



# ANURAG ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

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## Definitions of Key Words:

**Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.

**Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

**Course:** Usually referred to, as 'papers' is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/tutorials/laboratory work/ field work/ outreach activities/ project work/vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.

**Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.

**Credit Point:** It is the product of grade point and number of credits for a course.

**Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

**Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

**Grade Point:** It is a numerical weight allotted to each letter grade on a 10-point scale.

**Letter Grade:** It is an index of the performance of students in a said course.

Grades are denoted by letters O, A+, A, B+, B, C, P and F.

**Programme:** An educational programme leading to award of a Degree, Diploma or Certificate.

**Semester Grade Point Average (SGPA):** It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

**Semester:** Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June.

**Transcript or Grade Card or Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade

secured) along with SGPA of that semester and CGPA earned till that semester.

**Types of Courses:** The Courses in a programme may be of three kinds: Core, Elective and Foundation.

**Core Course:-**

There may be a Core Course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

**Elective Course:-**

Elective course is a course which can be chosen from a pool of papers. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

An elective may be "Generic Elective" focusing on those courses which add generic proficiency to the students. An elective may be "Discipline centric" or may be chosen from an unrelated discipline. It may be called an "Open Elective."

**Foundation Course:-**

The Foundation Courses may be of two kinds: Compulsory Foundation and Elective foundation. "Compulsory Foundation" courses are the courses based upon the content that leads to Knowledge enhancement. They are mandatory for all disciplines. Elective Foundation courses are value-based and are aimed at man-making education.

## **ACADEMIC REGULATIONS FOR B. TECH. (REGULAR)**

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

### **1. Title and Duration of the Programme.**

- 1.1 The programme shall be called the degree programme in Bachelor of Technology, abbreviated as B.Tech.
- 1.2 The programme shall be of four academic years duration divided into eight semesters, each semester having duration of minimum 16 weeks of instruction.
- 1.3 The calendar of events in respect of the programme shall be fixed by the College from time to time.
- 1.4 The external examination in all the courses (subjects) shall be conducted at the end of each semester for all the eight semesters.
- 1.5 Students joining the B.Tech. Programme shall have to complete the programme within a stipulated time frame of 8 years from the year of joining and Students joining the B.Tech. Programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the programme within a stipulated time frame of 6 years from the year of joining. Otherwise, they shall forfeit their seat in B.Tech Programme and their admission shall stand cancelled.

### **2. Admission Procedure**

- 2.1 Admissions will be done as per the norms prescribed by the Government of Telangana State.
- 2.2 The Government orders in vogue shall prevail.
- 2.3 The candidate should have passed the prescribed qualifying examination on the date of admission.

### **3. Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic requirements:

- 3.1 The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.
- 3.2 The candidate shall register for 192 credits and secure all the 192 credits by securing a minimum CGPA of 5.0.
- 3.3 The students, who fail to fulfill the academic requirements for the award of the degree within eight academic years from the year of admission, shall forfeit their seats in B.Tech. Programme.

#### 4. Courses of Study

The following B. Tech. Programmes are offered at present:

Branch	Branch Code
Civil Engineering	01
Electrical and Electronics Engineering	02
Mechanical Engineering	03
Electronics and Communication Engineering	04
Computer Science and Engineering	05

and any other course as approved by the Authorities from time to time.

#### 5. Credits

	Semester	
	Contact Periods / week	Credits
Theory	04	04
	03	03
	02	02
Practical	03	02
Drawing	00+04	02
	02+02	03
	00+06	03
Mini project	--	02
Comprehensive Viva Voce	--	02
Seminar	6	02
Project	15	10

**\*Note on Tutorials:- No Credits for < 2 periods /week**

#### 6. Distribution and Weightage of Marks

6.1 The performance of a student in a semester shall be evaluated course-wise for a maximum of 100 marks each for a theory and practical course. In addition, industry-oriented mini-project, seminar, Comprehensive Viva-Voce and Project work shall be evaluated for 100, 100, 100 and 200 marks respectively.

6.2 For theory courses the distribution shall be 25 marks for Continuous Internal Evaluation (CIE) and 75 marks for the Semester End- Examination (SEE).

6.3 For theory courses, during the semester there shall be 2 midterm examinations. Each mid term examination consists of Part-A (Short Answers) for 5 marks and Part-B (Long Answers) for 15 marks with duration of 90 Minutes and an assignment carrying 5 marks.

Part-B shall contain 3 questions with internal choice, each carries 5 marks. First mid term examination shall be conducted for 2.5 units of syllabus and second mid term examination shall be conducted for remaining 2.5 units. First Assignment should be submitted before the conduct of the first mid term exam, and the second assignment should be submitted before the conduct of the second mid term exam.

The total marks secured by the student in each mid term examination for 25 marks is considered and the average of the two mid term examinations shall be taken as the final marks secured by each student. If he/she is absent for any test / assignment, he/she is awarded zero marks for that test / assignment.

6.4 The Semester End Examination will be conducted for 75 marks which consist of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.

6.5 Part-A is compulsory, which consists of ten questions (numbered from 1 to 10) two from each unit carrying 2 / 3 marks each.

6.6 Part-B consists of five questions (numbered from 11 to 15) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice (that means there will be two questions from each unit and the student should answer any one question).

6.7 For practical courses, there shall be a continuous internal evaluation during a semester for 25 sessional (internal) marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and midterm practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. Semester End Examinations carries 75 marks.

6.8 The practical Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed by the Principal from the panel of examiners recommended by Chairman, Board of Studies in respective branches.

6.9 For the courses having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for midterm examination) and 75 marks for end examination. There shall be two midterm examinations in a semester and the average of the two shall be considered for the award of marks for midterm examinations.

6.10 There shall be an industry-oriented mini-Project, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated in IV year I Semester. The industry oriented mini project shall be submitted in report form and should be presented before the committee, which shall be evaluated for 100 marks. The committee consists of an external examiner, Head of the Department, the Supervisor of Mini Project and a Senior Faculty member of the department. There shall be no internal marks for industry oriented mini project.

6.11 There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of Head of the Department, Supervisor of Seminar and a Senior Faculty member of the department. The seminar report shall be evaluated for

100 marks. There shall be no external examination for the seminar.

6.12 There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a committee consisting of Head of the Department and two Senior Faculty members of the department. The Comprehensive Viva-Voce is intended to assess the students understanding of the courses he studied during the B. Tech. course of study. The Comprehensive Viva-Voce shall be evaluated for 100 marks. There are no external marks for the Comprehensive Viva-Voce.

6.13 Out of a total of 200 marks for the Project work, 50 marks shall be for Internal Evaluation and 150 marks for the Semester End Examination. The Semester End Examination (viva-voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department, the Supervisor of Project and a Senior Faculty member of the department. The topics for industry oriented mini project, seminar and project work shall be different from each other. The evaluation of Project work shall be conducted at the end of the IV year II Semester. The internal evaluation shall be on the basis of two seminars given by each student on the topic of his project.

6.14 The Laboratory marks and the sessional marks awarded by the faculty are subject to scrutiny and scaling by the Institution whenever/wherever necessary. In such cases, the sessional and laboratory marks awarded by the teacher will be referred to a College Standing Committee/ Academic Committee. The Committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved as per the University rules and produced before the Committees of the University as and when asked for.

6.15 Candidates shall be permitted to apply for recounting/revaluation of SEE scripts within the stipulated period with payment of prescribed fee.

## **7. Attendance Requirements**

7.1 A student is eligible to write the Semester End Examinations only if he / she acquires a minimum of 75% of attendance in aggregate of all the courses.

7.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on medical grounds with a documentary evidence approved by the Academic Council.

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

7.4 Shortage of attendance below 65% in aggregate shall not be condoned under any circumstances.

7.5 Students whose shortage of attendance is not condoned are not eligible to write Semester End Examinations of that semester. Such students are detained and their registration for examination stands cancelled.

7.6 A student detained due to shortage of attendance in a semester may seek re-admission into that semester, as and when offered, within four weeks from the

date of the commencement of class work with the academic regulations of the batch into which he/she gets admitted.

- 7.7 A student will be promoted to the next semester if he/she satisfies the attendance requirement of the present semester and shall not be eligible for readmission into the same semester.
- 7.8 For all mandatory, non-credit courses offered in a semester, a "Satisfactory Participation Certificate" shall be issued to the student, only after securing minimum 75% of attendance in such a course. No marks or Letter Grade shall be allotted for these activities.

## **8. Minimum 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 is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical/design/drawing course/project and secured not less 35% marks in Semester End Examination (SEE), and minimum 40% marks when the total of the internal evaluation and semester end examinations taken together.
- 8.2 The student has to pass the failed course by appearing the supplementary examination as per the requirement for the award of degree.
- 8.3 Students who fail to earn 192 credits as indicated in the course structure within eight academic years from the year of their admission, shall forfeit their seat in B. Tech. Programme and their admission stands cancelled.
- 8.4 A student shall be promoted from I Year to II Year only if he/she fulfills the academic requirements of securing 50% of average credits (24 credits out of 48 credits) upto I year II Semester, from all the examinations, whether or not the candidate takes the examinations.
- 8.5 A student shall be promoted from II Year to III Year only if he/she fulfills the academic requirements of securing 50% of average credits (36 credits out of 72 credits) up to II year I semester, from all the examinations, whether or not the candidate takes the examinations.
- 8.6 A student shall be promoted from III year to IV year only if he/she fulfills the academic requirements of securing 50% of average credits (60 credits out of 120 credits) up to III year I semester, from all the examinations, whether or not the candidate takes the examinations.
- 8.7 A student shall register and put up minimum attendance in all 192 credits and earn all 192 credits for the award of degree.
- 8.8 When a Student is detained due to shortage of attendance in any semester, no Grade Allotments or SGPA/CGPA calculations will be done for that entire Semester in which he got detained.
- 8.9 When a Student is detained due to lack of Credits in any year, he may be readmitted after fulfillment of the Academic Requirements, with the Academic

Regulations of the Batch into which he gets readmitted subject to 3.3.

- 8.10 For readmitted candidates, if there are any Professional Electives / Open Electives, the same may also be re-registered if offered. However, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the SAME set of Elective Courses offered under that category.
- 8.11 After securing the necessary 192 Credits as specified for the successful completion of the entire UGP, an exemption of 8 secured Credits (in terms of two of their corresponding Courses (Subjects) ) may be permitted for optional drop out from these 192 Credits earned; resulting in 184 Credits for UGP performance evaluation, i.e., the performance of the Student in these 184 Credits shall alone be taken into account for the calculation of 'the final CGPA (at the end of UGP, which takes the SGPA of the IV Year II Semester into account)' , and shall be indicated in the Grade Card of IV Year II Semester; however, the Student's Performances in the earlier individual Semesters, with the corresponding SGPA and CGPA for which already Grade Cards are given, will not be altered. Further, optional drop out for such 8 secured Credits shall not be allowed for Courses listed as ... i) Laboratories/ Practicals, ii) Industrial Training/ Mini-Project, iii) Seminar, iv) Comprehensive Viva Voce v) Major Project.
- 8.12 If a Student registers for some more 'extra courses' (in the parent Department or other Departments/Branches of Engg.) other than those listed courses totalling to 192 Credits as specified in the Course Structure of his Department, the performances in those 'extra courses' (although evaluated and graded using the same procedure as that of the required 192 Credits) will not be taken into account while calculating the SGPA and CGPA. For such 'extra courses' registered, % marks and Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in Items 7 and 8.1 – 8.11 above.



## 9. Program Structure

S. No.	Classification		Course Work - Subject Area	Range of Total Credits (%)	
	AICTE	UGC		Min	Max
1	HS	Foundation Courses	Humanities and Social Sciences including Management; (HS),	5	10
2	BS		Basic Sciences(BS) including Mathematics, Physics, Chemistry, Biology;	15	20
3	ES		Engineering Sciences (ES), including Materials, Workshop, Drawing, Basics of Electrical/ Electronics/ Mechanical/Computer Engineering Instrumentation;	15	20
4	PC	Core Courses	Professional Subjects-Core (PC), relevant to the chosen specialization/branch; (May be split into Hard (no choice) and Soft (with choice), if required.)	30	40
5	PW		Project Work, Seminar and/or Internship in Industry or elsewhere.	10	15
6	PE	Elective Courses	Professional Subjects – Electives (PE), relevant to the chosen specialization/ branch;	10	15
7	OE		Open Subjects- Electives (OE), from other technical and/or emerging subject areas;	5	10

## 10. Course pattern

- 10.1 The entire course of study is for four academic years in semester pattern.
- 10.2 A student eligible to appear for Semester End Examinations in a course, but absent from it or failed in that examination, may write the exam in that course during supplementary exams.
- 10.3 A student eligible to appear in the Semester End Examination in any Course, but absent at it or failed (thereby failing to secure P Grade or above), may reappear for that Course at the supplementary examination as and when conducted. In such cases, his Continuous Internal Evaluation (CIE) marks assessed earlier for that Course will be carried over, and added to the marks to be obtained in the supplementary examinations, for evaluating his performance in that course.

## 11. Minimum Instruction Days

The minimum instruction days for each semester shall be 90 days.

## 12. Grade Points

12.1 Marks will be awarded to indicate the performance of each student in each theory

course, or Lab/Practicals, or Seminar, or Project, or Mini-Project, Minor Course etc., based on the % of marks obtained in CIE+SEE(Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

12.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed.

<b>Letter Grade</b>	<b>Grade Points</b>	<b>% of marks Secured (Class Intervals)</b>
<b>O</b> ( Out Standing)	10	80% and above ( $\geq 80\%$ , $\leq 100\%$ )
<b>A+</b> ( Excellent)	9	Below 80% but not less than 70% ( $\geq 70\%$ , $< 80\%$ )
<b>A</b> ( Very Good)	8	Below 70% but not less than 60% ( $\geq 60\%$ , $< 70\%$ )
<b>B+</b> (Good)	7	Below 60% but not less than 55% ( $\geq 55\%$ , $< 60\%$ )
<b>B</b> ( Above Average)	6	Below 55% but not less than 50% ( $\geq 50\%$ , $< 55\%$ )
<b>C</b> ( Average)	5	Below 50% but not less than 45% ( $\geq 45\%$ , $< 50\%$ )
<b>P</b> (Pass)	4	Below 45% but not less than 40% ( $\geq 40\%$ , $< 45\%$ )
<b>F</b> (Fail)	0	Below 40% ( $< 40\%$ )
<b>Ab</b> (Absent)	0	--

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

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

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

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

12.7 The Student passes the Course only when he gets GP  $\geq$  4 (P Grade or above).

### **13. Registration/Dropping**

13.1 Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely necessary for the student to register for courses in time.

13.2 The student has to register for a minimum of 20 credits and may register up to a maximum of 28 credits based on the advice of the Faculty Advisor. On an average, a student is expected to register for 24 credits.

13.3 A student at the end of II year II semester either having the CGPA of  $\geq$  7.0 or having passed all previous courses in first attempt with a minimum CGPA  $\geq$  5.0 is allowed to register an additional course / credits from the offered open electives. However mandatory non credit courses can be register during the course of study with the consent of the faculty advisor.

13.4 Open Electives are offered to students in IV year I semester and II semester, which can be registered by the students during III year and IV year I semester. Prior permission for registration of Open Electives as additional course is compulsory.

13.5 A student would be allowed to register in an additional course only if he/she satisfies the prerequisites.

13.6 Departments will notify at the time of registration about the minimum number of students to be enrolled for a particular open elective to be offered.

13.7 Any student may be barred from registering for any course for specific reasons like disciplinary reasons, non- payment of fees, etc.

13.8 Dropping of Courses: Within four weeks after the commencement of the semester, the student may, in consultation with his / her faculty advisor, can drop one or more courses without prejudice to the minimum number of credits as specified in 13.2. The dropped courses are not recorded in the Grade Card.

13.9 After Dropping, minimum credits registered shall be 20.

### **14 Earning of Credit**

A student shall be considered to have completed a Course successfully and earned the credits if he/she secures an acceptable letter grade in the range 'O' to 'P'. Letter grade 'F' in any Course implies failure of the student in that Course and no credits earned.

### **15 Passing Standards:**

15.1 A student shall be declared successful or 'passed' in a Semester, only when he/she gets a SGPA  $\geq$  5.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UGP, only when he/she gets

a CGPA  $\geq$  5.00; subject to the condition that he/she secures a GP  $\geq$  4 (P Grade or above) in every registered Course in each Semester (during the entire UGP) for the award of Degree, as required.

15.2 In spite of securing P Grade or above in some (or all) 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 Continuous Internal Evaluation Marks (CIE Marks) in those Course(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.

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

15.4 After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) (*are all theses 3 are same?*) shall be issued to all the Registered Students of that Semester, indicating the Letter Grades and Credits earned. It will show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

## 16 Vertical Progression

It shall also be necessary to lay down uniform minimum standards for SGPA and CGPA together with the minimum number of *credits* to be earned in a semester for the *vertical progression* of students. This shall be used in facilitating the mobility of students from one College to another and also in avoiding any confusion among the students. The

a) Minimum Standard for SGPA =5.0;

b) Minimum Standard for CGPA =5.0; (at the end of each semester)

However, failure to secure a minimum CGPA = 5.0 at the end of any semester for the first time, shall **attract a warning** before approval of the student to continue in the following semester and will be required to register for courses having a GPA of 4.0 to improve the SGPA to 5.0 or above.

## 17 Eligibility for Award of B.Tech. Degree

A student shall be eligible for award of the B.Tech degree if he/she fulfils all the following conditions;

17.1 Registered and successfully completed all the components prescribed in the Programme of study (*Course of study* mentioned in all earlier occasions) to which

he/she is admitted,

17.2 Obtained CGPA greater than or equal to 5.0 (Minimum requirements for Pass),

17.3 Has no dues to the College, hostels, Libraries, NCC / NSS etc., and

17.4 No disciplinary action is pending against him/her.

### **18 Award of Class**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

<b>CGPA</b>	<b>Class Awarded</b>	<b>From the CGPA secured from 192 credits</b>
≥8.00	First Class with Distinction	
≥6.50 - <8.00	First Class	
≥5.50 - <6.50	Second Class	
≥5.00 - <5.50	Pass Class	

18.1 The marks obtained in Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) will not be shown in the memorandum of marks.

18.2 For the purpose of awarding First Class with Distinction (CGPA ≥ 8.0), the student must obtain the minimum required CGPA within 4 academic years or within 3 academic years in case of Lateral Entry candidates by clearing all the courses.

18.3 Candidates detained / prevented from writing the Semester End Examinations due to any reason in any semester are not eligible for the award of First Class with Distinction. Such candidates even if the CGPA ≥ 8.0, shall be placed in first class.

18.4 For the purpose of awarding First, Second and Pass Class, CGPA obtained in the examinations appeared within the maximum period allowed for the completion of Programme shall be considered as per the regulations.

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

18.6 The CGPA can be converted to equivalent percentage of marks by using the following equation:

$$(CGPA - 0.5) \times 10$$

### **19 Consolidated Grade Card**

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the four years B. Tech Programme.

## **20 Withholding of Results**

If the student has not paid the dues, if any, to the College or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases the matter will be referred to the Academic Council. The decision of the Academic Council is final.

## **21 Transitory Regulations**

21.1 Discontinued, detained, or failed candidates are eligible for readmission as and when next offered as per the college admission procedure.

21.2 Students on transfer shall complete the prescribed courses of the concerned programme not covered earlier and however he/she should take the remaining programme along with others.

21.3 There shall be no branch transfers after the cut off date of admissions in the academic year.

## **22 Transcripts**

After successful completion of the total Programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee.

## **23 Supplementary Examinations**

In addition to the Regular Final Examinations held at the end of each semester, Supplementary Final Examinations will be conducted during the academic year. Candidates taking the Regular / Supplementary examinations as Supplementary candidates may have to take more than one Semester End Examination per day. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However the maximum stipulated period cannot be relaxed under any circumstances.

## **24 Graduation Ceremony**

24.1 The College shall have its own annual Graduation Ceremony for the award of degree to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

24.2 The College shall institute Prizes and Awards to meritorious students, for being given away annually at the Graduation Ceremony.

## **25 Termination from the Program**

The admission of a student to the program may be terminated and the student asked to leave the College in the following circumstances:

25.1 The student fails to satisfy the requirements of the program within the

maximum period stipulated for that program.

25.2 The student fails to satisfy the norms of discipline specified by the College from time to time.

## **26 Non-Credit Courses (Mandatory Courses)**

26.1 All the courses designated as mandatory course is a compulsory requirement for all students for the award of degree.

26.2 These activities carry no credits and are evaluated as Satisfactory/Unsatisfactory.

26.3 Minimum attendance requirement as per the regulations is compulsory for completing the mandatory courses.

## **27 Amendments**

The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.

## **28 General**

28.1 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

28.2 The academic regulation should be read as a whole for the purpose of any interpretation.

28.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

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

Applicable for the students admitted into II year B. Tech. (Lateral Entry Scheme) from the Academic Year 2016-17 and onwards

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

1.1 The LES candidates shall pursue a course of study for not less than three academic

years and not more than six academic years.

1.2 The candidate shall register for 144 credits and secure 144 credits by securing a

minimum CGPA of 5.0 from II to IV year B.Tech. Program (LES) for the award of B.Tech. degree.

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

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

### **2. Promotion Rule**

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

2.1 A student shall be promoted from II Year to III Year only if he/she fulfills the academic requirements of securing 50% of average credits (12 credits out of 24 credits) up to II year I semester, from all the examinations, whether or not the candidate takes the examinations.

2.2 A student shall be promoted from III year to IV year only if he/she fulfills the academic requirements of securing 50% of average credits (36 credits out of 72 credits) up to III year I semester, from all the examinations, whether or not the candidate takes the examinations.

2.3 A student shall register and put up minimum attendance in all 144 credits and earn all 144 credits to be eligible for award of degree.

2.4 Students who fail to earn 144 credits as indicated in the course structure within six academic years, shall forfeit their seat in B.Tech. Programme and their admission stands cancelled.



**3. Award of Class**

After a	<b>Class Awarded</b>	<b>From the CGPA secured from 144 credits</b>
≥8.00	First Class with Distinction	
≥6.50 - <8.00	First Class	
≥5.50 - <6.50	Second Class	
≥5.00 - <5.50	Pass Class	

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

\*\_\*\_\*

## ANNEXURE - I

### 1 Grade Point Average

#### 1.1 SGPA and CGPA

The *credit index* can be used further for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA), both of which being important performance indices of the student. While SGPA is equal to the *credit index* for a semester divided by the total number of *credits* registered by the student in that semester, CGPA gives the sum total of *credit indices* of all the previous semesters divided by the total number of *credits* registered in all these semesters. Thus,

The Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where  $C_i$  = number of credits for the course  $i$ ,

$G_i$  = grade points obtained by the student in the course.

- 1.2 Semester Grade Point Average (SGPA) is awarded to candidates considering all the courses of the semester. Zero grade points are also included in this computation. SGPA is rounded off to TWO Decimal Places.

**SGPA will be computed as follows;**

$$\frac{\sum [(Course\ credits) \times (Grade\ points)] \text{ (for all Courses passed in that semester)}}{\sum [(Course\ credits)] \text{ (for all courses registered in that semester)}}$$

- 1.3 To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time. CGPA is rounded off to TWO Decimal Places.

