
Dynamic Programming: **[8 Periods]**
Multistage decision process, principles of optimality, examples, conversion of final problem to an initial value problem, application of dynamic programming, production inventory.

Module IV: Linear Programming: **[8 Periods]**
Formulation – Sensivity analysis. Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints. Simulation – Introduction

Module V: Stochastic Programming: **[8 Periods]**
Basic concepts of probability theory, random variables – distributions – mean, variance, Correlation, co variance, joint probability distribution – stochastic linear, dynamic programming.

Text Books:

1. S.S Rao / **Optimization theory & Applications** / New Age International/4th Edition/2009.
2. Kasan & Kumar / **Introductory to operation research** /Springar/2004.
3. M.C Joshi / **Optimization Techniques theory and practice**/K.M Moudgalya/ Narosa

Publications/2004.

Reference Books:

1. H.A. Taha / **Operation Research** /TMH/8th Edition/2011
2. R.L Rardin / **Optimization in operations research** /3rd Edition/1998.
3. Benugundu & Chandraputla / **Optimization Techniques** /Person Asia/2nd Edition/2014

Outcomes:

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

1. Develop models of optimization
2. The skills to consider real-world problems and determine whether or not linear programming is an appropriate modeling framework.
3. Solve the models for their optimal solutions; interpret the models' solutions and infer solutions to the real-world problems

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Course Code: 50B24 **Credits: 3**

B.Tech

MATHEMATICAL MODELLING

Course Objectives:

- The objective of the course is to introduce mathematical modeling of engineering problems.
- The construction and analysis of mathematical models inspired by real life problems.
- The course will present several modelling techniques and the means to analyze the resulting systems.

Module I: Mathematical Modeling& Types of models using Ordinary Differential Equations of First Order:

Mathematical Model, types of Mathematical models, Procedure of modeling, Linear Growth and
Decay Models, Non-Linear Growth and Decay Models, Mathematical Modeling in Dynamics through Ordinary Differential Equations of First Order,

ModuleII: Mathematical Modeling through Systems of Ordinary Differential Equations of the First Order

Mathematical Modeling in Population Dynamics, Mathematical Modelling in Economics Through Systems of Ordinary Differential Equations of First Order, Mathematical Models in Medicine, Mathematical Modelling in Dynamics Through Systems of OrdinaryDifferential Equations of First Order.

Moduele III: Mathematical Modelling Through Ordinary Differential Equations of Second Order

Mathematical Modeling of Planetary Motions, Mathematical Modeling of Circular Motion and Motion of Statellites, Mathematical Modeling Through Linear Differential Equations of Second Order, Miscellaneous Mathematical Models Through Ordinary Differential Equations of the Second Order.

Module IV: Mathematical Modeling Through Difference Equations

The Need for Mathematical Modelling Through Difference Equations: Some Simple Models, Basic Theory of Linear Difference Equations with Constant Coefficients, Mathematical Modelling Through Difference Equations in Economics and Finance, Mathematical Modelling Through Difference Equations in Population Dynamics and Genetics, Mathematical Modelling
Through Difference Equations in Probability Theory, Related problems.

Module V: Mathematical Modeling through Partial Differential Equations

Motivation of Partial Differential Equations Models,: First Method of Getting PDE Models, Momentum Balance Equations: The Second Method of Obtaining Partial Differential Equation Models, Variational Principles: Third Method of Obtaining Partial Differential Equation Models, Probability Generating Function, Fourth Method of Obtaining Partial Differential Equation Models, Model for Traffic Flow on a Highway, Nature of Partial Differential Equations, Initial and Boundary Conditions.

Text Books:

1. Edward A. Bender.. An Introduction to Mathematical Modeling.
2. A. C. Fowler.. Mathematical Models in Applied Sciences, Cambridge University Press.
3. J. N. Kapoor.. Mathematical Modeling, Wiley eastern limited.
4. S.M. Ross ..Simulation, India Elsevier Publication.
5. A.M.Law and W.D.Kelton.. Simulation Modeling and Analysis, T.M.H. Edition.
6. Numerical Solutions of Differential Equations by M.K.Jain, Wiley Eastern Ltd.