**CGPA will be computed as follows:**

$$\frac{\sum [(Course\ credits) \times (Grade\ points)] \text{ (for all Courses passed upto that semester)}}{\sum [(Course\ credits)] \text{ (for all Courses registered until that semester)}}$$

CGPA is thus computed from the I Year First Semester onwards, at the end of each Semester, as per the above formula. However, the SGPA of I year I Semester itself may be taken as the CGPA, as there are no cumulative effects

#### 1.4 Illustrative Example

An illustrative example given in below Table below indicates the use of the above two equations in calculating SGPA and CGPA, both of which facilitate the declaration of

academic performance of a student, at the end of a semester and at the end of successive semesters respectively . Both of them shall be normally calculated up to the second decimal position, so that the *CGPA*, in particular, can be made use of in rank ordering the student's performance in a class. If two students get the same *CGPA*, the tie should be resolved by considering the number of times a student has obtained higher *SGPA*; But, if it is not resolved even at this stage, the number of times a student has obtained higher grades like O, A, B etc shall be taken into account in rank ordering of the students in a class.

Year and Semester	Course No.	Credits	Grade	Grade Points	Credit Points
I Year I sem	XX101	5	A	8	40
I Year I sem	XX102	4	F	0	00
I Year I sem	XX103	3	A+	9	27
I Year I sem	XX104	4	F	0	00
I Year I sem	XX105	5	C	5	25
I Year I sem	XX106	5	P	4	20
<b>Total</b>		<b>26 (18*)</b>			<b>112</b>
<b>SGPA = 112/26 = 4.31</b>		<b>CGPA = 4.31</b>			
I Year II Sem	XX107	5	B+	7	35
I Year II Sem	XX108	4	A	8	32
I Year II Sem	XX109	3	C	5	15
I Year II Sem	XX110	5	P	4	20
I Year II Sem	XX111	4	A+	9	36
I Year II Sem	XX112	2	F	0	00
I Year II Sem	Xx113	2	A	8	16
<b>Total</b>		<b>25 (23*)</b>			<b>154</b>
<b>SGPA = 154/25 = 6.16</b>		<b>CGPA = 266/51 = 5.22</b>			

\* Total No. of credits excluding those with 'F'; this is particularly important to keep track of the number of credits earned by a student up to any semester;

## MALPRACTICES RULES

### DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	<b>Nature of Malpractices/Improper conduct</b>	<b>Punishment</b>
	<i>If the candidate:</i>	
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 course (subject) of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that course (subject) 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 the 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 is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the 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 END examinations. The

		continuation of the course by the candidate is course 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 END examinations. 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 Exams/Chief Superintendent / Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of	In case of students of the college, they shall be expelled from examination halls and cancellation 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 case is registered against them.

	unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that 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 END examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that 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.	Student of the colleges 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 semester examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the PRINCIPAL for further action to award suitable punishment.	

# ANURAG ENGINEERING COLLEGE

(AUTONOMOUS)

## I YEAR I SEMESTER

## COURSE STRUCTURE

Subject Code	Subject Name	Lectures	T/P/D	Credits
A51001	English-I	2	0	2
A51002	Mathematics - I	3	1	3
A51003	Engineering Physics-I	2	1	2
A51005	Computer Programming - I	3	1	3
A51010	Engineering Chemistry	3	1	3
A51011	Basic Electrical Engineering	3	1	3
A51217	English Language Communication Skills Lab - I	0	3	2
A51218	Computer Programming - I Lab	0	3	2
A51219	Engineering Chemistry Lab	0	3	2
A51220	IT Work shop	0	3	2
	Total	16	17	24

## I YEAR II SEMESTER

## COURSE STRUCTURE

Subject Code	Subject Name	Lectures	T/P/D	Credits
A52001	English-II	2	0	2
A52002	Mathematics – II	3	1	3
A52003	Engineering Physics-II	2	1	2
A52006	Computer Programming – II	3	1	3
A52008	Mathematics – III	3	1	3
A52011	Engineering Graphics	0	6	3
A52217	English Language Communication Skills Lab - II	0	3	2
A52218	Computer Programming - II Lab	0	3	2
A52219	Engineering Physics Lab	0	3	2
A52220	Engineering Workshop	0	3	2
	Total	13	19	24

Note: All End Examinations (Theory and Practical) are of three hours duration.

**T – Tutorial**

**P – Practical**

**D – Drawing**



## II Year I Sem

## COURSE STRUCTURE

S.No .	Course Code	Course	Category	Lecture s	T / P / D	Credits	Interna l Marks	Externa l Marks	Total Marks
1	A53001	Mathematics-III	BS	4	1	4	25	75	100
2	A53002	Building Materials, Construction and Planning	PC	3	0	3	25	75	100
3	A53003	Strength of Materials-I	ES	3	1	3	25	75	100
4	A53004	Fluid Mechanics	ES	3	1	3	25	75	100
5	A53005	Surveying	PC	4	1	4	25	75	100
6	A53006	Engineering Geology	PC	3	0	3	25	75	100
7	A53201	Surveying Lab	PC	0	3	2	25	75	100
8	A53202	Engineering Geology Lab	PC	0	3	2	25	75	100
9	A53203	Gender Sensitization	MC	2	0	0	25	75	100
<b>Total</b>				20	7	24	200	600	800

T – Tutorial    P – Practical    D – Drawing

## II Year I Sem

## COURSE STRUCTURE

S.No.	Course Code	Course	Category	Lectures	T / P / D	Credits	Internal Marks	External Marks	Total Marks
1	A54001	Probability and Statistics	BS	3	1	3	25	75	100
2	A54002	Elements of Electrical Engineering	ES	3	1	3	25	75	100
3	A54003	Strength of Materials-II	ES	4	1	4	25	75	100
4	A54004	Hydraulics & Hydraulic Machinery	PC	4	1	4	25	75	100
5	A54005	Concrete Technology	PC	3	0	3	25	75	100
6	A54006	Environmental Studies	HS	3	0	3	25	75	100
7	A54201	Strength of Materials Lab	PC	0	3	2	25	75	100
8	A54202	Fluid Mechanics & Hydraulic Machinery Lab	PC	0	3	2	25	75	100
9	A54203	Human Values & Professional Ethics	MC	0	2	0	25	75	100
<b>Total</b>				20	10	24	200	600	800

T – Tutorial    P – Practical    D – Drawing

### III YEAR I SEM

### COURSE STRUCTURE

S.No.	Course Code	Subject Name	Course Category	Lectures	T / P / D	Credits	Internal Marks	External Marks	Total Marks
1	A55001	Structural Analysis	PC	4	1	4	25	75	100
2	A55002	Design of RC Structures	PC	4	1	4	25	75	100
3	A55003	Environmental Engineering	PC	3	0	3	25	75	100
4	A55004	Soil Mechanics	PC	3	1	3	25	75	100
5	A55005	Water Resource Engineering	PC	4	1	4	25	75	100
PE-I 6	A55006	Elements of Earthquake Engineering	PE	3	0	3	25	75	100
	A55007	Water shed Management	PE						
	A55008	Disaster Management	PE						
7	A55201	Soil mechanics lab	PC	0	3	2	25	75	100
8	A55202	Computer Aided Drafting lab	PC	0	3	2	25	75	100
Total				21	10	25	200	600	800

T – Tutorial

P – Practical

D – Drawing

### III YEAR II SEM

### COURSE STRUCTURE

S.No.	Course Code	Course	Course Category	Lectures	T / P / D	Credits	Internal Marks	External Marks	Total Marks
1	A56001	Design of steel structures	PC	4	1	4	25	75	100
2	A56002	Foundation Engineering	PC	4	1	4	25	75	100
3	A56003	Transportation Engineering	PC	4	0	4	25	75	100
4	A56004	Irrigation Engineering	PC	3	1	3	25	75	100
PE-II 5	A56005	Construction technology & Project management	PE	3	0	3	25	75	100
	A56006	Environmental impact Assessment							
	A56007	Advanced Structural Analysis							
6		OE-1	OE	3	0	3	25	75	100
7	A56201	Concrete technology lab	PC	0	3	2	25	75	100
8	A56202	Advanced communication skills lab	PC	0	3	2	25	75	100
Total				21	9	25	200	600	800

T – Tutorial

P – Practical

D – Drawing

## IV YEAR I SEM

## COURSE STRUCTURE

S.No.	Course Code	Course	Course Category	Lectures	T / P / D	Credits	Internal Marks	External Marks	Total Marks
1	A57001	Estimating and Costing	PC	4	1	4	25	75	100
2	A57002	Pavement Design	PC	4	1	4	25	75	100
3	A57003	GIS & Remote sensing	PC	3	0	3	25	75	100
		PE-3							
4	A57004	Railways and Airport Engineering	PE	3	0	3	25	75	100
	A57005	Earth Retaining Structures							
	A57006	Advanced Structural Design							
		PE-4							
5	A57007	Ground improvement techniques	PE	3	0	3	25	75	100
	A57008	Finite element methods							
	A57009	Building Services							
6		OE-2	OE	3	0	3	25	75	100
7	A57201	Transportation Engineering lab	PC	0	3	2	25	75	100
8	A57202	Environmental Engineering lab	PC	0	3	2	25	75	100
Total				20	8	24	200	600	800

T – Tutorial

P – Practical

D – Drawing

## IV YEAR II SEM

## COURSE STRUCTURE

S.No.	Course Code	Course	Course Category	Lectures	T / P / D	Credits	Internal Marks	External Marks	Total Marks
		PE-5							
1	A58001	Prestressed Concrete	PE	4	0	3	25	75	100
	A58002	Hazards and solid waste management							
	A58003	Urban planning and development							
		PE-6							
2	A58004	Rehabilitation and Retrofitting of structures	PE	4	0	3	25	75	100
	A58005	Design and drawing of irrigation structures							
	A58006	Geo Environmental Engineering							
3		OE-3	OE	3	0	3	25	75	100
4	A58201	Project work	PW	0	0	10			
5	A58202	Technical seminar	PW	0	0	3			
6	A58203	Comprehensive viva	PW	0	0	2			
Total				11	0	24	75	225	300

T – Tutorial

P – Practical

D – Drawing

**ANURAG ENGINEERING COLLEGE**  
**(AN AUTONOMOUS INSTITUTION)**

I Year B.Tech. CE – I Sem

L	T/P/D	C
2	0	2

**(A51001) English-I**

**1. INTRODUCTION:**

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

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc. The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. *However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.*

**2. OBJECTIVES:**

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

**LEARNING OUTCOMES:**

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

**SYLLABUS:**

**Listening Skills:**

Objectives

1. To enable students 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, to distinguish between them to mark 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
  - Role play – Individual/Group activities (Using exercises from the five units of the prescribed text: ***Skills Annexe - Functional English for Success***)
  - Just A Minute(JAM) Sessions.

### **Reading Skills:**

#### Objectives

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

**NOTE :** *The students will be trained in reading skills using the prescribed text for detailed study.*

*They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.*

### **Writing Skills :**

#### Objectives

1. To develop an awareness in the students about writing as an exact and formal skill
  2. To equip them with the components of different forms of writing, beginning with the lower order ones.
- Writing sentences
  - Use of appropriate vocabulary

- Paragraph writing
- Coherence and cohesiveness
- Narration / description

- Note Making
- Formal and informal letter writing
- Describing graphs using expressions of comparison

**TEXTBOOKS PRESCRIBED:**

***For Detailed study:***

**First Textbook: “Skills Annexe -Functional English for Success”,** Published by Orient Black Swan, Hyderabad

***For Non-detailed study:***

**Second text book “Epitome of Wisdom”,** Published by Maruthi Publications, Guntur

**UNIT –I**

Chapter 1: ‘**Wit and Humour**’ from ‘Skills Annexe’ -Functional English for Success, Published by Orient Black Swan, Hyderabad

2 hrs

L-Listening For Sounds, Stress and Intonation 1

S-Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations) 1

R- Reading for Subject/ Theme 1

W- Writing Paragraphs 1

**UNIT –II**

Chapter 2:‘**Mokshagundam Visvesvaraya**’ from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad.

3 hrs

G-Types of Nouns and Pronouns 1

V- Homonyms, homophones synonyms, antonyms

2

**UNIT-III**

Chapter 3: “**Cyber Age**” from “Skills Annexe -Functional English for Success” Published by Orient Black Swan, Hyderabad.

2 hrs

L – Listening for themes and facts

1

S – Apologizing, interrupting, requesting and making polite conversation

1

R- For theme and gist

1

W- Describing People, Places, Objects, Events 1

**UNIT-IV**

Chapter 4:‘**Three Days To See**’ from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad

2 hrs

G- Verb forms

2

V- noun, verb, adjective and adverb

2

### **UNIT-V**

Chapter 5 '**Risk Management**' from "Skills Annexe -Functional English for Success"

Published by Orient Black Swan, Hyderabad

2 hrs

L – for main points and sub-points for note taking

1

S – giving instructions and directions; Speaking of hypothetical situations

1

R – reading for details

1

W – note-making, information transfer, punctuation

1

### **REFERENCES:**

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi.2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw – Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw –Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publishers

**ANURAG ENGINEERING COLLEGE**  
**(AN AUTONOMOUS INSTITUTION)**

I Year B.Tech. CE – I Sem

<b>L</b>	<b>T/P/D</b>	<b>C</b>
<b>3</b>	<b>1/-/-</b>	<b>3</b>

**(A51002) MATHEMATICS-I**  
**(Calculus and Matrices)**

**Course Objectives:**

1. Able to know the Mean value theorems and determine the maxima and minima for function of several variables.
2. Concepts of matrix algebra, methods of solving system of linear equations.
3. Determine eigen values and eigen vectors of a matrix, Cayley Hamilton theorem and inverse by Cayley Hamilton theorem
4. Develop a strategy for finding a solution of given arbitrary differential equation, using different methods.
5. Understand the sol of higher order differential equations, application of ODE in Bending of beams, electrical circuits and simple harmonic motion.

**UNIT-I: Functions of Single Variable and Functions of several variables**

Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – Generalized Mean Value theorem (all theorems without proof) – Geometrical interpretation of Mean value theorems. Functions of several variables – Partial Differentiation and total differentiation - Functional dependence-Jacobian Determinant- Maxima and Minima of functions of two variables with constraints and without constraints.

**UNIT-II: Matrices and Linear System of Equations**

Matrices and Linear systems of equations: Real matrices – Symmetric, skew - symmetric, orthogonal, Linear Transformation – Orthogonal Transformation. Complex matrices: Hermitian, Skew – Hermitian and Unitary. Elementary row transformations-Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods (Gauss Elimination, Gauss Jordan).

**UNIT-III: Eigen Values and Eigen Vectors**

Eigen values, Eigen vectors – properties, Cayley-Hamilton Theorem (without Proof) - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonalization of matrix.

**UNIT-IV: Differential Equations of first order and their Applications**

Differential equations of first order and first degree: exact, linear and Bernoulli, Applications to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

**UNIT-V: Higher Order Linear Differential Equations and their Applications**

Linear differential equations of second and higher order with constant coefficients, RHS term of the type  $f(X) = e^{ax}, \sin ax, \cos ax$  and  $x^k, e^{ax}V(x), x^kV(x)$ . Method of variation



of parameters. Applications - Bending of beams, Electrical circuits, simple harmonic motion.

**Course Outcomes:**

1. Understand Rolle's and the Mean value theorems and to verify the Mean value theorems
2. Apply partial derivatives to study maxima and minima of functions of two variables
3. Define rank and elementary transformations of a matrix.
4. Discuss Non homogeneous and homogeneous system of equations.
5. Compute eigen values and corresponding eigen vectors of a square matrix.
6. Specify standard methods for solving differential equations and their applications in geometrical and physical problems.
7. Identify different types of higher order differential equations and their applications in engineering problem solving.

**TEXT BOOKS:**

1. Grewal B.S (2007), Higher Engineering Mathematics, 40<sup>th</sup> Edition, New Delhi, Khanna Publishers.
2. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Engineering Mathematics Vol - I, 10<sup>th</sup> Revised Edition, New Delhi, S. Chand & Company Limited.
3. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Mathematical Methods, 10<sup>th</sup> Revised Edition, New Delhi, S. Chand & Company Limited.
4. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley.

**REFERENCE BOOKS:**

1. Jain R. K., and Iyengar S. R. K (2008), Advanced Engineering Mathematics, 3rd Edition, New Delhi, Narosa Publication House.
2. Shahanaz Bathul (2007), Engineering Mathematics-I, 3<sup>rd</sup> Edition, Hyderabad, Right Publishers.
3. Ramana B.V (2010), Engineering Mathematics, New Delhi, Tata McGraw Hill Publishing Co. Limited
4. Mathematical Methods: S.R.K. Iyengar and R.K. Jain, Narosa Publishing House. Mathematical Methods of Science and Engineering (Aided with Matlab) Kanti .Datta (2012), Seventh E

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**(A51003) ENGINEERING PHYSICS – I**

**Course objectives:**

1. To appraise the students about the importance and role of chemistry in the field of Engineering by explaining the relevant topics.
2. To enable students to apply the knowledge acquired in improving the properties of engineering materials.
3. To provide the students with the necessary knowledge to solve the problems and make decisions with regards to the application of materials in a variety of engineering disciplines.
4. To equip the students with the required fundamentals of engineering chemistry to carry out in the interdisciplinary research such that the findings benefit the common man.
5. After the completion of the course, the student would understand about the important chemistry of water, electrochemistry, batteries and surface chemistry.

**UNIT- I**

**INTERFERENCE AND DIFFRACTION:**

10

Superposition principle, resultant amplitude, coherence, methods to obtain coherent sources, interference, Young's double slit experiment (Qualitative), interference in thin films by reflection, Newton's rings Experiment, Distinction between Fraunhofer and Fresnel diffraction, Diffraction at single slit, Diffraction grating (Qualitative), Introduction to polarization, Brewster's law and Double refraction.

**UNIT - II**

**CRYSTAL STRUCTURES:**

05

Space lattice – Unit cell – Lattice parameter – Crystal systems – Bravais lattices, Atomic radius – Co-ordination number - Structures and Packing fractions of Simple Cubic – Body Centered Cubic – Face Centered Cubic crystals.

**DIRECTIONS, PLANES AND X-RAY DIFFRACTION:**

Miller Indices for Crystal planes and directions – Inter planar spacing of orthogonal crystal systems – Diffraction of X-rays by crystal planes and Bragg's law – Powder method – Applications of X-ray diffraction.

**UNIT - III**

**ELEMENTS OF STATISTICAL MECHANICS:**

08

Introduction, Phase space, Definition of Ensembles, Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics – Photon gas – Planck's law of black body radiation – Deduction of Wien's law and Rayleigh-Jeans law from Planck's law.

## **UNIT – IV**

### **MAGNETIC PROPERTIES :**

08

Introduction – Basic definitions - Origin of magnetic moment, Bohr magneton – Classification of magnetic materials (Dia, Para and Ferro)- Domain theory of ferromagnetism, Hysteresis curve – Soft and Hard magnetic materials – properties of Anti ferro and Ferri magnetic materials .

**SUPERCONDUCTIVITY:** Introduction, Meissner effect – Critical fields, Type I and Type II superconductors-Applications of super conductors.

## **UNIT - V**

### **DIELECTRIC PROPERTIES:**

Electric dipole, Dipole moment, Dielectric constant – Parallel plate Capacitor, Electronic, Ionic and Orientation Polarization – Calculation of Polarizabilities – Internal fields – Clausius – Mossotti equation – Basic concepts of Piezo, Pyro and Ferro electricity.

### **Course Outcomes:**

1. Finally the students may be familiar with the topics of crystals, dielectrics, optics etc... which will be useful in various branches of technology.
2. There will be a chance for them use the subject as a mathematical tool to solve their real life problems.

### **TEXT BOOKS:**

- (1) Modern Engineering Physics by, Dr.K. Vijay Kumar & Dr.S.Chandralingam:S .Chand.Co
- (2) Eengineering Physics by P K Palanisamy :Scietech publication
- (3) Solid State Physics by M Armugam; Anuradha Publications

### **REFERENCE BOOKS:**

- (1) Introduction to Solid State Physics by Charles Kittel : John Wiley & Sons
- (2) Engineering Physics by R.K.Gaur and S.L.Gupta; Dhanpat Rai and Sons
- (3) Engineering Physics by V Rajendran; McGraw hill education private ltd.
- (4) A Text book of Engineering Physics by M N Avadhanulu, P G Kshirsagar; S Chand
- (5) Engineering Physics by K Malik, A K Singh; Tata Mc Graw hill book publishers
- (6) Engineering Physics by M.R.Srinivasan, New Age Publishers

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**(A51004) APPLIED CHEMISTRY – I**

**Course objectives:**

1. To appraise the students about the importance and role of chemistry in the field of Engineering by explaining the relevant topics.
2. To enable students to apply the knowledge acquired in improving the properties of engineering materials.
3. To provide the students with the necessary knowledge to solve the problems and make decisions with regards to the application of materials in a variety of engineering disciplines.
4. To equip the students with the required fundamentals of engineering chemistry to carry out in the interdisciplinary research such that the findings benefit the common man.
5. After the completion of the course, the student would understand about the important chemistry of water, electrochemistry, batteries and surface chemistry.

**UNIT I : WATER TECHNOLOGY**

Hardness of water, expression of hardness, units and types of hardness. Estimation of temporary & permanent hardness of water by EDTA method. Numerical problems. Potable water, characteristics, treatment of water for domestic supply. Desalination of brackish water : reverse osmosis. Alkalinity of water. Boiler troubles:-priming and foaming, boiler corrosion, scales, sludges and caustic embrittlement. Boiler feed water and its treatment: Internal treatment :colloidal, phosphate calgon conditioning . External treatment: zeolite process and ion –exchange process. Numerical problems.

**UNIT II: ELECTROCHEMISTRY**

Conductance-types (electronic and electrolytic), Types of electrolytic conductance: specific, equivalent and molar conductance, Kohlrausch's law and its applications. Electrode, electrode potential, galvanic cell, cell reactions and cell notation, cell EMF, electrochemical series & its applications, types of electrodes (Normal Hydrogen Electrode, calomel electrode, glass electrode and quinhydrone electrode), Nernst equation and its applications, numerical problems. Potentiometric titrations. Concentration cells, classification with examples.

**UNIT III: BATTERIES**

Introduction to cell and battery, characteristics of a cell. Primary (dry cell and lithium cell) and secondary cells, (lead-Acid cell, Ni-Cd cell and Lithium ion cells,). Engineering applications of batteries, Solar battery, Fuel cells – Hydrogen – Oxygen fuel cell, Methanol -Oxygen fuel cell and advantages and engineering applications of fuel cells.

**UNIT IV: CORROSION AND ITS CONTROL:**

Corrosion and its types:chemical and electrochemical corrosion, mechanism of chemical and electrochemical corrosion , galvanic , water line and pitting corrosion, factors affecting the rate of corrosion : nature of the metal , galvanic series, purity of

metal, nature of corrosion product , nature of environment : effect of temperature, effect of pH, humidity. Corrosion control methods: Cathodic protection: sacrificial anode method and impressed current cathode method. Protective coatings : metallic coatings , anodic and cathodic, methods of application on metals , hot dipping (galvanizing ), cladding, cementation, electroplating (of copper), electroless plating (of nickel) Organic coatings – paints, its constituents and their functions.