Outcomes:

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

1. Types of models (static, discrete time, continuous time, stochastic) with case studies chosen from population dynamics and other fields can to be determined.
2. Identify the most important processes governing the problem (theoretical assumptions)
3. Identify the state variables (quantities studied)
4. Identify the basic principles that govern the state variables (physical laws, interactions)
5. Express mathematically these principles in terms of state variables (choice of formalism)

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Course Code: 50B25 **Credits: 3**

B.Tech

DIFFERENTIAL EQUATIONS AND DYNAMICAL SYSTEMS

Course Objectives:

- The aim is to give a self contained introduction to the field of or- dinary differential equations with emphasis on the dynamical systems point.
- The objective of this course is to provide the student with an understanding of the ... Apply techniques of Nonlinear ODE and Dynamical Systems to

Module I : Linear Systems , Uncoupled Linear Systems , Diagonalization , Exponentials of Operators , Linear Systems .

Module II: Complex Eigen values, Multiple Eigen values, Jordan Forms , Stability Theory Non homogeneous Linear Systems.

Module III: The Stable Manifold Stability and Liapunov Functions , Saddles, Nodes, Foci and Centers Global Theory, Dynamical Systems and Global Existence Theorems .

Module IV: Limit Sets and Attractors, The Stable Manifold Theorem for Periodic , Global Phase Portraits and Separatrix Configurations Structural Stability , Higher Codimension Bifurcations at Non hyperbolic Equilibrium Points.

Module V: Hopf Bifurcations and Bifurcations of Limit Cycles from a Multiple Focus Bifurcation , Finite Co -dimension Bifurcations in the Class of Bounded Quadratic Systems.

Text Books:

1) Lawrence Perko, Springer Publications , Third edition ,Texts in Applied Mathematics.
2) Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers, 10^{th} Edition, Reprint 2010.

References:

1. Mathematics for Engineers and Scientists, Alan Jeffrey, 6ht Edi, 2013, Chapman & Hall/ CRC
2. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.

Outcomes

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

1. By the end of the course the student develops the theory of dynamical systems systematically
2. The students will learn to analyze non-linear systems described for diagonalization.
3. The student has knowledge of basic concepts and methods from the theory of differential equations and dynamical systems.

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Course Code: 50B20 **Credits: 3**

B.Tech

ADVANCED PHYSICS FOR ENGINEERS

Prerequisites: Applied Physics – I & II

Objectives: The objective of this course is to make the students familiar with the recent advanced concepts in physics.

Module I: Special Theory of Relativity: **[9 Periods]**

Introduction, Concept of theory of relativity, Frames of reference-Inertial, non-inertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

Module II: Holography **[9 Periods]**

Introduction, Basic principle, Construction and Reconstruction of Hologram, Properties of Hologram, Types of Holograms, Applications- Holographic Interferometry, Acoustic Holography, Holographic Microscopy.

Module III: Thin films Synthesis and Characterization

III A - Synthesis **[7 Periods]**

Introduction, Deposition techniques-Pulsed Laser Deposition (PLD), Spray Pyrolysis; Nucleation and growth of the thin films, properties (Mechanical, Electrical, Magnetic and Optical).

III B – Characterization **[7 Periods]**

X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis (EDAX), Principles and applications of X-Ray Diffraction, Electron Diffraction, Atomic Force Microscopy.

Module IV: Photonic Crystals **[9 Periods]**

Important features of photonic crystals, Presence of photonic band gap, anomalous group velocity dispersion, Micro cavity, effects in Photonic Crystals, fabrication of photonic Crystals, Dielectric mirrors and interference filters, PBC based LEDs, Photonic crystal fibers (PCFs), Photonic crystal sensing.

Module V: Solar cell Physics **[9 Periods]**

Single, poly and amorphous silicon, GaAs, CdS, Cu_2S, CdTe; Origin of photovoltaic effect, Homo and hetero junction, working principle of solar cell, Evaluation of Solar cell parameters, I-V, C-V and C-f characteristics.

Text / Reference Books:

1. R K Gaur and SL Gupta, "**Engineering Physics**" Dhanpat Rai Publications, 8th revised Edition, 2006.
2. B K Pandey and S Chaturvedi, "**Engineering Physics**" Cengage Learning India, Revised Edition, 2014.
3. R F Bun shah, "**Hand Book of Technologies for Films and coating"**, Noyes publishers, 1st Edition, 1996
4. B E A Saleh and A C Tech, *"***Fundamentals of Photonics***"*, John Wiley and Sons,

New York, 1st Edition, 1993.
5. K L Chopra and S R Das, "**Thin film Solar Cells"**, Plenum press, 1st Edition 1983.
6. K Vijaya Kumar, T Sreekanth and S Chandralingam, "**Engineering Physics**" S Chand and Co 1st Edition, 2008.