#### **UNIT V: SURFACE CHEMISTRY:**

Adsorption , types - physical and chemical adsorption, Langmuir adsorption isotherm, application of adsorption, Colloids, classification of colloids, Electrical, mechanical & optical properties of colloids applications of colloids in industry. Micelles- Introduction, formation, structure, critical micellar concentration, uses.

Nano materials: Introduction, basic methods of preparation (co-precipitation method, chemical vapour deposition method and sol gel method) and applications of nano materials.

#### **Course Outcomes:**

1. Industrious Students and health conscious ones remain inquisitive on potable water its parameter and usage.
2. Dynamic students indeed capable of explaining the various aspects of electro chemistry work out numerical problems.
3. Thorough with cells and solar, fuel cells
4. Gets augmented to the caliber in knowing corrosion and causes going around and capable of suggesting periodical maintenance.
5. Archetypal students comprehend the applications of colloids in various fields in exhort their immense significance.

#### **TEXT BOOKS:**

1. Engineering Chemistry by NYS.Murthy, Pearson, India.
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company

#### **REFERENCE BOOKS:**

1. Text Book of Engineering Chemistry by Shasi Chawla, Dhantpat Rai publishing Company,
2. Engineering Chemistry by C.Daniel Yesudian , Anuradha publications

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**(A51005) COMPUTER PROGRAMMING - I**

**Course Objectives:**

1. To explain representation of numbers, alphabets and other characters in computer system
2. To understand the basic concepts in C Programming Language
3. To explain software development tools like algorithm, pseudo codes and programming structure.
4. To explain selection and repetition statements in 'C' Language
5. To explain arrays to solve problems
6. To explain strings and string operations
7. To learn how to write modular programming in 'C' Language.

**UNIT - I**

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, operating system functions, language processor concepts.

Overview of C Language : Program structure and simple programs using scanf and printf functions.

Data representations- Binary, octal, hexa number systems, ASCII and EBCDIC, data types, Identifiers, Variables, Constants, declarations.

**UNIT - II**

Operators, Expressions, Precedence and Associativity, evaluation of expressions, sample programs using expressions, Type conversions, unformatted I/O.

Algorithms- control structure – grouping, selectors, repetitions.

Step wise refinement, flowchart.

**UNIT - III**

Statements- Selection Statements – if and switch statements, algorithm and program example using selectors.

Repetition statements ( loops)-while, for, do-while statements, algorithm development using repetition and programs using repetition, break, continue, goto, exit, Simple C Program examples.

**UNIT - IV**

Arrays – Introduction, declaration, reading and printing arrays , programs using arrays, two – dimensional arrays,

Multidimensional arrays, C program examples.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, C program examples.

## **UNIT – V**

Functions- procedural abstraction, function declarations, function calls and parameter passing, Standard functions, Storage classes- recursion- recursive functions, example C programs.

### **Course Outcomes:**

Upon completion of this course the students will have an:

1. Ability to design algorithmic solutions to problem
2. Ability to convert algorithms to C-Programs
3. Ability to write, compile and debug programs in C Language
4. Ability to write Programs using selection and repetition statements
5. Ability to write programs using Arrays and Strings
6. Ability to design structured programming.

### **TEXT BOOKS:**

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.

### **REFERENCE BOOKS:**

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. C for All, S. Thamarai Selvi, R.Murugesan, Anuradha Publications.
3. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.
4. Programming in C, Ajay Mittal, Pearson.
5. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
6. Problem solving with C, M.T.Somasekhara, PHI
7. Programming with C, R.S.Bickar, Universities Press.
8. Computer Programming & Data Structures, E.Balagurusamy, 4th edition, TMH.

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**(A51006) ENGINEERING GRAPHICS – I**

**Course Objectives:**

1. To visualize and communicate geometrical elements like Polygons, Curves, Conic Sections, Cycloids and Involutives
2. To understand the fundamentals of geometry like Plane, Diagonal and Vernier Scales and its applications in design and manufacturing of various engineering components.
3. To understand the fundamentals of geometry like Polygons and Involutives and its applications in design and manufacturing of various engineering components.
4. To understand the fundamentals of geometry like Planes and its applications in design and manufacturing of various engineering components.
5. To understand the fundamentals of geometry like Solids and its applications in design and manufacturing of various engineering components.

**UNIT – I**

Introduction to Engineering Drawing: Drawing Instruments and their uses, types of lines, use of pencils, Lettering, Rules of dimensioning.

Construction of polygons Practice only.

Curves used in Engineering Practice and their Constructions.

Conic Sections: Ellipse, Parabola, Hyperbola including the Rectangular Hyperbola - General method only.

Cycloidal curves - Cycloid, Epicycloid and Hypocycloid

**UNIT – II**

Introduction to Scales: Construction of Plain, Diagonal, and Vernier Scales.

Involutives of Circle & Regular Polygons.

**UNIT – III**

Drawing of Projections or Views (Orthographic Projection in First Angle Projection Only): Principles of Orthographic Projections – Conventions – First and Third Angle Projections, Projection of Points, Projection of Lines - inclined to both planes, True lengths. (**Traces, Mid points** can be removed)

**UNIT – IV**

Projections of Planes: Projections of regular Planes, traces, Projections of Planes on Auxiliary planes.

**UNIT – V**

Projections of Solids: Projections of Regular Solids – Regular Polyhedra, solids of revolution, Axis inclined to both planes – Change of position and Auxiliary plane method.



**Course Outcomes:**

1. To know the importance of Engineering Graphics and to represent the various Curves, Conic Sections, and Cycloids used in Engineering Graphics.
2. To Draw and understand the Construction of Plane, Diagonal and Vernier Scales used in Engineering Graphics and also represent the Construction of Polygons and Involutés.
3. To Draw and understand the Principles involved in Orthographic Projections and to represent the Principles involved in Points, Lines and Traces.
4. To Draw and understand the construction Principles involved in Planes.
5. To Draw and understand the construction Principles involved in Solids.

**TEXT BOOKS:**

1. Engineering Drawing, N.D. Bhatt / Charotar publishers
2. Engineering Drawing, K.L.Narayana and Kannaiah / Scietech publishers.

**REFERENCES:**

1. Engineering Drawing, K.Venugopal/G.Sreekanjana, New Age International Publishers.
2. Engineering Drawing, Basant Agarwal, TMH

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**(A51007)ENGINEERING MECHANICS – I**

**Course Objectives:**

1. To apply the knowledge of mechanics for engineering problems
2. To develop an understanding of the principles of statics bodies.
3. To analyse the bodies with applications of friction.
4. To develop the geometric shapes for composite sections
5. To develop the moment of inertia of the geometric shapes for composite sections

**UNIT-I**

Introduction to Engineering Mechanics - Basic Concepts

**System of Forces:** Coplanar Concurrent Forces - Components in Space - Resultant - Moment of Force and its Application - Couples and Resultant of Force Systems.

**UNIT-II**

**Equilibrium of Systems of Forces:** Free Body Diagrams, Equations of Equilibrium of Coplanar and Spatial System of forces. Lamé's Theorem.

**UNIT-III**

**Friction:** Basic concepts, Types of Friction, cone of friction, Applications of Friction: Wedge friction, Screw friction and Belt friction

**UNIT-IV**

**Centroid:** Centroids of simple figures (from basic principles) Centroids of Composite Figures.

**Centre of Gravity:** CG of simple bodies (from basic principles), CG of composite bodies, Pappus theorem.

**UNIT - V**

**Area Moment of Inertia:** Definition - Polar Moment of Inertia, Transfer Theorem, MI of Composite Figures, Product of Inertia, Transfer Formula for Product of Inertia.

**Mass Moment of Inertia:** MI of Masses, Transfer Formula for MMI, MMI of composite bodies.

**Course Outcomes:**

1. To introduce the basic principles of mechanics applicable to rigid bodies in equilibrium.
2. Construct free body diagrams and develop appropriate equilibrium equations.
3. Analyse the systems with friction.
4. Determine the centroid and centre of gravity for composite areas.
5. Determine the moment of inertia for composite areas

**TEXT BOOKS:**

1. Engineering Mechanics by Ferdinand. L. Singer
2. Engineering Mechanics by S.S.Bhavikatti J.G.Rajasekharappa.

**REFERENCE BOOKS:**

1. Engineering Mechanics by Timoshenko & Young.
2. Engineering Mechanics by Meriam and Kraize
3. Engineering Mechanics by K.L.Kumar / Tata McGraw Hill.
4. Engineering Mechanics by A. K. Tayal.

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**(A51201)COMPUTER PROGRAMMING – I LAB**

**Course Objectives:**

1. To make the student learn Linux commands
2. To make the student learn a programming language
3. To teach the student to write programs in C to solve the problems
4. To make the student to write the programs using control statements
5. To make the student to use arrays for solving the problems
6. To make the student to write modular programming

**Week 1:**

1. Familiarity with Linux Commands – Login, Wild Chars, ls, cp, mv, mkdir, wc, chdir.
2. Creation of text files using vi editor.

**Week 2:**

Using vi editor – perform operations of pattern search, insertion, deletion and substitution operations

**Week 3:**

Write simple programs using scanf and printf functions and familiarity with format strings.

**Week 4 & 5:**

Write programs to illustrate the Assignment Operators

**Week 6:**

Write programs to illustrate the Logical Operators

**Week 7:**

Write programs to illustrate the Relational Operators

**Week 8:**

Write programs using If Statement

**Week 9:**

Write programs using while, do-while loops

**Week 10:**

Write programs using for loop

**Week 11:**

Write programs to illustrate one dimensional arrays

**Week 12:**

Write programs to illustrate two dimensional arrays

**Week 13:**

Write programs to illustrate String concepts.

**Week 14:**

Write programs using functions

**Week 15:**

Review

**TEXT BOOKS:**

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.

**REFERENCE BOOKS:**

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. C for All, S. Thamarai Selvi, R.Murugesan, Anuradha Publications.
3. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.
4. Programming in C, Ajay Mittal, Pearson.
5. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
6. Problem solving with C, M.T.Somasekhara, PHI
7. Programming with C, R.S.Bickar, Universities Press.
8. Computer Programming & Data Structures, E.Balagurusamy, 4th edition, TMH.

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**(A51202)English Language Communication Skills Lab-I**

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**

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

**Learning Outcomes:**

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

**Syllabus:** English Language Communication Skills Lab shall have two parts:

**a. Computer Assisted Language Learning (CALL) Lab**

**b. Interactive Communication Skills (ICS) Lab**

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

**Exercise-I**

**CALL Lab:** Introduction to Sounds of English Language  
Speech Sounds  
Vowels and Consonants

**Exercise-II**

**ICS Lab:** Ice-Breaking activity and Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

**Exercise-III**

**CALL Lab:** Structure of Syllables  
Past Tense Marker and Plural Marker  
Weak Forms and Strong Forms  
Consonant Clusters.

**Exercise-IV**

**ICS Lab:** Situational Dialogues -Role-Play- (Self-introduction and introducing others- Greetings- Apologies- Requests), JAM Session.

**Exercise-V**

**ICS Lab:** Social and Professional Etiquette and Telephone Etiquette-Tenses-Non-Verbal Communications.

**Minimum Requirement of infra structural facilities for ELCS Lab:**

**1. Computer Assisted Language Learning (CALL) Lab: the Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners. **System Requirement (Hardware component):**

**(computers with suitable configuration as per the purchased software demands)**

Computer network with

Lan with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

**2. Interactive Communication Skills (ICS) Lab:**

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

**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):**

1. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
2. **Strengthen Your Steps** - Dr. M. Hari Prasad and others, Maruthi Publications
3. Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
4. Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
5. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
6. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
7. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
8. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP
9. Nambiar, K.C. 2011. Speaking Accurately. A Course in International Communication. New Delhi: Foundation
10. Soundararaj, Francis. 2012. Basics of Communication in English. New Delhi: Macmillan
11. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
12. **English Pronouncing Dictionary** Daniel Jones Current Edition with CD.
13. **A textbook of English Phonetics for Indian Students** by T. Balasubramanian (Macmillan)
14. **Lab Manual:** A Manual entitled “**English Language Communication Skills (ELCS) Lab Manual- cum- Work Book**”, published by Cengage Learning India Pvt. Ltd, New Delhi. 2013

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**(A51203)ENGINEERING PHYSICS AND APPLIED CHEMISTRY LAB - I**

**Engineering Physics Lab:**

Any Five Experiments from the following:

1. Torsional Pendulum Expt. to determine the rigidity modulus of material of a wire
2. Melde's experiment
3. Newton's Rings
4. Dispersive Power of the material of a Prism using Spectrometer
5. Stewart & Gee's experiment
6. LED Characteristics
7. LASER Characteristics
8. Diffraction Grating with laser source

**APPLIED CHEMISTRY LAB – I:**

**Course objectives:**

1. To impart fundamental knowledge in handling the equipment /glassware and chemicals in the chemistry laboratory .
2. To offer hands on experience on the basic equipment related to engineering chemistry.
3. For practical understanding of theoretical concepts of chemistry.

**Number of periods = 3 periods in two weeks per batch**

**Perform any seven experiments:**

1. Fundamentals of volumetric analysis : Determination of strength of an acid (HCl)
2. Estimation of ferrous iron by dichrometry
3. Estimation of hardness of water by EDTA method.
4. Determination of iron by permanganometry.
5. Determination Surface Tension of lubricants.
6. Determination of alkalinity of water.
7. Determination of total dissolved solids in water.
8. Determination of free chlorine or chlorides in water.



9. Determination of reactivity of given metals
10. Determination of the rate constant of acid catalyzed hydrolysis of methyl acetate.

**TEXT BOOKS:**

1. Fundamentals of physics-D. Halliday , R.Resnick & John Wiley.
2. Optics- A. Ghatak, Tata McGrawhill.
3. Practical physics- GL Squires.
4. Vogel's Textbook of Quantitative Chemical Analysis
5. Essentials of experimental engineering chemistry , Shashi Chawla, Dhanpat Rai & Co
6. Laboratory manual of engineering chemistry, S.K.Bhasin and Sudha Rani, Dhanpat Rai & Co.

**REFERENCE BOOKS:**

1. Text Book of engineering chemistry by R. N. Goyal and Harmendra Goel.
2. A text book on experiments and calculations . S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

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**(A51204)ENGINEERING WORKSHOP – I**

**Course Objectives:**

1. To impart the knowledge regarding the various techniques, skills and tools necessary for engineering workshop practice.
2. To provide the students with hands on experience on different trades of engineering workshop like black smithy, foundry and welding.
3. To learn about the machines in view of constructions details, different operations to be performed on the machines and different tools.
4. To enhance the practical approach towards machine tools.
5. To introduce the concepts of power tools in constructions , wood working, electrical engineering and mechanical engineering in manufacturing applications

**1. TRADES FOR EXERCISES:**

**At least THREE exercises from each trade:**

1. Carpentry
2. Fitting
3. Tin-smithy and development of jobs carried out and soldering.
4. House-wiring

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

1. Plumbing
2. Machine shop

**Course Outcomes:**

1. To make a lap joint
2. To make a dovetail- joint
3. To make a T-briddle joint
4. To prepare a flat filing
5. To prepare a step cutting
6. To prepare a angular cutting
7. To prepare a open scoop
8. To prepare a rectangular tray
9. To prepare a square tin
10. To understand and to give the connections for one light point control by one single pole switch .

11. To understand and to give the connections for one light point control by two-two way switches (parallel connections)
12. To understand and to give the connections for to-connect a electrical bell by using bell push
13. To understand and to give the connections for two light point controlled by one single pole switch.
14. To prepare a pipe joint , tap- connections by using plumbing
15. To apply different operations to be performed on the lathe machines.

**TEXT BOOKS:**

1. Work shop manual - P.Kannaiah/K.L Narayana/scitech publishers.
2. Workshop manual by Venkat Reddy

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<b>3</b>	<b>1/-/-</b>	<b>3</b>

**(A52002)MATHEMATICS-II**  
**(Mathematical Techniques)**

**Course Objectives:**

1. To introduce some special functions like Gamma, Beta and learn how to evaluate definite integrals with the help of special functions.
2. Able to know the Laplace , Inverse Laplace transform and sol of ODE by using Laplace transforms
3. Evaluate the multiple integrals and analyze the DEL properties.
4. Apply the theorems by using line, surface and volume integrals
5. Determine the Fourier coefficients of a given function. Analyze the characteristics and properties of Fourier transforms

**UNIT-I: Laplace transform and its applications to Ordinary differential equations**

Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms – Application of Laplace transforms to ordinary differential equations.

**UNIT-II: Gamma and Beta Functions:**

Gamma and Beta Functions-Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.

**UNIT – III: Multiple Integrals**

Multiple integrals - double and triple integrals – change of order of integration- change of variables. Gradient- Divergence- Curl and their related properties - Potential function - Laplacian and second order operators.

**UNIT-IV: Vector Calculus**

Line integral – work done — Surface integrals - Flux of a vector valued function. Vector integrals theorems: Green's – Stoke's and Gauss's Divergence Theorems (Only Statements & their Verifications).

## **UNIT-V: Fourier Series**

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

### **Course Outcomes:**

1. Apply Beta and Gamma functions to evaluate many integrals which cannot be expressed in terms of elementary functions.
2. Apply Laplace transform to solve differential equations which will be converted to algebraic
3. Evaluate double integrals by changing variables , changing order and triple integration Calculate line integrals along piecewise smooth paths, interpret such quantities as work done by a force
4. Apply Green's theorem to evaluate line integrals along simple closed contours on the plane, Stoke's theorem to give physical interpretation of the curl of a vector field and Divergence theorem to give physical interpretation of the divergence of a vector field
5. Develop Fourier series of periodic functions.

### **TEXT BOOKS:**

1. Grewal B.S (2007), Higher Engineering Mathematics, 40<sup>th</sup> Edition, New Delhi, Khanna Publishers.
2. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Mathematical Methods, 10<sup>th</sup> Revised Edition, New Delhi, S. Chand & Company Limited.
3. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Engineering Mathematics Vol - I, 10<sup>th</sup> Revised Edition, New Delhi, S. Chand & Company Limited.
4. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley.

### **REFERENCE BOOKS:**

1. Shahanaz Bathul (2007), Mathematical Methods, 3<sup>rd</sup> Edition, Hyderabad, Right Publishers.
2. Jain R. K., and Iyengar S. R. K (2008), Advanced Engineering Mathematics, 3<sup>rd</sup> Edition, New Delhi, Narosa Publication House.
3. Dass H.K. and Rajnish Verma Er (2007), Higher Engineering Mathematics, First Edition, New Delhi, S. Chand & Company Limited.
4. Integral Transforms by A.R.Vasista
5. Schaum's outline series on Vector Analysis; Linear Algebra.
6. Larry C. Andrews and Bhimsen K. Shivamoggi, Integral Transforms for Engineers, Prentice – Hall of India Private Limited, New Delhi.
7. Mathematical Methods of Science and Engineering (Aided with Matlab) Kanti B.Datta (2012), Seventh Edition, CENGAGE Learning.

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**(A52001)English - II**

**1. INTRODUCTION:**

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

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc. The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.

**2. OBJECTIVES:**

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

**LEARNING OUTCOMES:**

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

**SYLLABUS:**

**Listening Skills:**

**Objectives**

1. To enable students 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, to distinguish between them to mark stress and recognise and use the right intonation in sentences.

- i. Listening for general content
- ii. Listening to fill up information
- iii. Intensive listening
- iv. 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
  - Role play – Individual/Group activities (Using exercises from the five units of the prescribed text: **Skills Annexe - Functional English for Success**)
  - Just A Minute(JAM) Sessions.

### **Reading Skills:**

#### Objectives

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

**NOTE:** The students will be trained in reading skills using the prescribed text for detailed study.

They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

### **Writing Skills:**

#### Objectives

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

- Formal and informal letter writing
- Describing graphs using expressions of comparison

## TEXTBOOKS PRES

### CRIBED:

#### For Detailed study:

**First Textbook: “Skills Annexe -Functional English for Success”,** Published by Orient Black Swan, Hyderabad

#### For Non-detailed study:

**Second text book “Epitome of Wisdom”,** Published by Maruthi Publications, Guntur

### UNIT-I

Chapter 1: ‘**Leela’s Friend**’ by R.K. Narayan from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad

2 hrs

G – Present Tense	2
V – Synonyms and Antonyms	2

### UNIT-II

Chapter 2: ‘**Human Values and Professional Ethics**’ from “Skills Annexe -Functional English for Success” Published by Orient Black Swan, Hyderabad

2 hrs

L -Listening for specific details and information	1
S- Narrating, expressing opinions and telephone interactions	1
R -Reading for specific details and information	1
W- Writing formal letters and CVs	1

### UNIT-III

Chapter 3: ‘**The Convocation Speech**’ by N.R. Narayanmurthy’ from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad

2 hrs

G- Past and future tenses	2
V- Vocabulary - idioms and Phrasal verbs	
	2

### UNIT-IV

Chapter 4: ‘**Sports and Health**’ from “Skills Annexe -Functional English for Success” Published by Orient Black Swan, Hyderabad

2 hrs

L- Critical Listening and Listening for speaker’s tone/ attitude	1
S- Group discussion and Making presentations	1
R- Critical reading, reading for reference	1
W-Project proposals; Technical reports, Project Reports and Research Papers	
	1



## UNIT-V

Chapter5: 'The Secret of Work' from "Epitome of Wisdom", Published by Maruthi Publications Hyderabad.

2 hrs

G- Adjectives, Prepositions and Concord

2

V- Collocations and Technical Vocabulary

2

### REFERENCES:

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi.2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw– Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixon, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw –Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan ,Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publishers

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**(A52003)ENGINEERING PHYSICS – II**

**Course Objectives:**

1. To impart the knowledge of mathematics and science to determine the working of semiconductor devices.
2. Emphasize the study of Quantum mechanics to apply it to solve problems of micro & macro particles.
3. To have the knowledge of laser technology to know about the working & applications of laser.
4. To inculcate the importance of nanotechnology which has the world wide importance.

**UNIT- I PRINCIPLES OF QUANTUM MECHANICS:**

08

Waves and particles – De Broglie hypothesis - Matter waves - Davisson and Germer experiment – Schrodinger Wave Equation – Wave function and its Physical Significance - Particle in one dimensional potential box(wave functions, probability densities and energy states).

**UNIT- II FREE ELECTRON THEORY OF METALS:**

06

Classical Theory, Electrical Conductivity and Ohm's Law – Drawbacks, Sommerfield theory (Qualitative), Density of States, Effect of temperature on the Fermi-Dirac distribution.

**BAND THEORY OF SOLIDS:**

06

Electron in a periodic potential – Bloch Theorem - Kronig-Penney model (Qualitative) – Origin of energy band formation in solids – Classification of materials into conductors, semiconductors & Insulators - Concept of effective mass of an electron.

**UNIT- III SEMICONDUCTOR PHYSICS:**

08

Fermi level in Intrinsic and Extrinsic semiconductors - Intrinsic semiconductor and carrier concentration – Extrinsic semiconductor and carrier concentration – Characteristics of p-n junction diode - Hall effect, LED, Photodiode.

**FIBRE OPTICS**

04

Basic principle of optical fibre, Acceptance angle, Acceptance cone, numerical aperture (Quantitative), Types of optical fibre, applications of optical fibre.

**UNIT IV LASERS:**

06

Characteristics of Lasers – Spontaneous and Stimulated Emission of radiation, meta stable state, population inversion, lasing action, Einstein's coefficients and relation between them — Ruby Laser – Helium-Neon Laser –Semiconductor Laser – Applications of lasers.

**UNIT V BASIC PRINCIPLES OF NANO SCIENCE:**

07

Introduction, surface to volume ratio, quantum confinement – Fabrication of nano materials- Top down fabrication, Bottom up fabrication: sol-gel Technique, CVD method– Characterization (XRD & TEM) - Applications of nanomaterials.

**TEXT BOOKS:**

- (1) Modern Engineering Physics by, Dr.K. Vijay Kumar & Dr.S.Chandralingam:S .Chand.Co
- (2) Engineering Physics by P K palanisamy :Scitech publication
- (3) Solid State Physics by M Armugam; Anuradha Publications

**REFERENCE BOOKS:**

- (1) Introduction to Solid State Physics by Charles Kittel : John Wiley & Sons
- (2) Engineering Physics by R.K.Gaur and S.L.Gupta; Dhanpat Rai and Sons
- (3) Engineering Physics by V Rajendran; McGraw hill education private ltd.
- (4) A Text book of Engineering Physics by M N Avadhanulu, P G Kshirsagar; S Chand
- (5) Engineering Physics by K Malik, A K Singh; Tata Mc Graw hill book publishers
- (6) Engineering Physics by M.R.Srinivasan, New Age Publishers

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**(A52004)APPLIED CHEMISTRY – II**

**Course objectives:**

1. To appraise the students about the importance and role of chemistry in the field of Engineering by explaining the relevant topics.
2. To enable students to apply the knowledge acquired in improving the properties of engineering materials.
3. To provide the students with the necessary knowledge to solve the problems and make decisions with regards to the application of materials in a variety of engineering disciplines.
4. To equip the students with the required fundamentals of engineering chemistry to carry out in the interdisciplinary research such that the findings benefit the common man.
5. After the completion of the course, the student would understand about the important chemistry of polymers ,corrosion and its control , material chemistry , phase rule and energy sources.

**UNIT-I: POLYMER CHEMISTRY:**

Introduction, classification of polymer, Types of polymerization (addition and condensation, *mechanisms not included*). Plastics, types of plastics -Thermoplastics and thermosetting plastics. Compounding and moulding of plastics. Preparation, properties and engineering applications of PVC, Teflon and Bakelite. Fibers: Nylon 6, 6 and terelene (Dacron). Elastomers , natural rubber, structure, vulcanization. Synthetic rubbers : Buna-S , butyl rubber , Thikol rubber. Conducting polymers: Classification, mechanism of conduction, Poly acetylene - preparation and effects of doping on conduction. Applications of conducting polymers.

**UNIT II: MATERIALS CHEMISTRY:** Cement: composition of Portland cement, manufacture of Port land cement, setting & hardening of cement (reactions). Admixtures for cement.

Refractories: Classification, Properties of refractory materials.( refractoriness, RUL test, spalling, dimensional stability and porosity). Characteristics of a good refractory.

Lubricants: Classification of lubricants, mechanisms of lubrication, properties of lubricants: Viscosity and viscosity index, cloud point, pour point, flash & fire point,

Insulators : Classification of insulators, characteristics of thermal & electrical insulators and applications.

**UNIT III: PHASE RULE and ALLOYS :** Definitions - phase, component, degree of freedom, and phase rule equation. Phase diagrams - one component system: water system. Two component system: lead- silver system. Alloys: classification preparation and objectives in alloy making.

**Unit IV: FUELS:** Classification, advantages and disadvantages of solid, liquid and gaseous fuels. Solid fuels - coal – classification , analysis - proximate and ultimate analyses and their significance Liquid fuels - petroleum -refining of petroleum , cracking : moving bed catalytic cracking. Knocking- octane number and cetane

number. synthetic petrol - Fischer Tropsch's process; Gaseous fuels – LPG and CNG , Combustion , quantity of air required for combustion of the fuel, calorific value of fuel - HCV, LCV, determination of calorific value of a gaseous fuel by Junkers calorimeter. Numerical problems. Flue gas and its analysis by Orsat apparatus.

**UNIT V: ADVANCED ENGINEERING MATERIALS:** Biodegradable polymers, types , examples: Polyhydroxy butyrate (PHB) ,Poly-Hydroxybutyrate-co-b-Hydroxy valerate (PHBV) ,Polyglycolic acid (PGA) , Polylactic acid (PLA) ,Poly (̂-caprolactone) (PCL). Applications of biodegradable polymers.

Composite materials: Constituents of composite materials. Types of composite materials. Advantages and engineering applications of composite materials.

Biofuels – Biodiesel, general methods of preparation and advantages.

### **Course Outcomes:**

1. Conscientious Students Expatiate And realize the immense importance of polymers and their applicability.
2. All the students under ambit no doubt derive the ins and outs of the construction items their properties and present drive.
3. The abstract phenomenon and the allied industrial applications got in bibed as well transfer to the industry.
4. Engineering minded students well realized the present demand of energy resources in all forms and try to be frugal.
5. Scintillating category students ardent enough in familiarizing the engineering materials on obvious reasons and pass it on.

### **TEXT BOOKS:**

1. Engineering chemistry –II, by NYS.Murthy, Pearson, India.
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).

### **REFERENCE BOOKS:**

1. Text Book of Engineering Chemistry by Shasi Chawla, Dhantpat Rai publishing Company, New Delhi (2008).
2. Engineering Chemistry by B. Siva Shankar, Mc.Graw Hill Publishing Company Limited New Delhi -2006.

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**(A52005)ENGINEERING MECHANICS – II**

**Course Objectives:**

1. To develop the analysis of frames with application
2. To teach the basic principles of mechanics applicable to the motion of particles and rigid bodies.
3. To introduce with mathematical description of the plane motion of rigid bodies.
4. To develop the work-energy equation for translations.
5. To develop the equilibrium conditions in terms of virtual work.

**UNIT-I**

**Analysis of perfect frames** ( Analytical Method) – Types of Frames – Assumptions for forces in members of a perfect frame, Method of joints, Method of sections, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

**UNIT-II**

**Kinematics:** Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

**UNIT-III**

**Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies

**UNIT-IV**

**Work – Energy Method:** Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

**UNIT-V**

Principle of virtual work: Equilibrium of Ideal systems, efficiency of simple machines, stable and unstable equilibriums

**Course Outcomes:**

1. Determine the axial forces in the members of trusses.
2. Determine the kinematic relations of particles & rigid body motion.
3. Apply equations of kinetics motions to particle and rigid body motion.
4. Analyze motion of particles & rigid bodies using the principle of work-energy.
5. Determine the equilibrium conditions(FBD) in terms of virtual work

**TEXT BOOKS:**

1. Engineering Mechanics by Ferdinand. L. Singer
2. Engineering Mechanics by S.S.Bhavikatti J.G.Rajasekharappa.

**REFERENCE BOOKS:**

1. Engineering Mechanics by Timoshenko & Young.
2. Engineering Mechanics by Meriam and Kraize
3. Engineering Mechanics by K.L.Kumar / Tata McGraw Hill.
4. Engineering Mechanics by A. K. Tayal.

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**(A52006)COMPUTER PROGRAMMING - II**

**Course Objectives:**

1. To explain various sorting and searching techniques
2. To explain structures, unions, and enumeration types and operations on them
3. To understand dynamic memory management using pointers.
4. To introduce basic data structures such as stacks, queues and linked lists.
5. To explain various types of files in 'C' Language.

**UNIT - I**

Searching and Sorting – Sorting- selection sort, bubble sort, Insertion sort, Quick Sort, Merge sort, Searching-linear and binary search methods.

**UNIT - II**

Structures - Declaration, initialization, accessing structures, operations on structures, nested structures, arrays of structures, Unions, Enumerated types, Type Definition (typedef), C programming examples.

**UNIT - III**

Pointers – Concepts, declarations, usage, pointers to pointers, pointer expressions, Arrays and Pointers, array of pointers, parameter passing of pointers, pointers to void, pointers to functions, structures through pointers, self referential structures, C programming examples

**UNIT - IV**

Lists- Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Push and Pop Operations, Queues- Enqueue and Dequeue operations.

**UNIT - V**

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions, command –line arguments, C program examples.

**Course Out Comes:**

1. Upon completion of this course the students will have an:
2. Ability to design various sorting and searching techniques
3. Ability to design user defined data types to solve real world problems
4. Ability to manage heap memory
5. Ability to implement and use data structures like stacks, queues and linked lists



6. Ability to create and use various types of files in 'C' Language.

**TEXT BOOKS:**

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.

**REFERENCE BOOKS:**

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. C for All, S. Thamarai Selvi, R.Murugesan, Anuradha Publications.
3. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.
4. Programming in C, Ajay Mittal, Pearson.
5. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
6. Problem solving with C, M.T.Somasekhara, PHI
7. Programming with C, R.S.Bickar, Universities Press.
8. Computer Programming & Data Structures, E.Balagurusamy, 4th edition, TMH.

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**(A52007)ENGINEERING GRAPHICS - II**

**Course Objectives:**

1. To visualize and communicate geometrical elements like Sections of Solids, Development of Surfaces and intersections of similar Solids and its applications in design and manufacturing of various engineering components.
2. To understand the fundamentals of geometry like Isometric Projections and its applications in design and manufacturing of various engineering components.
3. To understand the fundamentals of geometry like Conversion of Orthographic Views to Isometric Views and its applications in design and manufacturing of various engineering components.
4. To understand the fundamentals of geometry like Perspective Projections and its applications in design and manufacturing of various engineering components.
5. To understand the fundamentals of geometry like Computer Aided drafting and its applications in design and manufacturing of various engineering components.

**UNIT – I**

**Sections of Solids:** Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views

**UNIT – II**

**Development of Surfaces:** Development of Surfaces of Right Regular Solids – Prisms, Cylinders, Pyramids, Cones and their parts.

**Intersection of Similar Solids:** Line method - Intersection of Prism Vs Prism, Cylinders Vs Cylinder Simple treatment only. **(Dissimilar category- this part can be removed.)**

**UNIT –III**

**Isometric Projections/views:** Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines.

**UNIT –IV**

**Transformation of Projections:** Conversion of Orthographic Views to Isometric Views and Isometric views to orthographic views.

**UNIT –V**

**Perspective Projection:** Principle, Perspective elements, Perspective View of Points, Lines, Plane Figures and Simple Solids; Vanishing Point Method, Visual Ray Method.

**Course Outcomes:**

1. To Draw and understand about the Sections of Solids, Development of Surfaces and intersections of similar Solids used in Engineering Graphics.
2. To Draw and understand the construction Principles involved in Isometric Projections.
3. To Draw and understand about Conversion of Orthographic Views to Isometric Views and also represent it's Transformation of Projections.
4. To Draw and understand about the construction Principles involved in Perspective Projections.
5. To Draw and understand about the Computer Aided Drafting used in Engineering Graphics.

**TEXT BOOKS:**

1. Engineering Drawing, N.D. Bhatt / Charotar publishers
2. Engineering Drawing, K.L.Narayana and Kannaiah / Sciotech publishers.

**REFERENCES:**

1. Engineering graphics with Auto CAD- R.B Choudary / Anuradha Publishes
2. Engineering Drawing, K.Venugopal/G.Sreekanjana, New Age International Publishers.
3. Engineering Drawing, Basant Agarwal, TMH
4. Engineering Drawing, R. K. Dhawan, S.Chand Publishers.

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**(A52201)English Language Communication Skills Lab-II**

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**

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

**Learning Outcomes:**

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

**Syllabus:** English Language Communication Skills Lab shall have two parts:

1. **Computer Assisted Language Learning (CALL) Lab**
2. **Interactive Communication Skills (ICS) Lab**

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

**Exercise-I**

**CALL Lab:** Minimal Pairs  
Word accent and Stress Shifts  
Listening Comprehension

**Exercise-II**

**ICS Lab:** Descriptions- Narrations- Giving Directions and Guidelines  
Question Tags and One-Word Substitutes

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

**Exercise-III**

**CALL Lab:** Intonation and Common Errors in Pronunciation.-Neutralization of Mother Tongue Influence and Conversation Practice.

**Exercise-IV**

**ICS Lab:** Extempore - Oral Presentation Skills  
Active and Passive Voice,  
Common Errors in English,

**Exercise-V**

**ICS Lab:** Information Transfer

Public Speaking

Reading Comprehension

Job Application with Resume preparation.

**Minimum Requirement of infra structural facilities for ELCS Lab:**

**1. Computer Assisted Language Learning (CALL) Lab:**

**The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

**System Requirement (Hardware component):**

**(computers with suitable configuration as per the purchased software demands)**

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

i) P – IV Processor

a) Speed – 2.8 GHZ

b) RAM – 512 MB Minimum

c) Hard Disk – 80 GB

ii) Headphones of High quality

**2. Interactive Communication Skills (ICS) Lab:**

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

**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):**

1. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
2. Strengthen Your Steps - Dr. M. Hari Prasad and others, Maruthi Publications
3. Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
4. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
5. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
6. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
7. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
8. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP
9. Nambiar, K.C. 2011. Speaking Accurately. A Course in International Communication. New Delhi: Foundation
10. Soundararaj, Francis. 2012. Basics of Communication in English. New Delhi: Macmillan
11. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
12. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)
13. Lab Manual: A Manual entitled “English Language Communication Skills (ELCS) Lab Manual- cum- Work Book”, published by Cengage Learning India Pvt. Ltd, New Delhi. 2013.

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**(A52202)ENGINEERING PHYSICS AND APPLIED CHEMISTRY LAB - II**

**ENGINEERING PHYSICS:**

Any Five Experiments from the following:

1. Energy gap of a semiconductor material
2. Decay of charge - R C circuit and time constant
3. L C R Series circuits
4. Diffraction Grating with sodium vapor lamp
5. Single Slit with laser source
  
6. Numerical Aperture of an Optical Fibre
7. Bending losses of an Optical Fibre
8. Seebeck Effect

**APPLIED CHEMISTRY LAB – II:**

**Course objectives:**

1. To impart fundamental knowledge in handling the equipment /glassware and chemicals in the chemistry laboratory.
2. To offer hands on experience on the basic equipment related to engineering chemistry.
3. For practical understanding of theoretical concepts of chemistry.

**Number of periods = 3 in two weeks.**

(Any seven experiments out of the following ten experiments should be performed)

1. Estimation of HCl by conductometry using standard NaOH solution.
2. Estimation of HCl by potentiometry using standard NaOH solution.
3. Determination of strength of an acid by pH metry
4. Determination of cloud point and pour point of a lubricant
5. Synthesis of phenol – formaldehyde and urea formaldehyde resins .
6. Preparation of Biodiesel from Waste Vegetable Oil (WVO).
7. Determination of viscosity of sample oil .
8. Estimation of Copper by Colorimetric method.
9. Preparation of thikol rubber and nylon 6:6
10. Determination of carbon residue /flash point –fire point of a lubricant

**Course Outcomes:**

1. Awareness in obtaining some important products with enough yield.
2. gets familiar with synthesis of thermosetting plastics.

**TEXT BOOKS:**

1. Fundamentals of physics-D. Halliday , R.Resnick & john wiley.
2. Optics- A. Ghatak,Tata Magrawhill.
3. Practical physics- GL Squires.
4. 1. Vogel's Textbook of Quantitative Chemical Analysis
5. Essentials of experimental engineering chemistry , Shashi Chawla, Dhanpat Rai & Co
6. Laboratory manual of engineering chemistry, S.K.Bhasin and Sudha Rani , Dhanpat Rai & Co.

**REFERENCE BOOKS:**

1. Text Book of engineering chemistry by R. N. Goyal and Harmendra Goel.
2. A text book on experiments and calculations. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

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**(A52203)ENGINEERING WORKSHOP – II AND IT WORKSHOP**

**Course Objectives:**

1. To impart the knowledge regarding the various techniques, skills and tools necessary for engineering workshop practice.
2. To provide the students with hands on experience on different trades of engineering workshop like black smithy, foundry and welding.
3. To learn about the machines in view of constructions details, different operations to be performed on the machines and different tools.
4. To enhance the practical approach towards machine tools.
5. To introduce the concepts of power tools in constructions, wood working, electrical engineering and mechanical engineering in manufacturing applications.

**1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

1. Black smithy
2. Foundry
3. Welding

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

1. Plumbing
2. Machine shop
3. Power tools in construction, wood working, electrical engineering and mechanical engineering.

**Course Outcomes:**

1. To prepare a various shape of ( S-shape, T- shape, Z- shape)
2. To prepare a single piece and double piece pattern by using casting process
3. To make a lap-joint, but-joint and angular joint.
4. To prepare a pipe joint , tap- connections by using plumbing.
5. To apply different operations to be performed on the lathe machines.
6. To prepare a switch boards , wood drilling and threading different various sizes.



## **IT WORKSHOP:-**

### **Objectives:**

The IT Workshop for engineers is a training lab course spread over 40 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, and Power Point.

1. **IT Workshop-I:** Computer hardware, identification of parts, disassembly, assembly of computer to working condition, sample diagnostic exercises.
2. **IT Workshop-II:** Installation of operating system windows and Linux simple diagnostic exercises.

### **TEXT BOOKS:**

1. Work shop manual - P.Kannaiah/K.L Narayana/scitech publishers.
2. Workshop manual by Venkat Reddy

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**(A52204)COMPUTER PROGRAMMING II LAB**

**Course Objectives:**

1. To make the student to implement various sorting and searching techniques
2. To introduce the student to structures, unions, and enumeration types and operations on them
3. To introduce the student dynamic memory management using pointers.
4. To introduce basic data structures such as stacks, queues and linked lists.
5. To make the student to create various types of files in 'C' Language.

**Week 1:**

Review of Arrays and functions.

**Week 2:**

Write programs to illustrate the implementation of Bubble Sort and Selection Sort

**Week 3:**

Write programs to illustrate the implementation of Insertion Sort and Quick Sort

**Week 4:**

Write programs to illustrate the implementation of Merge Sort.

**Week 5:**

Write programs to illustrate the implementation of Binary Search and Linear Search.

**Week 6 & 7:**

Write programs to illustrate the various concepts of structures

**Week 8:**

Write programs to illustrate the concepts of accessing variables using pointers

**Week 9:**

Write programs to illustrate the implementation of call by reference

**Week 10:**

Write programs to illustrate the implementation of arrays using pointers

**Week 11:**

Write programs to implement structures using pointers

**Week 12:**

Write program to illustrate the implementation of Single Linked List

**Week 13:**

Write programs to illustrate Stack operations using arrays and pointers

**Week 14:**

Write programs to illustrate Queue operations using arrays and pointers

**Week 15:**

Write programs to illustrate the various concepts of files.

**Week 16:** Review.

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**(A53001) MATHEMATICS-III**

Prerequisite: Mathematics-I and Mathematics-II

**Course Objectives:**

1. To acquaint students with the fundamental concepts of Numerical Analysis
2. To develop an understanding of the role of Numerical Analysis in engineering.
3. To provide an understanding of the processes by which real life problems are analyzed
4. Able to know basic properties of standard partial differential equations to solve engineering problems.

**Course Outcomes:**

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

1. Be Familiar with numerical solution of Non Linear equations.
2. Be Familiar with numerical interpolation and approximation of functions.
3. Be Familiar with calculation and interpretation of errors in Numerical Methods
4. Apply Partial differential equations to solve complex engineering problems.

**UNIT-I: Solution of Non- linear Equations and Linear System of Equations.**

Solution of Algebraic and Transcendental Equations – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method. Solving system of non-homogeneous equations by L-U Decomposition method(Crout's Method)Jacobi's and Gauss-Seidel Iteration method.

**UNIT-II: Interpolation:**

Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols- Difference Equations - Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

**UNIT-III: Numerical Differentiation, Numerical Integration & Curve fitting**

Numerical Differentiation, Generalized Quadrature (Newton's Cote's formula), Trapezoidal, Simson's and Weddle's rules and problems. Curve fitting: Fitting a straight line – Second degree curve – exponential curve-power curve by method of least squares.

**UNIT – IV: Numerical solution of IVP's in ODE**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods –Predictor-Corrector Methods- Adams-Bashforth Method-Milne Thamsom Method.

**UNIT-V: Partial differential equations**

Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (Standard type) equations, Charpits Method, Method of separation of Variables for second order equations. Classification of general second order partial differential equations. Applications of Partial Differential Equations-One dimensional wave equation, Heat equation.

**TEXT BOOKS:**

1. Grewal B.S (2007), Higher Engineering Mathematics, 40<sup>th</sup> Edition, New Delhi, Khanna Publishers.
2. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Mathematical Methods, 10<sup>th</sup> Revised Edition, New Delhi, S. Chand & Company Limited.
3. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley.

**REFERENCE BOOKS:**

1. Shahanaz Bathul (2007), Mathematical Methods, 3<sup>rd</sup> Edition, Hyderabad, Right Publishers.
2. Jain R. K., and Iyengar S. R. K (2008), Advanced Engineering Mathematics, 3<sup>rd</sup> Edition, New Delhi, Narosa Publication House.
3. Introductory Methods of Numerical Analysis. S.S. Sastry, Prentice Hall.
4. Numerical Analysis (Paper IV), First Edition 2010, Telugu Akademi, Hyderabad.
5. Schaum's outline series on Matrices.
6. Mathematical Methods of Science and Engineering (Aided with Matlab) Kanti B.Datta (2012), Seventh Edition, CENGAGE Learning.

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**(A53002) BUILDING MATERIALS, CONSTRUCTION &  
PLANNING**

Prerequisite: - General sciences

**Course Objectives:**

- To provide the knowledge of various materials required in construction and their properties
- To provide the knowledge of design of various structural elements, form work and their planning

**Course Outcomes:**

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

- Have the knowledge of construction methodology, materials and its planning
- Know the functional design of various elements such as arches, lintels, floors, stairs, doors & windows
- Have the complete knowledge of form work and plastering.
- Get the innovative methods of construction by using the latest technology.

**Unit I**

**(a) Stone Masonry:** Cutting and dressing, selection of stones, types of stone masonry, principles of construction joints in masonry, lifting heavy stones, common building stones in India.

**(b) Brick Masonry:** Qualities of good bricks, classification of bricks, Tests on bricks as per IS codes, terms used in brickwork, commonly used types of bonds in brickwork such as stretchers and headers in English and Flemish bonds, principles of construction, Reinforced brickwork, brick noggin, parapets, copings, sills and corbels, brief introduction to cavity walls, load bearing and partition walls, Masonry construction using cement concrete blocks and clay blocks, precast construction, Introduction to methods and materials, precast elements like poles, cover, jallies, steps etc.

**Unit II**

**(a) Arches and lintels:** Terminology in construction, types, chajjas and canopies, precast lintel and arches.

**(b) Damp proofing:** Causes and effects of dampness, various methods of damp proofing, damp proofing in plinth protection, new techniques of damp proofing.

**(c) Floors:** General principles, types and method of construction, upper floors, finishing and testing of floor tiles, Synthetic and ceramic tiles.