Outcomes

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

1. Understand the concepts of special theory of relativity.
2. Analyze the basic concepts of Holography and applications.
3. How to synthesize and different methods of characterization of thin films.
4. Develop basic knowledge on the photonic crystals and solar physics and their applications

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Malla Reddy Engineering College (Autonomous)

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2 2 -

Course Code: 50B21 **Credits: 3**

B.Tech

NANO MATERIALS: SYNTHESIS AND CHARACTERIZATION

Prerequisites: Applied Physics – I & II

Objectives: The objective is to provide different methods of synthesis and characterizationof nano material.

Module I: Physical Methods **[9 periods]**
Bottom-up approachand Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, molecular beam epitaxial, and electro deposition.

Module II: Chemical methods **[8 periods]**
Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis,Nano crystals of semiconductors.

Module III: Thermal Methods
III A-Thermal Methods: **[8 periods]**
Thermolysisroute – spray pyrolysis and solved metal atom dispersion, sol-gel method solvothermal and hydrothermal routes, solution combustion synthesis, CVD method.

III B: Surface Characterization **[8 periods]**
Scanning electron microscopy (SEM), Transmission electron microscopy (TEM). Photo luminescence Spectroscopy.

Module IV: Compositional and structural Characterization techniques **[9 periods]**
X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis(EDAX),Principles and applications of X-Ray Diffraction, Electron Diffraction, and Electron probe microanalysis(EPMA).

Module V: Properties and Applications of Nanomaterials **[8 periods]**
Carbon Nano Tube (CNT) – Single-Wall Carbon Nano Tube (SWCNT), Multi-wall carbon Nano tube (MWCNT), Activated carbon, Fullerene, Graphene, Quantum wire and Quantum dots

Text Books:

1. C N R Rao, A Muller and A K Cheetham "**The chemistry of Nanomaterials: Synthesis, Properties and Appliocations**" John Wiley, First Edition, 2004
2. Hari Singh Nalwa, "**Nanostructured Materials and Nanotechnology**", Academic Press, First Edition, 2002.

Reference Books:

1. Charles P Poole Jr "**Introduction to Nanotechnology**", John Willey & Sons, 1st Edition, 2003
2. C Dupas, P Houdy, M Lahmani, Nanoscience: "**Nanotechnologies andNanophysics**", Springer-Verlag Berlin Heidelberg, 1st Edition, 2007

3. Guozhong Cao, "**Nanostructures and Nanomaterials, synthesis, properties and applications***",* Imperial College Press, 1st Edition, 2004.
4. T Pradeep, "**NANO: The Essentials: Understanding Nanoscience andNanotechnology***".* Tata McGraw-HillPublishing Company Limited, Revised Edition, 2007
5. Z L Wang, "**Characterization of Nanophase Materials***"* Wiley-VCH, 1st Edition, 2000.
6. K Vijaya Kumar, T Sreekanth and S Chandralingam, "**Engineering Physics**" S Chand and Co 1st Edition, 2008.

Outcomes

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

1. Understand different methods of synthesis of nano materials
2. Analyze the differences in the different methods of synthesis
3. Learn different characterization techniques of nano materials.
4. Develop basic knowledge on the properties and the applications few nano materials.

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L T P
2 2 -

Course Code: 50B22 **Credits: 3**

B.Tech

NDT AND VACUUM TECHNOLOGY

Prerequisites: Applied Physics – I & II

Objectives: The objective is to provide a basic level of understanding on Non destructive testing and Vacuum technology.

Module I: Introduction to Non destructive testing [6 periods]
Introduction, Objectives of Non destructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage.

Module II: Methods of Non destructive Testing [10 Periods]
Liquid penetration method, Dye penetration method, Radiographic testing, Ultrasonic Inspection method, Pulse Echo method, Magnetic particle testing, Eddy current Testing.