**(d) Roofs:** Flat and pitched roofs, roof coverings, types and their construction, features, Thermal insulation.

**Unit III**

**(a) Stairs:** Types of stairs, functional design of stairs.

**(b) Doors and windows:** Purpose and materials of construction and types.

**(c) Building Services: Plumbing services:** Water distribution, Sanitary lines &

fittings; **Ventilations:** Functional requirements, system of ventilations; **Air conditioning:** Essentials and types; **Acoustics:** Characteristics, absorption, design; **Fire protection:** Fire hazards, classification of fire resistant materials and construction, fire safety norms.

#### **Unit IV**

**(a) Plastering and pointing:** Necessity, types and methods.

**(b) Form work:** Centering and formwork, shoring, underpinning and scaffolding.

**(c) Painting:** White washing, colour washing and distempering, new materials and techniques.

**Unit V: Building Planning:** Principles of building planning, Classification of buildings and building by laws.

#### **TEXT BOOKS:**

1. Building Materials Construction by Arora and Bindra, Dhanpat Roy Publications, New Delhi.
2. Building Construction by B. C. Punmia, Ashok Kr. Jain and Arun Kr. Jain, Laxmi Publications Pvt. Ltd, New Delhi.
3. National Building Code of India,

#### **REFERENCE BOOKS**

1. Building Materials by S. K. Duggal, New Age International Publications, New delhi.
2. Building Construction by P. C. Verghese, PHI Publications, New Delhi.
3. Construction Technology, Vol. I & II by R. Chuddy, Longman Publications, UK.
4. Basics of Civil Engineering by Subhash Chander, Jain brothers Publications.
5. Building by laws by State and Central Governments and Muncipal Corporations.

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**(A53003) STRENGTH OF MATERIALS-I**

Prerequisite: Engineering Mechanics

**COURSE OBJECTIVES:**

- To provide the knowledge on elasticity and plasticity of various materials.
- To know the mechanism of development of shear force and bending moment in beams due to various loads.
- To estimate the bending stresses shear stresses in beams of various cross sections.
- To estimate the slopes and deflection of beams by various methods.
- To impart the knowledge of principal stresses and strains and theories of failures.

**COURSE OUTCOMES:**

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

- Understand the meaning of basic terminology involved in estimation of strength of various materials.
- Understand the behaviour of beams under various loads through the shear force diagram, bending moment diagram, flexural and shear stress distribution diagrams.
- Understand the theories involved in the failure of a member due to compound stress system.
- Know the methods of estimation of deflection of beams and their limiting conditions.

**UNIT I**

**Simple Stresses And Strains:** Elasticity and plasticity-Types of stresses and strains-Hooke's law-stress-strain diagram for mild steel-working stress-factor of safety-Lateral strain, Poisson's ratio and volumetric strain-Elastic moduli and the relationship between them-Bars of varying section-composite bars-Temperature stresses.

**UNIT II**

**Shear Force and Bending Moment:** Definition of beam-Types of beams-concept of shear force and bending moment-S.F and B.M diagrams for cantilever, simply supported with or without overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads-point of contraflexure-Relation between S.F, B.M and rate of loading at a section of a beam

**UNIT III**

**Flexural Stresses:** Theory of simple bending-Assumptions-Derivation of bending equation:  $M/I=f/y=E/R$ -Neutral axis-Determination of bending stresses-section modulus



of rectangular and circular sections (solid and hollow), I, T, and Channel sections and- Design of simple beams.

**Shear Stresses:** Derivation of formula - Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T.

#### **UNIT IV**

**Deflection of Beams:** Bending into a circular arc - slope, deflection and radius of curvature-Differential equation for the elastic line of a beam-Double integration and Macaulay's methods- Determination of slope and deflection for cantilever and simply supported beams, subjected to point loads, U.D.L, Uniformly varying loads-Mohr's theorems - Moment Area Method, Conjugate Beam Method, application to simple cases.

#### **UNIT V**

**Torsion of Circular Section:** Theory of pure torsion – derivation of torsion equations-  $T/J = q/r = N\theta/L$  – assumptions made in the theory of pure torsion – torsional moment of resistance – polar section modulus – power transmitted by shafts – combined bending and torsion and end thrust – design of shafts according to theories of failure

**Springs:** Introduction – type of springs – carriage/leaf springs, helical springs- deflection of close and open coiled helical springs under axial pull and axial couple - springs in series and parallel.

#### **TEXT BOOKS:**

1. Mechanics of Materials-Dr. B.C.Punmia, Laxmi publications.
2. Strength of Materials-B.S.basavarajaiah, University Press, Hyderabad.
3. Strength of Materials practical approach, DS Prakasha Rao, University Press
4. Strength of Materials by S. Ramamrutham, Dhanpath Rai Publishers

#### **REFERENCE BOOKS:**

1. Mechanics of Solid, by Ferdinandp Beer and others-Tata Mc.Grawhill publications 2000.
2. Strength of materials by Schaum's out line series-Mc.Grawhill International Editions.
3. Strength of materials by R.K.Rajput, S.Chand & Co, New Delhi.
4. Strength of materials by A.R.Basu, Dhanpat Rai & Co, Nai Sarah, New Delhi.

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**(A53004) FLUID MECHANICS**

Prerequisite: Mathematics

**COURSE OBJECTIVES:**

- To know the various fluid properties and fluid pressure measurement.
- To study the different equations of fluid motion.
- To impart the knowledge of boundary layer theory and flow in pipes.

**COURSE OUTCOMES:**

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

- Understand the basic principles involved in fluid in static and dynamic condition.
- Know flow through pipes corresponding problems and flow measuring methods.

**UNIT I**

Units of measurement - Physical properties of fluids - specific gravity – viscosity - vapour pressure surface tension and capillarity - pressure at a point - variation of pressure in a fluid - Pascals law atmospheric, absolute, gauge and vacuum pressure - measurement of pressure: pressure gauges, Manometers: differential and Micro Manometers.

**UNIT II**

Hydrostatic forces on submerged plane: horizontal, vertical, inclined and curved surfaces - center of pressure. derivations and problems.

**UNIT III**

**Fluid Kinematics:** Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows : Steady, unsteady, uniform, non uniform, laminar, turbulent, rotational and irrotational flows - equation of continuity for one, two , three dimensional flows stream and velocity potential functions, flow net analysis.

**Fluid Dynamics:** forces acting on fluid in motion - Eulers and Bernoullie's equations for flow along a stream line for 3-D flow, impulse momentum equations and its applications -forces on pipe bend.

**UNIT IV**

**Boundary Layer Theory:** Boundary layer concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers (no derivations) BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect

**Laminar & Turbulent Flows:** Reynolds experiment - Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

#### **UNIT V**

**Closed Conduit Flow:** 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 Reynolds number –Moody's Chart.

**Measurement of Flow:** pitot tube, venture meter and orifice meter -classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches -Broad crested weirs. Surge analysis, mouth piece

#### **Text Book(s)**

1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics and Hydraulic Machines, Standard Book House, 20/e, 2015.
2. A.K. Jain, Fluid Mechanics, 12/e, khanna publishers 2014.

#### **References**

1. L. Victor, Streeter and E. Benjamin Wylie, Fluid Mechanics, 9/e, Tata McGraw Hill, 2013
2. K.R. Arora, Fluid Mechanics, Hydraulics and Hydraulic Machines, 9/e, Standard Publishers, 2013.
3. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2011.
4. M. Franck White, Fluid Mechanics, Tata McGraw Hill, 2014.

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## (A53005) SURVEYING

Prerequisite: - Nil

### **COURSE OBJECTIVES:**

- To understand principles and classification of surveying.
- To understand principles and functioning of basic survey equipment such as chain, prismatic compass, plane table, levels.
- To impart the knowledge of calculating the areas and volumes and contours and their usage.

### **COURSE OUTCOMES:**

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

- Calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments
- Estimate measurement errors and apply corrections
- Interpret survey data and compute areas and volumes

### **UNIT I**

Introduction: Surveying objectives, plane surveying principles and classification, scales, linear measurements, instruments for surveying, preparation of map and plan.  
Chain surveying: Measurement of distance, chain surveying principles, selection of stations, offsets, locating building corners, field book, chain surveying instruments, conventional signs.

Compass surveying: Measurement of directions and angles, types of compass, meridians and bearings, local attraction, magnetic declination, traversing with a chain and compass, plotting of traverse, adjustment of closing error.

Plane table surveying: Principle and instruments used in plane table surveying, working operations, methods of plane table surveying.

### **UNIT II**

Levelling and contouring: Description of a point (position) on the earth's surface, instruments for leveling, principle and classification of leveling, bench marks, leveling staff, readings and booking of levels, field work in leveling, longitudinal section and cross section, plotting the profile, height (level) computations, contours, characteristics of contours, contours of natural features, methods of contouring, interpolation, contour gradient, contour maps.

Areas and volumes: Computation of areas from plans, calculation of areas of a closed traverse, instruments for map areas computation, measurements from cross section, calculation of volumes from spot levels, earth work calculations, practical problems.

**UNIT III**

Theodolite survey and traversing: Theodolite component parts, classification, theodolite observations, principle of theodolite survey and traversing, field work, traverse computations, practical problems.

Tacheometric surveying: Instruments, principle of tacheometry, methods of tacheometry, tacheometric tables, reduction diagram, tacheometry as applied to subtense measurement, field work for tacheometric surveying, errors.

**UNIT IV**

Trigonometrical surveying: Base of the object accessible, base of an inclined object accessible, reduced level of the elevated points with inaccessible bases, instrument axes at different levels.

Curve setting: Types of curves, elements of a curve, setting out a simple curve, setting out a compound curve, checks on field work, reverse curve, transition curves, super elevation, deflection angles, transition curves, characteristics of transition curves, method of setting out a compound curve, types of vertical curves, setting out vertical curves, sight distance.

**UNIT V**

Triangulation: Principle of triangulation, purpose and classification of triangulation surveys, layout of triangulation, field work, triangulation stations, triangulation computations, EDM instruments.

Total Station: types and applications

Global Positioning System.

**TEXT BOOKS:**

1. B.C. Punmia, A.K.Jain, Arun Jain, Surveying I and II, Laxmi Publications, 2005.
2. R. Subramanian, Surveying and Levelling, 2/e, Oxford University Press, 2014.
3. D.G Charles, R.W. Paul, Elementary Surveying, 14/e, Prentice Hall, 2014

**REFERENCE:**

1. S.K. Roy, Fundamentals of Surveying, Prentice Hall of India, 2011.
2. T.P. Kanetkar, (2012), Surveying and Levelling, Part I and II, New Central Book Agency, 2012.

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## (A53006) ENGINEERING GEOLOGY

Prerequisite: -nil

### **COURSE OBJECTIVES:**

1. Role of geology and geophysics in Civil Engineering structures such as dams, reservoir, tunnels, excavations and man made or natural environmental disasters etc.
2. Impact of structural geology, ground water and weathering in civil engineering
3. Geological and geophysical implications on and civil structures.

### **COURSE OUTCOMES:**

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

1. Know the application of geological, geophysical knowledge which will help in construction of resistant, long life civil structures on the earth.
2. Distinguishing between strong and weak rock structures and making weak structures strong in construction of dams, tunnels, reservoirs etc.
3. Understand that the engineering geology paves the way to produce strong geotechnical engineers which is back bone of civil structures.

### **UNIT I: Introduction**

Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of civil engineering construction due to geological drawbacks. 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 mineralogy definition of mineral, importance of study of minerals, different methods of study of minerals, advantages of study of mineral 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 feldspar, quartz, flint, jasper, olivine, agate, hornblende, muscovite, biotite, asbestos, chlorite, kyanite, garnet, talc, calcite, study of other common economic minerals such as pyrite, hematite, magnetite, chlorite, galena, pyrolusite, graphite, magnetite, and bauxite.

### **UNIT II: Petrology**

Definition of rock. Geological classification of rocks into igneous, sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous, sedimentary and metamorphic rocks. Their distinguishing features, Macroscopic and microscopic study of granite, dolerite, basalt, pegmatite, laterite, conglomerate, sand stone, shale, limestone, gneiss, schist, quartzite, marble and slate. Rock excavation, stone aggregates.

### **UNIT III: Structural geology**

Indian stratigraphy and geological time scale. Out crop, strike and dip study of common geological structures, associating with rocks such as folds, faults unconformities and joints - their important types Geophysical studies importance of geophysical studies principles of geophysical study by gravity methods,. Magnetic methods, electrical methods, seismic methods, radio methods, and geothermal method.

### **UNIT IV**

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. Geology and dams and reservoirs 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. Factor contributing to the success of a reservoir. Geological factors influencing water tightness and the life of the reservoirs. Geo hazards. Ground subsidence.

### **UNIT V: Ground Water & Water Table**

Common types of ground water springs, cone of depressions, geological controls of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precaution to be taken for buildings construction in seismic areas, landslides, landslides hazards, water in landslides and their causes and effect measures to be taken to prevent the occurrence of importance of study of ground water . earthquake and landslides Tunnels purpose of tunnelling effects of tunnelling on the ground role of geological consideration ( litho logical, structural and ground water ) in tunnelling over break and lining in tunnels, tunnels in rock. Subsidence over old mines. Mining substances.

#### **TEXT BOOKS:**

1. Engineering and General Geology by Parbin Singh, Katson Press Publications.
2. Principles of engineering geology by KVGK Ghkhale - BS publications
3. Engineering geology by N Chankesavulu, MAC Millan Publishers, 2<sup>nd</sup> edition India Lit. 01
4. Engineering geology by D Venkat Reddy, Vikas Publications.

#### **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
3. Foundations of Engineering Geology - Tony Waltham - Sport Press cry press Taylor and Francis\

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**(A53201)SURVEYING LAB**

Prerequisite: Surveying

**COURSE OBJECTIVES:**

- To understand the practical applications of survey instruments.
- To know the field measurements and observations.
- To understand the different methods involved in survey field work.

**COURSE OUTCOMES:**

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

- Conduct survey and collect field data
- Prepare field notes from survey data
- Interpret survey data and compute areas and volumes

**LIST OF EXPERIMENTS:**

1. Introduction & list of equipments.
2. Survey of an area by chain survey (closed traverse) & plotting.
3. Compass Traversing.
4. Theodolite Traversing.
5. Radiation method, intersection methods by plane table survey.
6. Traversing by plane table survey.
7. Fly levelling (differential levelling).
8. Longitudinal and Cross Sectioning.
9. Grid Contouring.
10. Indirect Contouring.
11. Total Station Surveying.



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## (A53202) ENGINEERING GEOLOGY LAB

Prerequisite: Engineering Geology

### **COURSE OBJECTIVES:**

- Determination of Physical and Optical properties of rocks and economic ore minerals
- Delineation of geological subsurface structures by solving structural problems
- Understanding features of geological maps and its applications.

### **COURSE OUTCOMES:**

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

- Student can identify important rocks, minerals, ore minerals based on Physical and optical properties to distinguish between strong and weak rocks
  - Students can unravel the surface and subsurface geological structures for taking appropriate decision to either construct or to strengthen the existing geological structures for raising civil structures
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 and minerals
  4. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc,
  5. Simple structural geology problems.

Lab Examination Pattern.

1. Description and identification of SIX minerals
2. Description and identification of six (including igneous, sedimentary and metamorphic) rocks
3. Interpretation of a geological map along with geological section
4. Simple strike and dip problems

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**(A53203) GENDER SENSITIZATION**  
**(Mandatory Course)**

**R14A21EE01 Course Objectives:**

1. To develop students sensibility with regard to issues of gender in contemporary India.
2. To provide critical perspective or the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender vigilance.
6. To expose students to more egalitarian interactions between men and women.

**Learning Outcomes:**

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

**Unit-I:-**

**UNDERSTANDING GENDER:**

Gender: Why should we study it? (Towards a world of equals: Unit - 1)

**Socialization:** Making women, Making Men (Towards a world of equals: Unit – 2)

Introduction. Preparing for Womanhood Growing up male. First lessons in Cases.

Different masculinities.

**Just Relationships:** Being Together as Equals (Towards a world of equals: Unit – 12)

Mary Kom and onles love and Acid just do not Mix. Love Letters, Mothers and Fathers. Further Reading: Rose Parks The Brave Heart.

**Unit – II:****GENDER AND BIOLOGY:**

Missing Women: Sex Selection and its consequences (Towards a world of equals: Unit – 4)

Destining 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)

**Unit – III:****GENDER AND LABOUR:**

Housework: the Invisible Labour (Towards a world of equals: Unit – 3)

“My Mother doesn’t Work.” “Share the Load.”

Women’s Work: Its Politics and Economics (Towards a world of equals: Unit – 7)

Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

**Unit – IV:****ISSUES OF VOLENCE:**

Sexual Harassment: Say Not (Towards a world of equals: Unit – 6)

Sexual Harassment: not Eve teasing Coping with Everyday Harassment Further Reading: “*Chupalu*”.

Domestic Violence: Speaking Out (Towards a world of equals: Unit – 8)

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-“I fought for my life....” – Further Reading: The Caste Face of Violence

**Unit – V:****GENDER STUDIES:**

Knowledge: Through the Lens of Gender (Towards a world 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, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Thanu.

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 of books 37.20 (20 December 1990). Print. “we Were Making History...” Life Stories of Women in the Telangana People’s Struggle. New Delhi: Kall for Women. 1989.

2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." *Women's Studies Journal* (14 November 2012) Available online at : <http://blogs.wsj.com/india-real-time/2012/11/14/by-the-numbers-where-indian-women-work/>
3. K.Satyanaraya and Susie Tharu (Ed.) *Steel Nibs Are Sorouting: New Dalit Writing From South India, Dussier 2. Telugu And Khannada*
4. Vimala. "Vartillu (the Kitchen)". *Women Writing in India: 600 BC to the Present. Volume II: The 20<sup>th</sup> Century*. Ed. Susie Tharu and K.Lalits. Delhi:Oxford University Press, 1995. 599-601.
5. Shatruguna. *Veana At . Women's Work and its Impact on Child Health and Nutrition* Hyderabad, National Institute of Nutrition . India council of research. 1993.
6. Stree Shakti Sangeetana. "We Were Making History ... 'Life Stories of women in the Telangana People's Struggle. New Delhi: Kai for Women. 1989.
7. Menon. Nivedita. *Seeing Like a Feminist* New Delhi: Zubaan-Penguin Books, 2012.
8. Yayaprabha, A. "Chupulu (states)". *Women Writing in India: 500BC to the Present. Volume II: The 20<sup>th</sup> Century* Ed. Susie Tharu and K.Lalita Delhi: Oxford University Press. 1995.596-597.
9. Haveed Shayam and Anupam Maruhaar, "Women and Wage Discrimination in India: A Critical Analysis. " *I International journal of Humanities and Social Science Invention* 2.4(2013)
10. Gautam. Liela and Gita Ramaswamy. "A Conversation between a Daughter and a Mohter. " *Eroadsheet on contemporary Politics. Special Issue on Sexually and Harassment: Gender Politics on Campus Today*. Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad Anveshi Research Center for Women's Studies. 2014
11. Aodulali Sohaila. "I fought for My Life .. and Won. " Available online at <http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohala-abdula/>
12. Jeganathan Pradeep. Partha Chattarjee (Ed). "Community, Gender and Violence Subaltn Studies XI". Parmanert Black and Ravi Dayal Publishers, New Delhi, 2000.
13. Kkapadia. *The Violence of Development: The Plitics of Identity, Gender and Social Inequalities in india* London: Zed Books. 2002
14. S.benhabib. *Situling the Self Gender, Community ana Postmoderism in Contemporary Ethics*. London roullege. 1992
15. Virgnia Woolf. *A Room of One's Own*. Oxford Black Swan. 1992
16. T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a human Face*, Karachi Oxford University Press, 1997

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### (A54001) PROBABILITY AND STATISTICS

Prerequisites: Mathematics – I and II

UNIT-I: Probability: Sample space and events, Classical and Statistical definition of Probability, The axioms of probability, Some Elementary theorems of Probability, Conditional probability, Baye's theorem. Random variables, Discrete and continuous random variable,

UNIT-II: Definitions of Probability Distribution function, Probability mass function, Probability density function and properties. Definitions of Mathematical expectation, Moments (about origin & Centre), Definition of moment generating function for discrete and continuous random variable.

Discrete Distributions: Binomial and Poisson distributions (definition and problems) their mean, variance and moment generating function.

Continuous Distribution: Normal and exponential distributions (definition and problems) related properties.

UNIT-III: Sampling distribution: Populations and samples - Sampling distributions of mean ( $\sigma$  known and unknown)

Estimation: Concept of Point estimation and its properties (definition only), Concept of interval estimation with examples.

Test of Hypothesis: Null & Alternative Hypothesis, Critical region, Type I and Type II errors, level of significance, one tail, two-tail tests.

UNIT-IV: Large sample test: concerning means – proportions (One and Two samples).

Small sample test: Chi-Square test, Student's t-test (Single mean, Difference of mean and Paired samples) and F-test.

UNIT-V: Design of Experiment: Introduction to ANOVA (one – way, two – way), Principles of Design of Experiment, completely randomized design (CRD), randomized complete block design (RBD), Latin Square Design (LSD).(No Derivations only concept, definitions and problems)

Text Books:

1. Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press.

2. Probability and Statistics for Engineers by Richard A Johnson, Pearson Education.
3. Introduction to Probability by Charles M Grinstead, J Laurie Snell, American Mathematical Society.

Reference:

1. A.V. Skorokhod, Basic Principles and Applications of Probability Theory, Springer.
2. Arnold O. Allen, Probability & Statistics, Academic Press.
3. Hwei P. Hsu, Theory and Problems of Probability, Random Variables, and Random Processes, Schaum's Outline Series, McGraw- Hill.
4. Mendan Hall, Probability & Statistics, Beaver Thomson Publishers.
5. Miller and John E. Freund, Probability & Statistics for Engineers, Prentice Hall of India.
6. Montgomery: Design and Analysis of Experiments, Wiley.
7. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, JohnWiley & Sons, Ltd.
8. Zivorad R. Lazic, Design of Experiments in Chemical Engineering, Wiley-VCH.

**Outcomes:**

- Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variable involved in the probability models. It is quite useful for all branches of engineering.
- The student would be able to calculate mean and proportions (small and large sample) and to make important decisions from few samples which are taken out of unmanageably huge populations .It is Mainly useful for non-circuit branches of engineering.
- The student would able to understand about the random process, Markov process and Markov chains which are essentially models of many time dependent processes such as signals in communications, time series analysis, queuing systems. The student would be able to find the limiting probabilities and the probabilities in nth state. It is quite useful for all branches of engineering

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(A54002) ELEMENTS OF ELECTRICAL ENGINEERING

Prerequisite: -nil

## UNIT-I: Electrical Circuits

Basic definitions, types of elements, ohms law, Kirchhoff' laws, resistive networks, inductive networks, capacitive networks, series, parallel circuits and star –delta transformations.

## UNIT-II: DC Machines

**DC generators:** Construction, basic principle, EMF equation, types of dc generators, losses & efficiency, applications.

**DC Motors:** Basic principle, types of dc motors, torque equation, necessity of starters, 3-point starter, characteristics, speed control of dc shunt motor, losses & efficiency, applications.