Module III: Introduction to Vacuum Technology and Flow meters
A: Introduction to Vacuum Technology [9 Periods]
Definition of vacuum, Degrees of vacuum and their ranges; Review of Kinetic theory of gases; Definitions of particle flux, mono layer formation time, pressure; Elementary gas transport phenomena; Knudsen's and Reynolds' numbers; Throughput, mass flow and conductance;

B: Flow meters [8 Periods]
Molar flow, Mass flow and throughput; Rota meters and chokes; differential pressure techniques;

Module IV: Pressure gauges [8 Periods]
Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge

Module V: Vacuum Pumps [9 Periods]
Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps

Text Books:

1. B K Pandey, S Chaturvedi, **"Engineering Physics"**, Cengage learning, 1st Edition, 2014
2. John. F. O'Hanlon, **"A User's guide to Vacuum technology",** Wiley, 3rd Edition, 2003

Reference Books:

1. M R Srinivasan, **"Physics for Engineers"**, New Age international, 1st reprint, 2007
2. R K Gaur and S L Gupta, "**Engineering Physics**", Dhanpat rai, Reprint, 2006
3. Krishna Seshan, "**Hand Book of Thin film deposition**", Noyes, 2nd Edition, 2002

Outcomes

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

1. Understand the concepts of NDT and Vacuum technology.
2. Learn different methods of NDT.
3. Develop basic knowledge of flow meters, pressure gauges and vacuum pumps working and their applications.

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2 2 -

Course Code: 50B17 **Credits: 3**

B.Tech

CHEMISTRY OF ENGINEERING MATERIALS

Objectives:

The objective is to make the students know about the Concept of phase rule and alloys, phase diagrams of different systems. To give knowledge to the students regarding lubricants, abrasives, glass, ceramics, re-fractories and adhesives. To make the students to understand the basic concepts of chemistry to develop futuristic materials for high-tech applications in the area of engineering.

Module I:Phase Rule and alloys [10 periods]

Phase Rule: Definition of terms : Phase, component, degree of freedom, phase rule equation. Phase diagrams – one component system- water system. Two component system Lead-Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization.
Alloys-fabrication of alloys-Ferrous alloys-Non ferrous alloys-industrial applications.

Module II:Lubricants, Abrasives and Adhesives [9 periods]

Introduction to Lubricants-Mechanism of Lubrication-classification of Lubricants-properties of lubricants-viscosity, flash and fire points, cloud and pour points,decomposition stability,saponification number. Abrasives-natural and artificial abrasives-grinding wheels-abrasive paper and cloth. Adhesives-classification -action of adhesives- factors influencing adhesive action development of adhesive strength.

Module III:Cement and Concrete [8 periods]

Introduction-Classification of cement-natural –chemical composition of cement-portland cement-chemical reactions involved in setting and hardening of cement-additives for cement--mortars and concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement industry-Reinforced concrete constructions-testing and decaying of cement-prevention of cement decay

Module IV: Glass , Ceramics and Refractories [9 periods]

Structure of glass-properties-Manufacturing of glass-Types of glasses-uses Ceramics-clays-methods for fabrication of ceramic ware plasticity of clays. Ceramic products-glazes. Porcelain and vitreous enamels. Requisites of a good refractory-classification, properties and applications of refractories.

Module V:Polymers and Composite materials [9 periods]

Structure and properties of polymers-rubber –classification-vulcanization of rubber – preparation properties and application of Buna-S and Buna-N and Thiokol rubber. Biogradable polymers- poly vinyl acetate and poly lactic acid. Liquid crystals-Introduction-structure of liquid crystal forming compounds-classification-chemical properties-importance and applications.

Reference books:

1. Engineering Chemistry by R.P. Mani,K.N. Mishra, B. Rama Devi /CENGAGE learning.
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).
3. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited, New Delhi (2006).
4. Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills Publishing Company Limited, New Delhi (2004).
5. Text Book of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co Publishers, New Delhi(2006) Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.

Outcomes

After completion of this course, students will be able to

1. Ability to practice professional chemical - polymer engineering knowledge for sustainabledevelopment.
2. Be able to apply core concepts in Materials Science to solve engineering problems.

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L T P
2 2 -

Course Code: 50B18 **Credits: 3**

B.Tech
NANO CHEMISTRY

Objectives:

The objective is to make the learners know about the scope of nanoscale materials and their versatile properties. To give knowledge of various instrumental techniques to the analysis the nonmaterials. To make aware of the learners of different applications of nano materials.

Module I:Nano Chemistry-I [9 periods]
Introduction -synthesis of nanostructure materials, Bottom-up approach and Top-down approach
With examples-sol-gel method,-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

Module II:Nano Chemistry-II [9 periods]
Properties of nano materials-Electronic properties, Energy bands and gaps in semiconductors, Fermi surfaces-Optical properties- Fluorescence/luminescence,
photoluminescence/fluorescence, electroluminescence, quantum dot. Magnetic properties-mechanical properties-thermal properties.