## UNIT-III: AC Machines

**Transformers:** Principle of operation of 1-phase transformers, construction, oc & sc tests, losses, efficiency & regulation, applications.

**Induction machines:** Principle of operation of 3-phase induction machines, torque-slip characteristics. Losses and efficiency and applications.

## UNIT-IV: Diode and Transistor

**Diode:** p-n junction diode, symbol, V-I characteristics, Diode Application, Rectifier- Half wave, Full wave and Bridge rectifier.

**Transistor:** PNP and NPN junction transistor, Transistor as an amplifier,

## UNIT-V: Cathode Ray Oscilloscope

Principles of CRT (Cathode Ray Tube), Deflection, sensitivity, Electroscopic and Magnetic deflection, Application of CRO-voltage, Current and frequency measurements.

**Course Outcomes:**

After going through this course the student gets knowledge on

- *Introduction of Electrical Elements, Electrical circuits and applications of KVL, KCL, and Ohm's Law.*
- *DC machines and their applications.*
- *AC machines and their applications.*
- *Electronic devices like Diode, Transistors and their applications.*
- *Working principle of CRO and its internal parts.*

**TEXT BOOKS:**

1. Principles of Electrical and Electronics Engineering - *V.K.Mehta*, 2<sup>nd</sup> edition, S.Chand & Co, 2008.
2. Introduction to Electrical Engineering - *Kothari and Nagarath*, 2<sup>nd</sup> edition, TMH Publications.
3. Fundamentals of Electrical Engineering and Electronics - *J.B. Gupta*, S.K. Kataria & sons Publications, 2002.

**REFERENCE BOOKS:**

- (e) Basic Electrical Engineering - *Kothari and Nagarath*, TMH Publications, 2<sup>nd</sup> edition
- (f) Electrical and Electronics Technology - *Hughes* – Pearson education



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## (A54003) STRENGTH OF MATERIALS-II

Prerequisite: Strength of Materials-I

### COURSE OBJECTIVES:

- To provide the knowledge of the torsion induced in shafts and springs.
- To impart the knowledge of direct and bending stresses in columns.
- To impart the knowledge of analysis of simple indeterminate structures.
- The theory involved in the various columns with various end conditions.

### COURSE OUTCOMES:

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

- Understand the behaviour of shafts under pure torsion and springs on various loads.
- Understand the behaviour of columns and struts and the theories involved.
- Know the analysis of indeterminate beams and curved beams.

### UNIT I

**Direct and Bending Stresses:** Stresses under the combined action of direct axial load 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.

**Unsymmetrical Bending:** Introduction - principal axes - centroidal principal axes of section – moments of inertia referred to any set of rectangular axes - resolution of bending moment into two rectangular axes through the centroid - location of neutral axis - stresses in beams subjected to unsymmetrical bending - deflection of beams under unsymmetrical bending – concept of shear centre.

### UNIT II

**Principal Stresses and Strains:** 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.

**Thin Cylinders:** Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – change in diameter and volume of thin cylinders – spherical shells.

### UNIT III

**Fixed beams:** Fixed beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – shear force and bending moment diagrams - deflection of fixed beams - effect of sinking of support - effect of rotation of support.

**Continuous beams:** Introduction - Clapeyron's theorem of three moments - analysis of continuous beams with constant moment of inertia with one or both ends fixed - continuous beams with overhang, continuous beams with different moment of inertia for different spans - Effects of sinking of supports - shear force and bending moment diagrams

### UNIT IV: Columns and Struts

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 columns- slenderness ratio – Euler's critical stress - limitations of Euler's theory – Rankine formula - long columns subjected to eccentric loading – Secant formula – empirical formulae - straight line formula - Prof Perry's formula

**Beam columns:** Laterally loaded struts subjected to uniformly distributed and concentrated loads - maximum BM and stress due to transverse and lateral loading.

### UNIT V:

**Strain Energy:** Resilience - Gradual, sudden, impact and shock loadings-simple applications.

**Energy Theorems:** Introduction - strain energy in linear elastic system, expression of strain energy due to axial load, bending moments and shear force - Castigliano's first theorem – deflection of simple beams and pin jointed trusses. Castigliano's second theorem - Analysis of indeterminate trusses and frames whose degree of redundancy is not exceeding two.

### TEXT BOOKS:

1. A Text of strength of materials by RK Bansal - Laxmi publication (P) It., New Delhi
2. Strength of materials by Basavarajaiah and Mahadevappa, university press
3. Strength of Materials by Vazrani and Ratwani
4. Mechanics of Structures Vol I and Vol II, by SB junarkar, Charity Publishers

### REFERENCE:

1. Mechanics of Solid, by Beer and Johnson – Tata Mc Grahil Publications 2000
2. Strength of Materials by S. Ramamrutham
3. Strength of Materials by Bhavikatti, Vikas publications
4. Strength of Materials by S. Ramakrishna and R. Narayan - Dhanpat rai publications
5. Strength of materials by RK Rajput, S. Chand & Co, New Delhi

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## (A54004) HYDRAULICS AND HYDRAULIC MACHINERY

Prerequisite: Fluid Mechanics

### COURSE OBJECTIVES:

- To provide the knowledge of the flow in open channels and hydraulic models.
- To provide the types, working principles of various turbines and pumps.

### COURSE OUTCOMES:

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

- Understand the behaviour of flow in open channels and the hydraulic similitude.
- Know the types, working principles and the usage of various turbines and pumps.

### UNIT I

**Open Channel Flow:** types of flows – geometric properties of channels - velocity distribution – energy and momentum correction factors - Chezy's, Manning's and Bazin formulae for uniform flow –Most economics sections - critical flow- specific energy - critical depth - computation of critical depth: critical, sub-critical and super critical flows – application to channel transitions.

### UNIT II

**Non uniform flow in channels:** dynamic equation for gradually varies flow: mild, critical, steep, horizontal and adverse slopes - surface profiles: classification and characteristics - direct step method, rapidly varied flow - hydraulic jump - energy dissipation – surge in open channels.

### UNIT III

**Dimensional Analysis:** Introduction – dimensions – dimensional homogeneity – methods: Rayleigh's method and Buckingham's pi theorem - study of hydraulic models - similitude: geometric, kinematic and dynamic similarities - dimensionless numbers - model laws and - types of models - merit and limitations of models – scale effect in models - prototype relations.

### UNIT III

**Impact of Jets:** hydrodynamic force of jets on stationery flat, moving flat, stationary curved vanes and moving curved vane: jet striking centrally and at tip, velocity

triangles at inlet and outlet - expressions for work done and efficiency - angular momentum, principle, applications to radial flow turbines.

**Hydraulic Turbines:** Elements of hydroelectric power plants - heads and efficiencies of turbines - classification of turbines: pelton wheel, Francis turbine, Kaplan turbine - work done, efficiency, velocity diagram, working proportions and design - draft tube theory – surge tank.

**Performance of Turbines:** Performance under unit head – under specific conditions – expressions for specific speeds in terms of known coefficients for different turbines – performance characteristic curves.

## **UNIT V**

**Centrifugal Pumps:** component parts of centrifugal pumps - working of centrifugal pump – types – work done – head of pump - minimum starting speed – losses and efficiencies - specific speed - multi stage pumps - pumps in parallel - performance of a pumps characteristic curves - Net Positive Suction Head (NPSH) - Cavitations.

**Hydropower engineering:** types of hydro power plants – definition of load factor, utilization factor, capacity factor – components of hydropower plants.

### **TEXT BOOKS:**

1. Open channel flow by K Subramanya - Tata MC Grawhill Publishers
2. Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard Book house
3. Fluid Mechanics & fluid machines by narayana Pillai, Universities Press.

### **REFERENCES:**

1. A text of Fluid mechanic and Hydraulic achiness by Dr. RK Bansal Lamxi publication (P) old New Delhi
2. Elements of Open channel flow by Ranga Raju, Tata MC Graw Hill publications
3. Fluid mechanics and fluid machines by Rajput, S chand &n Co
4. Open channel flow by VT chow, MC Graw hills Book company
5. Fluid mechanics and machinery by D ramadurgaiah, new age publications.

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## (A54005) CONCRETE TECHNOLOGY

Prerequisite: Building Materials, Construction and Materials

### Course Objectives:

- To impart the knowledge of the materials required for making the concrete
- To know the properties of various materials used in the concrete
- To provide the knowledge of mix design of concrete and the properties of green & hardened concrete.

### Course Outcomes:

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

- Have the complete knowledge of types and properties of materials require for making concrete
- Know the properties of the green and hardened concrete
- Know the methods of finding the properties of materials and concrete
- Know the IS codal specifications of concrete and its materials.
- Have the knowledge of special concretes.

**UNIT I: Cement:** Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Test on physical properties – Different grades of cement.

**Water:** Quality of mixing water.

**Aggregates:** 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.

### UNIT II: Fresh Concrete

Water / Cement ratio – Abram's Law – Gelspaoe ratio - Workability – Factors affecting workability – Measurement of workability by different tests – Setting time of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete

### UNIT III: Mix Design

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-ACI method of mix design - British method.

**Admixtures:** Types of Admixtures – Mineral and chemical admixtures- properties –

dosages – effects – usage.

#### **UNIT IV: Hardened Concrete**

Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

**Tests on Hardened Concrete:** Compression tests – Tension tests – Factors affecting strength – Flexure test – Splitting tensile test – Pull-out test.

**NDT:** Codal provisions – Ultrasonic Pulse Velocity – Rebound Hammer Tests – Core cutting test.

**Properties of Hardened Concrete:** 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

#### **UNIT V: Special Concretes**

Light weight aggregates – Light weight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete Polymer concrete – Types of Polymer concrete – High performance concrete – Self compacting concrete .

#### **TEXT BOOKS:**

1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition
2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004

#### **REFERENCES:**

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi

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## (A54006) ENVIRONMENTAL STUDIES

Prerequisite: -Nil-

### COURSE OBJECTIVES:

- To impart the knowledge of multidisciplinary nature of environmental studies.
- To provide the knowledge of natural resources, environmental pollution, waste management technology.
- To impart the knowledge of rules and regulations of environmental policy.

### COURSE OUTCOMES:

**On successful completion of this course, it is expected that the students will be able to,**

- Understand the natural resources such as water, mineral, food, energy, land and their associated problems.
- Understand causes of the environmental pollution and their controlling measures.
- Know environmental policy rules and regulations.

### UNIT I: Multidisciplinary nature of Environmental Studies

Definition, Scope and Importance – Need for Public Awareness.

- (a) **Ecosystems:** Concept of an ecosystem – Classification, structure and function of different ecosystems - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids.
- (b) **Biodiversity and its conservation:** Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. ICUN categories of biodiversity and RED DATA book - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### UNIT-II: Natural Resources

Renewable and non-renewable resources – Natural resources and associated problems: Forest resources – Use and over – exploitation, deforestation, – Timber extraction, mining, dams and other effects on forest and tribal people: Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. - Food

resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources: Equitable use of resources for sustainable lifestyles.

#### **UNIT-III:**

**(a) Environmental Pollution:** Definition, Cause, effects and control measures of:

- a. Air pollution, b. Water pollution, c. Soil pollution, d. Marine pollution
- e. Noise pollution, f. Thermal pollution, g. Nuclear pollution, h. e-Waste.

**(b) Social Issues and the Environment:** From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, and watershed management. -Climate change, global warming, ozone layer depletion, nuclear accidents and holocaust.

#### **UNIT-VI:**

**(a) Waste management technology:** Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution, Disaster management: floods, earthquake, cyclone and landslides.

Waste water and sewage treatment technology: primary, secondary and tertiary treatments. Bioremediation, Photo-remediation, ZLD (zero liquid discharge), membrane technology. Application of GIS and GPS system in environmental science.

**(b) Environmental policy, Rules and regulations.** EIA (Environmental Impact Assessment) & EMP (ENVIRONMENTAL Management Plan) – Environment Protection Act. - Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act –Forest Conservation Act.-Public awareness. Global environmental problems and global efforts.

#### **UNIT-V:**

**(a) Towards sustainable future:** concept of sustainable development, threats of sustainability, population and its explosion, 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, concept of green building, Basic principles of Green engineering, clean development mechanism (CDM), Low carbon life cycle, Polluters-pay principle.

**(b) Field work:** Visit to a local area to document environmental assets  
River/forest

grassland/hill/ mountain Visit to a local polluted site-Urban/Rural/industrial/  
Agricultural Study of common plants, insects, birds, Visit to effluent treatment  
Plant/sewage treatment plant Study of simple eco systems pond, river, hill



slopes, etc.

**Mini projects by students which is mandatory.**

**TEXT BOOK:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Mishra and Pandey.
3. P.D.Sharma
4. Environmental Studies by R. Rajagopalan, Oxford University Press.

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## (A54201) STRENGTH OF MATERIALS LAB

Prerequisite: Strength of Materials-I & II

### **COURSE OBJECTIVES:**

- To know the functioning and methods of conducting the practical on various equipment to know the properties of materials.
- To know the behaviour of various materials under the loading conditions.

### **COURSE OUTCOMES:**

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

- Understanding the working principles of various machines to conduct the test on materials.
- To know the behaviour of members and their limiting conditions on loading.

1. Torsion Test
2. Bending test on steel/wood cantilever beam
3. Bending test on simply supported beam
4. Hardness test
5. Tension test
6. Test on Helical Spring
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's reciprocal theorem.
11. Demonstration on use of electrical resistance gauges
12. Deflection test on cantilever beams

Note: Any 10 experiments may be completed from the list given above.

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### (A54202) FLUID MECHANIS AND HYDRAULIC MACHINARY LAB

Prerequisite: Fluid Mechanics & Hydraulic Machinery

#### **COURSE OBJECTIVES:**

- To understand the measurement of flow through open channels and pipes and the problems faced there in.
- To provide the knowledge of working principles of various pumps and turbines.

#### **COURSE OUTCOMES:**

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

- Understand the flow measuring equipment and their functioning.
- To know the usage of pumps and turbines.

#### **List of Experiments:**

1. Calibration of venture meter
2. Determination of Coefficient of Discharge of Orifice
3. Determination of Coefficient of Discharge of Mouthpiece
4. Calibration of contracted Rectangular Notch
5. Calibration of contracted Triangular Notch
6. Determination of Friction factor of a pipe.
7. Determination of Coefficient for minor losses.
8. Verification of Bernoulli's Equation.
9. Impact of Jet on Vanes.
10. Study of Hydraulic jump.
11. Performance test on Pelton Wheel turbine.
12. Performance test on Francis turbine
13. Performance characteristics of a single stage centrifugal pump.
14. Performance characteristics of a multi stage centrifugal pump.
15. Performance characteristics of a reciprocating pump.

Note: Any 10 experiments may be completed from the list given above.

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## HUMAN VALUES AND PROFESSIONAL ETHICS (MANDATORY COURSE)

### Objectives:

- To help the students appreciate the essential complementarities between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

### UNIT - I:

Course Introduction - Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

### UNIT - II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' ( I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

### UNIT - III:

**Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship:** Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence.

Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society ( society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society ( Akhand Samaj), Universal Order ( Sarvabhaum Vyawastha) - from family to world family!

#### **UNIT - IV:**

**Understanding Harmony in the nature and Existence - Whole existence as Co-existence:** Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

#### **UNIT - V:**

**Implications of the above Holistic Understanding of Harmony on Professional Ethics:** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

- a. Ability to utilize the professional competence for augmenting universal human order,
- b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
- c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order.

- a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- b. At the level of society: as mutually enriching institutions and organizations.

#### **TEXT BOOKS:**

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

#### **REFERENCE BOOKS:**

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumaner, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A. N. Tripathy, 2003, Human Values, New Age International Publishers.

7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics ( including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.

**Relevant CDs, Movies, Documentaries & Other Literature:**

1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charle Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story

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### (A55001) STRUCTURAL ANALYSIS

**Prerequisite:** Strength of Materials I & II

**Course Objectives:**

- To provide the knowledge of Analysis of indeterminate structures.
- To provide the knowledge of conventional methods of structural Analysis

**Course Outcomes:**

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

- Analyze the independent structures by using the conventional methods
- Have the knowledge of influence lines and moving loads & their applications for analyzing the simple structures

#### UNIT I

**Indeterminacy of Structures:** Degree of static indeterminacy of pin jointed and rigid jointed plane and space structures - degree of kinematic indeterminacy of rigid jointed plane structures

**Arches:** Elastic theory of arches - Eddy's theorem, three hinged parabolic and segmental arches, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading.

**Two Hinged Arches:** parabolic and segmental, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading and temperature effects.

#### UNIT II

**Moment Distribution Method:** Stiffness of member with farther end fixed and hinged – moment distribution – distribution factor - application to continuous beams with and without settlement of supports - application to portal frames with and without sway.

#### UNIT III

**Slope-Deflection Method:** Derivation of slope deflection equations - Application to continuous beams with and without settlement of supports - Application to portal frames with and without sway (DOF not exceeding 3).

#### UNIT IV

**Influence Lines and Moving Loads:** definition of Influence Line (IL) - IL for support reactions, shear force (SF) and bending moment (BM) at a section for simply supported beams with and without overhang - Load position for maximum reaction, SF and BM at a section due to moving point loads, udl longer than span and shorter than the span- two/several point loads - Maximum BM under a chosen point load - Absolute maximum BM for a girder. Influence lines for forces in members of Pratt and Warren trusses. Influence lines for three hinged arches.

## **UNIT V**

**Approximate Methods:** Application to building frames – portal method – Cantilever method - Substitute frame method.

**Beams curved in plan:** Introduction – circular beams loaded uniformly and supported on symmetrically placed columns - semi circular beam simply supported on three equally spaced supports.

### **TEXT BOOKS:**

1. Structural Mechanics Vol I & II, Junnarkar S B, Charotar Publishers
2. Structural Analysis by A. K. Jain
3. Theory of Structure by, S. Ramamrutham, Dhanpath Rai & Sons
4. R. Subramanian, Strength of Materials, 2/e, Oxford University Press, 2010
5. T.S.Thandavamoorthy, Structural Analysis, 2/e, Oxford University press.

### **REFERENCE BOOKS:**

1. Structural Analysis Volume – I, Devdas Menon, Narosa Publication
2. Structural Analysis Volume – I, Bhavikatti, 3rd edition, Vikas Publishers.
3. Basic Structural Analysis, C S Reddy, Tata McGraw Hill
4. Theory of Structures, Timoshenko & Young, Tata McGraw Hill
5. Intermediate Structural Analysis, C K Wang, McGraw Hill
6. Elementary Structural Analysis, Norries & Wilbur, McGraw Hill
7. Structural Analysis, Laursen H I, McGraw Hill
8. Structural theorems and their application, B G Neal, Pergamon Press.
9. R.C. Hibbeler, Structural Analysis, 6/e, Pearson, 2011



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## (A55002) DESIGN OF REINFORCED CONCRETE STRUCTURES

**Prerequisite:** Strength of Materials & Structural Analysis

**Course Objectives:**

- To provide the basic concepts of reinforced concrete design
- To impart the knowledge of various methods of design
- To provide the design of simple structural elements such as beams, Columns, footings & slabs

**Course Outcomes:**

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

- Know the methods of design of R.C. Structural elements
- Know the IS codal provisions of various R.C. Structural elements
- Design the structural elements with innovative ideas.

### UNIT I

**Concepts of RC Design:** Working stress method - Ultimate load method - Limit State method - Stress-strain curve for concrete, steel - Partial safety factor - Characteristic values - Stress Block parameters – IS:456 2000 provisions.

### UNIT II

**Design and Detailing of Beams:** Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections.

**Shear, Torsion and Bond:** Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, IS Code provisions. Design examples in simply supported and continuous beams, detailing.

### UNIT III

**Design and Detailing of Slabs and Stair Cases:** Design of one way, two way and continuous slabs using IS Codes - Limit state of serviceability for deflection and cracking – IS Code provisions - Introduction to yield line theory - Design principles of staircases.

### UNIT IV

**Design and Detailing of Short and Long Columns:** Subjected to axial loads – uniaxial and biaxial bending - IS Code provisions.

### UNIT V

**Design and Detailing of Footings:** Different types of footings – Design of isolated, square, rectangular and circular footings - Introduction to combined footings.

**TEXT BOOKS:**

1. A.K. Jain, Reinforced Concrete – Limit State Design, 7/e Standard book house, 2012.
2. Pillai and Menon, Reinforced Concrete Design, 3/e, Tata McGraw Hill, 2009.
3. P.C. Varghese, Limit State Design of Reinforced Concrete, 2/e, Prentice Hall of India, 2013

**REFERENCE BOOKS:**

1. Plain and Reinforced Concrete, Vol. I, Jain & Jaikrishna, Nemchand Brothers.
2. Design of Reinforced Concrete Structures, Dayaratnam P, Oxford & IBH.
3. Ultimate Strength Design for Structural Concrete, Arthur P D & Ramkrishnan V, Wheeler & Co.
4. Limit State Theory for Reinforced Concrete Design, Huges B P, Pitman.
5. Reinforced Concrete, Warner R F, Rangan B C & Hall A S, Pitman.
6. Reinforced Concrete, H.J. Shah, Charotar Publisher.
7. Theory of Reinforced Concrete, Shina & Roy
8. Limit State Design - Reinforced Concrete, Shah & Karve,
9. Illustrated Reinforced Concrete Design, V.L. Shah & S.R. Karve
10. N. Subramanian, Design of Reinforced Concrete Structures, Oxford University, 2014.

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**(A55003) ENVIRONMENTAL ENGINEERING**

**Prerequisite:** Environmental Studies

**Course Objectives:**

- To provide the knowledge of source of water and its distribution.
- To impart the knowledge of various treatment required for potable water
- To provide the knowledge of characteristics of sewage and its treatment.

**Course Outcomes:**

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

- Have the complete knowledge of source of water, its demand and standards.
- Have the knowledge of various treatment methods in treating the drinking water and sewage
- Design the various treatment plants and water distribution system

**UNIT I**

**Introduction:** waterborne diseases – protected water supply – populations forecasts, design period – water demand – types of demand – factors affecting – fluctuations – fire demand – storage capacity – water quality and testing – drinking water standards.

**Sources of water:** Selection of water source based on quality, quantity and other considerations – intakes – infiltration galleries, confined and unconfined aquifers distribution system – requirements – methods and layouts.

**UNIT II**

Layout and general outline of water treatment units – sedimentation, uniform settling velocity

– Principles – design factors – surface loading – jar test - optimum dosage of coagulant – coagulation fluctuations clarifier design – coagulants – feeding arrangements

**Filtration:** – 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.

**UNIT III**

Distribution systems – types of layouts of distribution systems – design of distribution system

– Hardy cross and equivalent pipe methods and service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meter – laying and testing of pipe lines – pump house.

Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water over flows combined flow.

Layouts and general outline of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles and design of biological treatment – trickling filters – standard and high rate.

#### **UNIT IV**

Characteristics of sewage – cycle of decay – decomposition of sewage, examination of sewage – BOD – COD. Equations , design of sewers – shape and materials – sewer appurtenances man holes – inverted siphon – catch basins – fusing tanks – ejectors, pumps and pump houses and house drainage – components requirements – sanitary fittings – traps – one pipe and two pipe systems of plumbing ultimate disposal of sewage – sewage farming – dilution.

#### **UNIT V**

Waste water treatment plant- Flow diagram – primary treatment design of screens – grid chambers – skimming tanks –sedimentation tanks – principles of design – biological

Treatments – trickling filters – standard and high rate - Construction and design of oxidation ponds.Sludge digestion tanks – factor affecting – design of digestion tanks – sludge disposal by drying – septic tanks working principles and design – soak pits.

#### **TEXT BOOKS:**

1. K.N. Duggal, Elements of Public Health Engineering, S Chand, 1988
2. P.N. Modi, Water Supply Engineering - Environmental Engineering (Vol I), Standard Book House, 2006

#### **REFERENCE BOOKS:**

1. S.K. Garg, Environmental Engineering Vol I: Water Supply Engineering, Khanna Publishers, 2004.
2. Gurucharan Singh Water Supply and Sanitary Engineering Vol, 1; Standard Publishers, Distributors, 2013.
3. J. Mark Hammer Water and Wastewater Technology; John Wiley and Sons, 2013.
4. Manual on Water Supply and Treatment; CPH and EEO, Ministry of Urban Development; Govt, of India, New Delhi.

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**(A55004) SOIL MECHANICS**

**Prerequisite:** Strength of Materials I & II

**Course Objectives:**

- To provide the basic knowledge of soil formation and the properties of various soils.
- To provide the knowledge load bearing capacity of various soils and the effect of seepage and permeability on soils
- To impart the knowledge of methods of improving the load bearing capacity of the soils.

**Course Outcomes:**

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

- Understand the soil formation, the effect of permeability and seepage on soils.
- Know the methods of tests conducting on soils
- Know the lab tests and field tests on soils.
- Know the methods of improving the load bearing capacity on various soils

**UNIT I**

**Introduction:** Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass-volume relationship – Relative density.

**Index Properties Of Soils:** Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils

**UNIT II**

**Permeability:** Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting – laboratory determination of coefficient of permeability – Permeability of layered soils – Insitu permeability tests (Pumping in & pumping out test).

**Effective Stress & Seepage through Soils:** Total, neutral and effective stresses – principle of effective stress - quick sand condition – Seepage through soils – Flow nets: Characteristics and Uses.

**UNIT III**

**Compaction:** Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties. – Field compaction Equipment – compaction quality control.

**Consolidation:** Types of compressibility – immediate settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves – normal consolidation 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.

#### **UNIT IV**

**Shear Strength of Soils:** Importance of shear strength - Mohr – Coulomb Failure theories- Types of laboratory strength tests – strength tests based on drainage conditions- strength envelopes – Shear strength of sands – dilatancy Critical void ratio – Liquefaction- shear strength of clays

#### **UNIT V**

**Slope Stability:** 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 slopes of earth dams under different conditions.

#### **TEXT BOOKS**

1. B.C. Punmia, Soil Mechanics and Foundations, (SI Modules), 16/e Laxmi Publications.
2. Gopala Ranjan and A.S.R, Rao, Basic and Applied Soil Mechanics, 2/e, New Age International Publishers.

#### **REFERENCES:**

1. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork
2. Geotechnical Engineering by Purushotham Raj
3. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi
4. C. Venkataramaiah, Geotechnical Engineering, ,New Age International, 2006.
5. H. Iqbal Khan, Text Book of Geotechnical Engineering, Prentice Hall of India, 2005.
6. M. Braja Das, Principles of Geotechnical Engineering,Cengage Learning, 2013.
7. P. Donald, Coduto, Geotechnical Engineering, Prentice-Hall India, 2010.
8. Rodrigo Salgado, The Engineering of Foundations, McGraw Hill, 2006.

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## (A55005) WATER RESOURCES ENGINEERING

**Prerequisite:** Fluid Mechanics

**Course Objectives:**

- To provide the knowledge of hydrology and hydrologic cycle and its applications.
- To provide the knowledge of ground water occurrence and the importance of irrigation.
- To impart the knowledge of design of irrigation canals.

**Course Outcomes:**

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

- Have the knowledge of rain water, ground water and their utility.
- Design the irrigation structures and canals.

**UNIT I**

Introduction to engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data – Adjustment of record – Rainfall double mass curve. Runoff – factors affecting Runoff – Runoff over a catchment – Empirical and Rational Formulae.

Abstraction from rainfall-evaporation, factors affecting evaporation, measurement of evaporation-Evapotranspiration-Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

**UNIT II**

Distribution of Runoff-Hydrograph Analysis Flood Hydrograph – effective Rainfall - base flow separation – Direct Runoff Hydrograph- Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph, from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

**UNIT III**

Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissibility and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers. Types of wells – Well Construction – Well Development

**UNIT IV**

Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility, preparation of land for Irrigation, standards of quality for Irrigation water. Soil-water-plant relationship, vertical distribution of soil

moisture, soil moisture  
constants, soil moisture tension, consumptive use, estimation of consumptive use,  
Duty and delta, factors affecting duty- Design discharge for water course. Depth and  
frequency of Irrigation, irrigation efficiencies – water Logging.

#### **UNIT V**

Classification of canals, design of Irrigation canals by Kennedy's and Lacey's  
theories, balancing depth of cutting, IS standards for a canal design canal lining.

Design Discharge, Computation of design discharge-rational formula, SCS curve  
number method, flood frequency analysis introductory part only – Stream Gauging –  
measurement and estimation of stream flow. -

#### **TEXT BOOKS:**

1. Jayaram Reddy, 'Engineering Hydrology', Laxmi publications pvt. Ltd., New Delhi
2. S K Garg, Irrigation Engineering & Hydraulic Structures, Khanna Publishers
3. P N Modi, Irrigation Engineering & Hydraulic Structures, Standard Book  
House,2014

#### **REFERENCE BOOKS:**

1. G L Asawa, Irrigation Engineering, Wiley Eastern
2. B.C. Punmia and B.B. Lal Pande, Irrigation and Water Power Engg, 16 e, Laxmi  
Publications, 2014.
3. J D Zimmerman, Irrigation, John Wiley & Sons
4. Varshney, Gupta & Gupta, Theory and Design of Irrigation Structures, Nem  
Chand & Bros.



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## (A55006) ELEMENTS OF EARTHQUAKE ENGINEERING

**Prerequisite:** -BMCP

**Course Objectives:**

- To provide the knowledge of occurrence of earthquakes and their effects on structures.
- To know the design principle of structures due to earthquake (EQ) loads.
- To understand the provisions incorporated in the IS 1893 and IS 13920.
- To impart the knowledge of behaviour of structural and non- structural elements due to earthquake forces

**Course Outcomes:**

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

1. The student is able to estimate the lateral loads on structures and design the structures for gravity and lateral load combinations.
2. Understand the design principles given in the Codes for EQ resistant design of structures.
3. Know the importance of ductile detailing required for reducing the EQ effects on structures.

### **UNIT I: Engineering Seismology**

Earthquake phenomenon cause of the earthquakes- Faults – Plate tectonics- Seismic waves – Term associated with earth quakes – Magnitude/Intensity of an earthquake – scales- Energy released- Earthquake measuring instruments – Seismoscope, Seismograph, accelerograpg – strong ground motions – seismic zones of India.

**Theory of Vibrations :-** Elements of vibratory system – Degree of freedom – Continuous system – lumped mass idealization – Oscillatory motion – Simple harmonic Motion – Free vibration of single degree pf freedom system- Undamped and damped- critical damping –Logarithmic decrement – Forced vibration – Harmonic excitation – Dynamic magnification factor – Excitation by rigid based translation for SDOF system – Earthwork ground motion.

### **UNIT II: Conceptual Design**

Introduction-functional Planning-Continuous load path- overall form – simplicity and symmetry – elongated shapes- stiffness and strength – Horizontal and Vertical members – Twisting of buildings –Ductility – definition – ductility relationships – flexible building – framing systems – choice of construction materials – unconfined concrete – confined concrete – masonry – reinforcing steel.

**Introduction to earthquake resistant design:-**

Seismic design requirements- regular and irregular configurations – basic assumptions – design earthquake loads – basic load combinations – permissible stress – seismic methods of analysis – factors in seismic analysis – equivalent lateral force method.

### **UNIT III: Reinforced Concrete Buildings**

Principal of earthquake resistant design of RC members- structural models for frame buildings –Seismic methods of analysis –Seismic design methods- IS code based methods for seismic design – Seismic evaluation and retrofitting – Vertical irregularities – Plan configuration problems – Lateral load resisting systems – Determination of design lateral forces – Equivalent lateral force procedure – Lateral distribution of base shear.

### **UNIT IV: Masonry Building**

Introduction –Elastic properties of masonry assemblage – categories of masonry buildings – Behaviour of unreinforced and reinforced masonry walls – Behaviour of Walls – Box action and bands – Behaviour of infill walls – Improving seismic behaviour of masonry building – Load combinations and permissible stress – Seismic design requirements – Lateral Load analysis of building.

### **UNIT V: Structural Walls and Non – Structural Elements**

Strategies in the location of structural wall – sectional shapes – variations in elevations – cantilever walls without opening – Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non – structural damage – Isolation of non –structures . Ductility considerations in earthquake Resistant Design of RC building . Introduction- impact of ductility- Requirements for Ductility- Assessment of Ductility – Factors affecting Ductility – Ductile detailing consideration as per IS 13920. Behaviour of beams, columns and joints in RC buildings during earthquakes – vulnerability of open ground storey and short columns during earthquakes

### **TEXT BOOKS:**

5. Earthquake Resistant Design of structures –S.K Duggal, Oxford University Press.
6. Earthquake Resistant Design of Structures – Pankaj Agarwal and Manish Shrikhande , Prentice Hall of India Pvt Ltd.

### **REFERENCES:**

4. Seismic Design of Reinforced Concrete and Masonry Building. T Paulay and M J N Priestly , John wiley & sons.
5. Earthquake resistant Design of Building structural by Vnod Hosur wiley India Pvt Ltd.

# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

III Year B.Tech. CE-I Sem

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## (A55007) WATERSHED MANAGEMENT

### Course Objectives:

- To provide the concept and characteristics of watershed management system
- To know the principles and measures to control the soil erosion
- To know the cropping management system

### Course Outcomes:

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

- Understand the need of watershed development in India
- Know the controlling techniques of soil erosion
- Plan the watershed management activities and preparation of action plan

### UNIT I

**Introduction:** Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

**Characteristics of Watershed:** size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

### UNIT II

**Principles Of Erosion:** Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

**Measures to Control Erosion:** Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.

### UNIT III

**Water Harvesting:** Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

**Land Management:** Land use and Land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

### UNIT IV

**Ecosystem Management:** Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

**UNIT V**

Planning of watershed management activities, people's participation, preparation of action plan, administrative requirements.

**TEXT BOOKS:**

1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R.Awurbs and WP James, - Prentice Hall Publishers

**REFERENCE:**

1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India

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## (A55008) DISASTER MANAGEMENT

### Course Objectives:

- To provide the concept and characteristics of disaster management system
- To know the principles and measures to control various disasters
- To know various types of disasters ,their causes & management system

### Course Outcomes:

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

- Understand the need of disaster management system in India
- Know the principles and measures to control various disasters
- Plan for face types of disasters ,their causes & management system

### UNIT-I

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

### UNIT-II

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

### UNIT-III

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

### UNIT-IV

Exogenous hazards/ disasters- Infrequent events- Cumulative atmospheric hazards / disasters.

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 and forms of soil erosion-factors and 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 and environmental problems-corrective measures of erosion and sedimentation biological hazards/disasters:-population explosion.

#### **UNIT-V**

Emerging approaches in Disaster Management-3 stages

1. Pre-Disaster stage (preparedness)
2. Emergency stage
3. Post Disaster Stage-Rehabilitation.

#### **TEXT BOOKS:**

- 1.Disaster mitigation:Experiences and reflections by Pardeep Sahni.
- 2.Natural hazards and disasters by Donald Hyndman and David Hyndman-Cengage learning.

#### **REFERENCE BOOKS**

- 1.R.B.Singh (Ed)Environmental geography,Heritage Publishers,New Delhi,1990.
- 2.Savindar singh environmental geography,Prayag Pustak Bhawan,1997.
- 3.Kates,B.I and White,G.F The Environment as hazards,Oxford,Newyork,1978.
- 4.R.B.Singh (Ed) Disaster Management,Rawat Publications,New Delhi,2000.
- 5.H.K.Gupta(Ed)Disaster Management,universiters Press,India,2003.
- 6.R.B.Singh,Space technology for disaster mitigation in India(INCED),University of Tokyo,1994.
- 7.Dr.Satender,Disaster Management in Hills,concept publishing co.,New Delhi,2003.
- 8.A.S.Arya Action Plan for earth quake,Disaster,Mitigation in
- V.K.Sharma(Ed)Disaster Management IIPA Publication NewDelhi,1994.
- 9.R.K.Bhandani An overview on natural and man made disaster and their reduction,CSIR,NewDelhi.
- 10.M.C.Gupta manuals on natural disaster management in India,National Centre for Disaster Management, IIPA,NewDelhi 2001.

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**(A55201) SOIL MECHANICS LAB**

**Course Objectives:**

- To impart the knowledge of various tests conducted to know the properties of soils
- To impart the knowledge of field tests involved in knowing the soil properties

**Course Outcomes:**

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

- Have the knowledge of field tests and lab tests conducted on soils.
- Get the complete knowledge of properties of various soil.
- Have the innovative methods of conducting the tests on soils.
- Do the consultancy work on soil properties.

**LIST OF EXPERIMENTS**

1. Attenberg Limits (Liquid Limit, Plastic Limit)
2. Determination of specific gravity of soil
3. Field density by core cutter method
4. Field density by sand replacement method
5. Grain size distribution by sieve analysis
6. CBR Test
7. Permeability of soil by constant and variable head test methods
8. Standard Proctor's compaction tests
9. Determination of coefficient of consolidation
10. Unconfined compression tests
11. Triaxial compression test
12. Direct shear test
13. Vane shear test
14. Differential free swell index

**Note:** Students are expected to perform minimum of ten experiments

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## (A55202) COMPUTER AIDED DESIGN LAB

**Prerequisite:** Building Materials, Construction and Planning, Structural Analysis & Design of RC Structures

### Course Objectives:

- To provide the knowledge of software involved in building drawing.
- To impart the knowledge of drawing the various views of buildings.
- To impart the knowledge of using the software to analyze and design of buildings

### Course Outcomes:

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

- Draw the plan, section, elevations and other views of a structure by using AutoCAD software.
- Prepare the working drawing of building.
- Analyze the various structures by using the any softwares.
- Model, analyze and design the buildings by using the any softwares.

### a. List of Drawings

1. Introduction to computer aided drafting
2. Software for CAD – Introduction to different software
3. Practice exercises on AutoCAD software
4. Drawing of plans of buildings for (a) single storey building (b) multi-storey buildings
5. Developing section and elevations for a) single storey building (b) multi-storey buildings
6. Detailing of building components like doors, windows roof trusses etc. using CAD software
7. Exercises on development of working drawings of buildings

### b. Analysis and design by STAAD Pro or any other available software

1. Modelling, analysis and design of multi storied symmetrical building
2. Modelling, analysis and design of multi storied unsymmetrical building

### TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sessa Prakash & Dr. G. S. Servesh, Laxmi Publications, New Delhi.
2. Engineering Graphics by P. J. Sha, S. Chand Publications, New Delhi.



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### (A56001) DESIGN OF STEEL STRUCTURES

**Prerequisite:** Strength of Materials

**Course Objectives:**

- To provide the knowledge various materials used and their properties in the steel design
- To provide the knowledge of various connections involved in steel structures
- To provide the knowledge of design principles of various elements of steel structures

**Course Outcomes:**

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

- Have the knowledge of various steels used in the construction of steel design and their properties.
- Have the thorough knowledge of IS codal provisions and the design of various structural steel elements such as beams, girders, columns, columns bases.
- Design various connections involved in the steel structures.

#### UNIT I

**Materials** - Composition of steel - types of structural steel - mechanical properties of steel - concept of plasticity - yield strength - loads and combinations - local buckling behavior of steel - concept of limit state design - limit states - design strengths - deflection limits – serviceability - stability check.

**Bolted Connections:** Types of bolts – types of joints - failure of joints - specifications - design strength - efficiency of joint - prying action.

**Welded connections:** Types of welded joints - specifications - design requirements.

#### UNIT II

**Design of Tension Members** - Design strength - design procedure – splice - lug angle.

**Design of Compression Members:** Buckling class - slenderness ratio - design strength - design of angle section.

#### UNIT III

**Design of Columns and Column Bases:** Rolled steel columns - built-up columns: laced and battened - slab base - gusseted base.

#### UNIT IV

**Design of beams:** types of sections – classification of cross sections - bending and shear strength of beams – web buckling – web crippling – design - built-up beams – bearing plates - laterally supported beams.

**Beam Connections:** Design of eccentric connections – framed, seated and

stiffened seated connections.

#### **UNIT V**

**Design of welded plate girder:** Elements - economical depth - design of main section - connections between web and flange - design of stiffeners - design of web splice & flange splice.

#### **TEXT BOOKS:**

4. Design of steel structures – N.Subramaniam, oxford university press -2009.
5. Limit state design of steel structures, S.K. Duggal, Tata Mcgraw –Hill, 2010.
6. Design of steel structures Vol I&II by Ramachandra, Standard Publications.

#### **REFERENCE BOOKS:**

1. V.L. Shah and Veena Gore, Limit State Design of steel structures IS:800- 2007, Structures Publications, 2012.
2. M.L. Gambhir, Fundamentals of Structural Steel Design, McGraw Hill Education, 2013.
3. R. Narayanan, Teaching Resource on Structural Steel Design, INSDAG, Ministry of Steel Publications, 2002.
4. Ramachandra and V. Gehlot, Design of Steel Structures, Scientific Publishers, 2009

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### (A56002) FOUNDATION ENGINEERING

**Prerequisite:** Soil Mechanics

**Course Objectives:**

- To provide the knowledge of stress distribution in soils, methods of finding the load bearing capacity of soils and settlement of soils.
- To provide the knowledge of various kinds of foundations.
- To impart the knowledge of earth pressure theories and there causes .

**Course Outcomes:**

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

- Know the knowledge of stress distribution in soils due to various kinds of loads
- Know the various methods of load bearing capacity of soils and settlement of soils
- Design the various kind of foundations, Retaining walls caissons.

#### UNIT I

**Stress Distribution in Soils:** Boussinesq's and Westergaard's theories for point loads, 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.

#### UNIT II

**Earth Pressure Theories:** Lateral Earth pressure, earth pressure at rest, earth pressure theories, Rankine's theory of earth pressure, Coulomb's earth pressure theory, Culmann's graphical method.

**Retaining Walls:** Type of Retaining walls, stability of retaining walls against overturning, sliding, bearing capacity and drainage from backfill.

#### UNIT III

**Bearing Capacity of Soils:** Karl von Terzaghi's equation for bearing capacity in soils – its modification for continuous, square, rectangular and circular footings, general and local shear failure conditions. Plate load test as per IS specification. Allowable bearing capacity. Standard penetration test and use of N values for estimating soil condition and bearing capacity. Proportioning of footings and rafts.

#### UNIT IV

**Shallow Foundations – Bearing Capacity Criteria:** Types of choice of foundation – location of depth – safe bearing capacity – Terzaghi, Meyerhof, Skempton IS methods.

**Shallow Foundations – Settlement Criteria:** Safe bearing pressure based on N value – allowable bearing pressure: safe bearing capacity – plate load test – allowable settlements of structures.

#### **UNIT V**

**Pile Foundation:** Types of piles – load carrying capacity of piles based on static pile formulae – Dynamic pile formula –pile load tests- load carrying capacity of pile groups in sands and clays – settlement of pile groups.

**Well Foundation:** Types – different shapes of wells – components of wells – functions and design criteria – sinking of wells – tilts and shifts.

#### **TEXT BOOKS:**

1. Soil Mechanics and Foundation Engineering, B.C.Punmia, Laxmi Publications, 2010
2. Soil Mechanics and Foundation Engineering, K.R.Arora, Standard Publishers, New Delhi

#### **REFERENCE BOOKS:**

1. Soil Mechanics in Engineering Practice by K. Terzaghi & R.B. Peck Wiley 3rd Ed.
2. Design Aids in Soil Mechanics and Foundation Engineering by S.R. Kaniraj, TMH New Delhi, 2004
3. Foundation Design Manual by N.V. Nayak, Dhanpat Rai Publications, New Delhi
4. Relevant Indian Standard Specifications and Codes.
5. Gopala Ranjan and A.S.R. Rao, Basic and Applied Soil Mechanics, New age Publishers, 2000.
6. C. Venkataramaiah, Geotechnical Engineering, New Age Publishers, 2006.
7. V.N.S. Murthy, Soil Mechanics, Foundation Engineering, UBS Publishers, 2011.
8. J.E. Bowles, Foundation Analysis and Design, McGraw Hill, Publishers, 2001.

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## (A56003)TRANSPORTATION ENGINEERING

**Prerequisite:** Building Materials)

**Course Objectives:**

- To provide the knowledge of highway development, planning and its geometric design
- To provide the knowledge of traffic regulations and its management.

**Course Outcomes:**

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

- Have the knowledge of highway planning, survey involved and its geometric design
- Have the knowledge of basic parameter of traffic regulations and management.
- Have the knowledge of pavement design as per the IRC codal provisions

### UNIT I

**Highway Development and Planning:** High way development in India – necessity for high way planning – different road development plans. Classification of roads – road network patterns – high way alignment – factors affecting alignment – engineering surveys – drawings and reports, road projects initiation need based planning.

### UNIT II

**Highway Geometric Design:** Importance of geometric design – design controls and criteria – high way cross section elements – sight distance elements – stopping sight distance, over taking sight distance and intermediate sight distance – design of horizontal alignment – design of super elevation and extra widening – design of transmission curve – design of vertical alignments – gradients – vertical curves. Typical cross sections for different types of roads

### UNIT III

**Traffic Engineering:** Basic parameters of traffic – volume , speed and density – traffic volume studies – data collection and presentation – parking studies and parking characteristics – road accidents – causes and preventive measures – accident data recording – condition diagram and collusion diagrams . traffic infrastructures and safety audits

### UNIT IV

**Traffic Regulation and Management:** 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

## **UNIT V**

**Traffic Intersection Design:** types of intersections – conflicts at intersections – types of at – grad intersections – canalization: objectives – traffic islands and design criteria – types of grade separated intersections – rotary intersections – concept of rotary and design criteria – impact of geometrics on intersection with reference safety, operational capacity

**Pavement Design:** Pavement types, factors to be considered for pavement design – Concept of layer theory, design wheel load, ESWL, EALF, vehicle damage factor, design by CBR developed by US corps of Engineers, IRC cumulative standard axiles methods (IRC 37: 2002).

### **TEXT BOOKS:**

1. Khanna and Justo, Highway Engineering, 10/e, Nem Chand and Bros, 2014.
2. L.R. Kadiyali, N.B. Lal, Principles and Practice of Highway Engineering, 6/e, Khanna Publication, 2014.