Module III:Instrumental Analysi [9 periods]
Characterization techniques: Principles involved in Scanning Electron Microscopy(SEM), Electron Dispersion Spectroscopy(EDS), Transmission Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy(AFM) -Illustrative examples.

Module IV:Carbon Nano Tubes And Application [9 periods]
Carbon Nano structures ,types and preparation of Carbon Nano tubes.Nano structured crystals. Graphene, Carbon nano-fibers- Carbon clusters and Fullerenes- optical and telecommunication applications. Organic Nano Solar cells and its applications.

Module V:Environmental Nanotechnology [9 periods]
Implications of Nanotechnology & Research needs- Nano structured Catalysts TiO2 Nano particles for Water purification- Nano membranes in Drinking water treatment and desalination, Nano membranes in Sea desalination- Nano particles for treatment of Chlorinated Organic Contaminants.

Reference Books:

1. Nano Technology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springer
2. Nano Technology – science, innovation and opportunity by Lynn E Foster;Prentice Hall - Pearson education.
3. Hand book of Nano structured materials; Vol I to V Bio Ethics Readings and cases by Branch.
4. Nano: The Essentials – Understanding Nano Scinece and Nanotechnology – by T.Pradeep; Tata Mc.Graw Hill.

5. Nanotechnology: Principles and Practices – Sulabha K. Kulkarni – Capital Publishing Company
6. Specimen preparation for Transmission Electron microscopy by John & Bravmno et al, published by MRS.

Outcomes

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

1. The students become aware about the synthesis of nanostructure materials.
2. The learners get knowledge about the properties of nano materials and instrumental analysis.
3. The students can come to know about the Carbon nano tubes, Carbon nano-fibers, nano structured Catalysts and Organic nano solar cells.

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2 2 -

Course Code: 50B19 **Credits: 3**

B.Tech

PHOTOCHEMISTRY AND SPECTROSCOPY

Objectives:

The objective is to make the students know about the impact of light on matter and the implications of it also to bring awareness to explore the consequences of light matter interaction. To give knowledge to the learners regarding the structural identification /determination utilizing the different regions of electromagnetic spectrum.

Module I: **Photochemistry I**: **[9 periods]**

Introduction to photochemistry, atomic orbitals,molecular orbitals,thermal and photochemical reactions. Fundamental principles of photochemistry-Interaction of light with chemical substances.absortion spectra, electronic transition. spin multiplicity, singlet and triplet of excited state.

Module II: **Photochemistry II**: **[10 periods]**

Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – determination.Jablonski Diagram-Fluorescence and Phosphorescence. Chemiluminescence and Thermoluminescence with examples. Photosensitization.

Module III: Absorption Spectroscopy: **[9 periods]**

Introduction and importance; Principles and instrumentation; Interferences - Chemical & Spectral methods; Applications of Atomic Absorption Spectroscopy for qualitative and quantitative analysis. UV-Visible spectroscopy: principles, applications for qualitative and quantitative analysis.

Module IV: IR Spectroscopy: **[9 periods]**

Introduction- basic principles, Instrumentation. Identification of some functional groups applications for qualitative and quantitative analysis.

Module V: Nuclear magnetic resonance spectroscopy: **[9 periods]**

Introduction-basic principles , Instrumentation – chemical shift- Spin-Spin splitting- coupling constant, Spin decoupling, shift reagents. Structure determination, applications of proton NMR spectroscopy.

References Books:

1. "Vogel's Text Book of Quantitative Chemical Analysis", by J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, Pearson Education Pvt. Ltd., New Delhi, (6thedition).
2. Organic Spectroscopy by R.C.Banwell
3. Organic Spectroscopy by William kemp.
4. R.O. Kan .Organic Photochemistry.New York :Mc Graw-Hill.
5. N.J Turro ,modern molecular photochemistry,The Benjamin/comings publishing

6. Applications of Absorption Spectroscopy of Organic Compounds" by John R.Dyer, Prentice-Hall of India Pvt. Ltd., New Delhi (1969).
7. Instrumental Methods of Analysis by Hobart H.Willard and D.U.Merritt & J.R.J.A.Dean, C.E.S Pu8blishers and distributors.
8. Instrumental methods of chemical analysis – By Scoog and West .
9.

Outcomes

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

1. The students become aware about the light matter interaction.
2. The learners get knowledge about the usage of UV-Visible, IR & NMR radiations for structural identification of matter.