### **REFERENCE BOOKS:**

1. Highway Engineering by S.B.Bindra, Dhanpat Rai & Sons Publications, 4<sup>th</sup> edition
2. Traffic Engineering and Transportation Planning – Dr.L.R.Kadyali, khanna publications
3. Principles of Traffic Engineering by Garber & Hoel, CengageLearning.
4. W.R. McShane and R.P. Roess, Traffic Engineering, Prentice Hall India, 2010.
5. C. JotinKhisty and B. KentLal, Introduction to Highway Engineering,3/e, Prentice Hall India, 2002.

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### (A56004) IRRIGATION ENGINEERING

**Prerequisite:** Water Resource Engineering

**Course Objectives:**

- To enable the students understand the purpose and functions of the various irrigation structures.
- To understand various theories involved and design principles of irrigation structures.

**Course Outcomes:**

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

- Understand the various types storage reservoirs, dams, canals and diversion head works.
- Know the causes of failure of water storage structures
- Design the simple irrigation structure.

#### UNIT I

**Storage Works-Reservoirs:** Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation – Life of Reservoir.. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

#### UNIT II

**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.

#### UNIT III

**Earth dams:** 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.

Spillways: 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.

#### UNIT IV

**Diversion Head works:** 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 Weirs on Permeable Foundations – 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.

#### **UNIT V**

**Canal Falls:** 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

**Cross Drainage Works:** types, selection of site, design principles of aqueduct, siphon aqueduct and super passage, design of type-II aqueduct (under tunnel)

#### **TEXT BOOKS:**

1. S.K. Garg, 'Irrigation Engineering and Hydraulic Structures', Khanna Publishers.
2. B. C. Punmia, B. Pande and B. Lal, 'Irrigation and Water Power Engineering', Standard Book House
3. P. N. Modi, 'Irrigation, Water Resources and Water Power', Khanna Publishers
4. K. R. Arora, 'Irrigation, Water Power and Water Resources Engineering', Standard Publishers.

#### **REFERENCES:**

1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers
2. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
3. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers
4. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI



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**(A56005) CONSTRUCTION TECHNOLOGY AND PROJECT  
MANAGEMENT  
(PROFESSIONAL ELECTIVE-VI)**

**Prerequisite:** Building Materials, Construction and Planning, Design of RC Structures & Design of Steel Structures

**Course Objectives:**

- To impart the knowledge of construction technology, scheduling and methods
- To provide the knowledge of construction equipment, quality control, project planning and its scheduling

**Course Outcomes:**

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

- Handle the project work with proper planning and scheduling
- Know the methods of management to complete the project within the stipulated time
- Have the knowledge of equipment involved and technology used in the construction
- Use the innovative methods of construction of a project.

**UNIT I**

**Fundamentals of construction technology:** Construction activities – Process – Construction schedule – Construction records – Documents – Quality – Safety – Codes and regulations - Construction method – Earthwork – Piling – Concrete and concreting – Form work – Fabrication and erection.

**UNIT II**

**Mechanized construction:** Construction equipment – Equipment economics – Excavators – Rollers – Dozers – Scrapers – Handling equipment – Concrete equipment – Handling equipment – Cranes Draglines and Clamshalls.

**UNIT III**

**Quality control:** Assurance and safety – ISO-900 Quality systems – Principles on safety – Personnel, Fire and Safety – Environment protection – Concept of green building.

**UNIT IV**

**Contract management:** Project estimation – Project estimation – Contract document – Classification – Bidding – Procurement process. Construction planning – Project planning techniques – Planning of man power – Material, Equipment and Finance.

**UNIT V**

**Project scheduling:** PERT – CPM, Resource leveling, Construction claims, Dispute and Project closure – Source of claim – Claim management – Dispute resolution – Arbitration – Construction closure – Contract closure – Documentation.

**TEXT BOOK:**

1. Construction Technology by Subir K Sarkar, Subhajit Saraswati / Oxford University Press
2. Construction Project Management – Theory and practice, Nirajjha Pearson Education

**REFERENCES:**

1. Construction planning, Equipment and Methods by Peurifacy. Schexnayder Shapira, TMH

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**(A56006) ENVIRONMENTAL IMPACT ASSESSMENT &  
MANAGEMENT  
(PROFESSIONAL ELECTIVE-I)**

**Prerequisite:** Environmental Engineering

**Course Objectives:**

- To impart the basic concepts of EIA and its methodologies
- To know the environmental audit and legislation
- To impart the knowledge of soil quality, EIA in surface water, air and biological environment and causes and effects of deforestation

**Course Outcomes:**

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

- Appreciation of the contexts and role of EIA in environmental management
- Understanding of the elements of EIA and the processes by which they are applied
- Confidence to apply the framework of EIA to relevant situations.

**UNIT I**

**Basic Concept of EIA:** Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

**UNIT II**

**E I A Methodologies:** Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis. Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of activities.

**UNIT III**

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact. Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

**UNIT IV: Environmental Audit & Environmental legislation**

Objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

**UNIT V**

Post Audit activities, The Environmental pollution Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

**TEXT BOOKS:**

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

**REFERENCES:**

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

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**(A56007) ADVANCED STRUCTURAL ANALYSIS**

**Prerequisite:** Fluid Mechanics & Hydraulic Machinery

**Course Objectives:**

- To use the matrix algebra for the analysis of simple structures
- To provide the knowledge of analysis of indeterminate skeletal structures

**Course Outcomes:**

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

- Analyze the skeletal structures by matrix methods
- Simplify the analysis by taking the advantage of symmetry of structures

**UNIT I**

**Flexibility Matrix Method:** Degree of indeterminacy of plane & space structures (static and kinematics) - description of method, flexibility coefficients, steps in the analysis, application to beams and trusses with kinematic indeterminacy not exceeding three.

**UNIT II**

**Stiffness Matrix Method:**, stiffness matrix of a spring element, analysis of spring systems, discretization, assembly of global stiffness matrix, stiffness matrix of a bar element, analysis of bar systems, discretization and analysis of tapered bar structures.

**Analysis of Beams by Stiffness Method:** Stiffness matrix of a beam element equivalent nodal load vector due to point load, udl and a couple, steps in the analysis, application to the problems with not more than three DOF.

**UNIT III**

**Analysis of Plane Trusses by Stiffness Method:** Global local coordinate systems, stiffness matrix of a truss element in local axis, transformation matrix, stiffness matrix in global axis, forces in the members, steps in the analysis, application to plane trusses with not more than 3 DOF, trusses involving with members of too long and too short in length and with change of temperature.

**UNIT IV**

**Analysis of Plane Frames by Stiffness Method:** Stiffness matrix of a plane frame element in local axis, steps in the analysis, transformation matrix, stiffness matrix of a plane frame element in global axis, steps in the analysis, application to frames with not more than three DOF.

## **UNIT V**

**Additional topics:** Use of symmetry and anti-symmetry, analysis of trusses with inclined supports, beams with shear deformations, beams with hinged ends. Banded matrix, semi band width, band minimization techniques

### **TEXT BOOKS:**

1. Matrix methods of structural analysis by P.N. Godbole, R.S. Sonparote, S.U. Dhote, PHI Learning private Limited, Delhi.
2. Matrix analysis of framed structures by William Weaver, J. R. and James M. Gere, CBS Publishers and distributors, New Delhi.
3. Matrix structural analysis by J. L. Meek, McGraw Hill

### **REFERENCES:**

1. Introduction to finite elements in engineering by T. R. Chandrupatla, A.D. Belegundu, Prentice Hall.
2. Matrix methods of structural analysis by M. B. Kanchi, Wiley Eastern Limited.

# ANURAG ENGINEERING COLLEGE

## (AN AUTONOMOUS INSTITUTION)

III Year B.Tech. CE-II Sem

L	T /P/D	C
0	3	2

### (A56201) CONCRETE TECHNOLOGY LAB

**Prerequisite:** Concrete Technology

**Course Objectives:**

- To provide the knowledge of various tests conducted on cement, aggregates and concrete.
- To provide the knowledge of IS codal provisions.
- To know various materials used in the concrete and their properties

**Course Outcomes:**

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

- Understand conducting the tests on various materials used in making the concrete
- Do the consultancy work on concrete materials

### LIST OF EXPERIMENTS

**I. Tests on Cement:**

1. Fineness and normal consistency of cement
2. Initial setting time and final setting time of cement
3. Specific gravity of cement
4. Compressive strength of cement
5. Soundness of Cement.

**II. Tests on Aggregate:**

1. Fineness modulus of fine and coarse aggregate
2. Specific gravity and bulk density of fine and coarse aggregate
3. Bulking of sand

**III. Tests on Concrete:**

1. Workability tests on concrete by slump and Vee-bee
2. Compaction Factor Test
3. Young's modulus and compressive strength of concrete
4. Splitting tensile strength of concrete
5. Flexural strength of plain concrete
6. Non-destructive testing on concrete (for demonstration)

**Note:** Students are expected to perform minimum of ten experiments

# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

III Year B.Tech. CE-II Sem

L	T/P/D	C
0	3	2

## (A56202)ADVANCED ENGLISH COMMUNICATION SKILLS LAB

### 1. Introduction

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

The proposed course should be an integrated theory and lab course to enable students to use ‘good’

English and perform the following:

- Gather ideas and information, to organize ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

### 2. Objectives:

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

To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.



Further, they would be required to communicate their ideas relevantly and coherently in writing.

### **3. Syllabus:**

The following course content is prescribed for the Advanced Communication Skills Lab:

- 1. Vocabulary Building** – synonyms and antonyms, Word Roots, One-Word Substitutes, Prefixes and Suffixes, Study of Word Origin, Analogy, Idioms and Phrases.
- 2. Reading Comprehension** – Reading for Facts, Guessing meanings from context, Scanning, Skimming, Inferring Meaning, and Critical Reading.
- 3. Writing Skills** –Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose.
- 4. Technical Writing**- Technical Report Writing, Research Abilities/Data Collection/Organizing Data/Tools/Analysis.
- 5. Group Discussion** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Coherence.
- 6. Presentation Skills** – Oral presentations (individual and group) through JAM sessions/Seminars, Written Presentations through Projects/ PPTs/e-mails etc.
- 7. Interview Skills** – Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Interview through Telephone and Video-Conferencing.

**4. Minimum Requirement:** The English Language Lab shall have two parts:

i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

**System Requirement (Hardware component):** Computer network with Lan with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

### **5. Suggested Software:**

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

#### **Suggested Software:**

- Clarity Pronunciation Power – part II
- Oxford Advanced Learner's Compass, 7<sup>th</sup> Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech.
- TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS) □
- The following software from train2success.com
  - i. Preparing for being Interviewed,
  - ii. Positive Thinking,
  - iii. Interviewing Skills,
  - iv. Telephone Skills,
  - v. Time Management
  - vi. Team Building,
  - vii. Decision making
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

### **6. Books Recommended:**

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. English Language Communication : A Reader cum Lab Manual Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
4. English Vocabulary in Use series, Cambridge University Press 2008.
5. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
10. English for Technical Communication for Engineering Students, Aysha Vish hwamohan, Tata Mc Graw-Hil 2009.
11. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/Cambridge University Press.
12. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

**IVYear B.Tech. CE-I Sem**

L	T /P/D	C
4	1	4

## (A57001) ESTIMATING AND COSTING

(Prerequisite: -nil-)

### **Objectives:**

- To study the material and cost estimation of buildings
- To study the estimation of roads covering culverts and bridges
- To study the rate analysis
- To bring about an exposure to field problems associated with roads/bridge marking and estimation of roadwork quantities

### **Course Outcomes:**

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

- The student will have an idea about rate analysis and costing for different stages of work
- Will have knowledge on various methods of valuations and estimating cost depreciations.
- Will be able to estimate labour required stage wise
- Will have complete knowledge on various types of contracts and tenders.

### **UNIT I**

Working out the detailed estimate for the following:

- i) Flat roofbuilding (load bearing, RCC & Steel framed structure)
- ii) Bituminous and C.C. Road work including earthwork
- iii) Single pipe culvert and single cell rectangular box culvert.
- iv) Septic tank
- v) Irrigation canal work including earthwork

### **UNIT II**

Estimation of steel quantities for the following R.C. Works

- i) Slabs, Beams and Columns
- ii) Footings - Rectangular, isolated and combined
- iii) Stair Case
- iv) Overhead rectangular water tank

### **UNIT III**

Preparation of analysis of rates and theoretical requirements of materials as per the standard data of APDSS for the following:

- i) Major items of works of a building
- ii) All items of work of bituminous and concrete road works

### **UNIT IV**

As per APDSS

- i) General and detailed specification of works
- ii) Departmental procedure for construction work
- iii) Types of estimates

#### **UNIT V**

- i) Types of contracts, essentials of contract, condition of contract and recent developments.
- ii) Tender - Tender form, Tender documents, Tender notice, e-tender work order.
- iii) Earnest money, Security deposit and new developments
- iv) Measurement book and Muster roll. Concept of PPP projects, BOT and BOOT projects

#### **TEXT BOOKS:**

1. B.N. Dutta, Estimating and Costing in Civil Engineering, UBS Publishers.
2. M. Chakraborti, 'Estimation, Costing, Specifications and Valuation in Civil Engineering', M. Chakraborti Publishers

#### **REFERENCE BOOKS:**

1. Relevant Indian Standard Specifications.
2. World Bank Approved Contract Documents.
3. FIDIC Contract Conditions.
4. Acts Related to Minimum Wages, Workman's Compensation, Contract, and Arbitration.
5. Standard schedule of rates and standard data book by public works department.
6. G.S. Birdie, Textbook of Estimating and Costing in Civil Engineering, 2014.
7. IS 1200-1992 "Methods of Measurements of Building and Civil Engineering Works"
8. Joy P K, Handbook of Construction Management, Macmillan
9. B.S. Patil , Building & Engineering Contracts

# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

IV Year B.Tech. CE-I Sem

L	T /P/D	C
4	1	4

## (A57002) PAVEMENT DESIGN

(Prerequisite: Transportation Engineering)

### Course Objectives:

- To provide the knowledge on various types of pavements used in construction with computation of material characteristics and layer concepts
- To provide knowledge on stresses induced in pavements and its importance
- To explain various types of pavement designs like flexible and rigid
- To provide the knowledge on highway construction and maintenance of different pavements

### Course Outcomes:

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

- Understand the types of pavements and the materials used effectively in the pavements
- Gives an idea to explore various highway construction materials, techniques and their maintenance
- Design the various pavements by using the available sources economically
- Have the knowledge on identification of causes pavement failures and remedial measures

### UNIT I

Types of pavement – Factors affecting design of pavements – wheel loads –ESWL Concept- tyre pressure – contact pressure, Material characteristics – Environmental and other factors. Stresses in flexible pavement – layered systems concept – one layer system – Boussinesq Two layer system – Burmister Theory for Pavement Design.

### UNIT II

Stresses in rigid pavements – relative stiffness of slab, modulus of sub-grade reaction – stresses due to warping, stresses due to loads, stresses due to friction. Pavement design: CBR Method of Flexible Pavement Design- IRC method of flexible pavement design.- AASHTO Method of Flexible Pavement design

### UNIT III

IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements-Types of Joints – Use of Tie Bars and Dowell Bars. Highway Materials – Soil, Aggregate and Bitumen- Tests on aggregates – Aggregate Properties and their Importance- Tests on Bitumen – Bituminous Concrete- Requirements of Design Mix- Marshall's Method of Bituminous Mix design.

**UNIT IV**

Highway construction – Construction of Earth Roads- Gravel Roads – WBM Roads- Bituminous Pavements- Cement Concrete Roads- Steps in Construction- Reinforced Concrete Pavements – Soil Stabilization – Methods and Objectives- Soil-cement Stabilization and Soil-lime Stabilization.

**UNIT V**

Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements- Types and Causes-Rigid Pavement Failures- Types and causes- Pavement Evaluation- Benkelman Beam method- Strengthening of Existing Pavements- Overlays.

**TEXT BOOKS:**

1. Highway Engineering – S.K.Khanna & C.J.Justo, Nemchand & Bros., 7th Edition (2000).
2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal – Khanna publishers – (2003).
3. Design of functional pavement Nai C Yang – Mc Graw Hill Publications

**REFERENCES:**

1. Principles of Pavement Design by Yoder, E.J. & Witczak, M.W., John Wiley and Sons, USA.
2. Pavement analysis and Design by Huang, Y. H. (1993), Prentice Hall, Englewood Cliffs, New Jersey.

**CODES:**

1. IRC Code for flexible pavement – IRC – 37 -2001.
2. IRC Code for Rigid pavement – IRC – 58 – 2002

# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

IVYear B.Tech. CE-I Sem

L	T /P/D	C
3	-	3

## (A57003) GIS & Remote Sensing

### Course Objectives:

- To understand the principles involved and applications of RS & GIS
- To interpret images
- To analyse spatial & attribute data
- To know the spatial analysis method

### Course Outcomes:

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

- Use the RS & GIS applications in various aspects
- Analyse the energy interaction in the atmosphere and earth surface features
- Interpret the images for preparation of thematic maps
- Analyse spatial & attribute data for solving spatial problems
- Know the GIS spatial analysis method.

### UNIT – I

Introduction to Photogrammetry: Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height, determinations.

Remote Sensing – I: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

### UNIT – II

Remote Sensing – II: 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.

### UNIT – III

Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Types of data representation: 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 GIS mapping.

### UNIT – IV

GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data. Water Resources Applications-I: 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

**UNIT – V**

RS & GIS applications: Transportation Watershed management, Geology, Emergency Management, Agriculture, Land use and Land cover Mapping.

**TEXT BOOKS:**

1. Remote Sensing and its applications by LRA Narayana University Press 1999.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.

**REFERENCES:**

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yongng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S.Publications.
3. GIS by Kang – tsung chang, TMH Publications & Co.,
4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
5. Fundamental of GIS by Mechanical designs John Wiley & So



# ANURAG ENGINEERING COLLEGE

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IVYear B.Tech. CE-I Sem

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### (A57004) RAILWAYS AND AIRPORT ENGINEERING (PROFESSIONAL ELECTIVE-III)

(Prerequisite: Transportation Engineering)

#### Course Objectives:

- To provide the basic knowledge on importance and components railways and airways
- To provide the knowledge on the geometric features of railways
- To provide the knowledge on importance of airway systems and airport planning studies
- To provide the knowledge on airport configurations and its alliance

#### Course Outcomes:

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

- Identify different components of railway track and select right materials for construction
- Compute the various geometric features of railways for a given set of requirements.
- Understand the importance of airway system and characteristics of aircrafts and involve in planning of airport facilities.
- The students will be able to understand the facilities at airports construct the same.

## RAILWAY ENGINEERING

### UNIT I

**Introduction:** Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways. Railway Track:

**Permanent way:** Gauges in Railway track, Railway track cross - sections; Coning of wheels.

### UNIT II

**Rails & Rail Joints :** Functions of rails; Requirements of rails; Types of rails sections; Standard rail sections; Length of rails; Rail failures; Wear on rails. Requirements of an ideal joint; Types of rail joints; Welding of rails.

**Sleepers:** Functions of sleepers; Requirements of sleepers; Classification of Sleepers - Timber sleepers, Metal sleepers & Concrete sleepers; Comparison of different types of sleepers. Fish plates, failure of fish plates.

**Ballast:** Functions and requirements of ballast; Types of ballast; Renewal of ballast.

## **AIRPORT ENGINEERING**

### **UNIT III**

**Introduction:** 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.

### **UNIT IV**

**Airport Planning:** 1. Types of airport planning studies, 2. Forecasting in aviation and airport planning

### **UNIT V**

**Airport Configuration:** 1. Introduction of Airport configurations, 2. Analysis of wind, 3. Runway configurations, 4. Taxiway configurations, 5. Air traffic control facilities, 6. Air safety & regulation issues

### **TEXT BOOK**

- 1 Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 1994.
2. Railway Engineering by Rangwala, Charotar Publishing House.

### **REFERENCES**

1. Air Transportation Planning & design – Virendhra Kumar & Statish Chandhra – Gal Gotia Publishers (1999).

# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

IVYear B.Tech. CE-I Sem

L	T /P/D	C
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## (A57005) EARTH RETAINING STRUCTURES (PROFESSIONAL ELECTIVE-III)

(Prerequisite: Soil Mechanics & Foundation Engineering)

### Course Objectives:

- To provide the fundamentals and tools needed for the design and analysis of earth retention systems.
- To know the selection, design, and performance of earth retaining structures
- To impart the theory involving earth pressures and soil-reinforcement interaction.
- To provide the case histories as well as demonstrating the various earth retaining structures.

### Course Outcomes:

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

- Quantify the lateral earth pressures associated with different earth systems.
- Evaluate the mechanical properties of geosynthetics used for soil reinforcement
- Identify the types, advantages, and disadvantages of the different earth retaining systems
- Complete the design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods.

### UNIT I

**Introduction:** Types of earth retaining systems- Classification- Overview of fill wall systems- Overview of cut wall systems.

**Earth Pressure Theory:** Mohr's circle- At rest, active, and passive earth pressures- Influence of movement on earth pressures- Earth pressure from surcharge loads and due to compaction- Earth pressures from seismic forces.

### UNIT II

**Retaining Walls:** Proportioning of retaining walls- application of lateral earth pressure to design- Stability of retaining walls, Check for overturning, sliding and bearing capacity.

### UNIT III

Design of gravity retaining walls, and semi-gravity walls- Design of modular gravity walls- Design of sheet pile walls- Design of anchored walls- Retaining wall design by with metallic strip reinforcement- step by step procedure with metallic strip reinforcement- Retaining walls with geotextile reinforcement

#### **UNIT IV**

**Internal Stability:** Design of mechanically stabilized earth (MSE) walls - Design of segmental retaining walls- Design steps for reinforced steep slopes- Design of soil nail walls.

#### **UNIT V**

**Sheet Pile walls:** Construction Methods - cantilever Sheet pile walls - Cantilever sheet piling penetrating sandy soils - Cantilever sheet piling penetrating clay soils - anchored sheet piles.

Introduction to Prestressed anchors, Soil Nailing, Uplift anchors and Soil Retention Systems.

#### **TEXT BOOKS:**

1. Koerner, R.M. (2012). *Designing with Geosynthetics*. Sixth Edition. Prentice Hall.
2. Das, B.M. (2015). *Principles of Foundation Engineering*, Cengage Learning.

#### **REFERENCE BOOKS:**

1. Advanced Foundation Engineering by VNS Murthy, (2012), CBS Publishers and Distributors.
2. Bowles J.E, Foundation Analysis and Design (1996), Tata Mc Garw Hill Company.

# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

IV Year B.Tech. CE-I Sem

L	T /P/D	C
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## (A57006) ADVANCED STRUCTURAL DESIGN

(Prerequisite: Design of RC Structures & Design of Steel Structures)

### Course Objectives:

- To understand the theory and design of retaining walls, combined footings and water tanks.
- To provide the knowledge of design of roof trusses
- To provide the knowledge of plastic analysis

### Course Outcomes:

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

- Know the theory and design of retaining walls, combined footings and RC water tanks
- Design a long span roof trusses by applying various loads
- Know the plastic behaviour of steel structures

### UNIT I

**Retaining Walls:** Introduction, types, design of RCC cantilever and counter fort retaining walls.

### UNIT II

**Combined Footings:** Introduction, design of rectangular footing, strap footing, trapezoidal footing and raft.

### UNIT III

**Design of RCC water tanks:** Circular water tank with roof slab/dome resting on ground, underground and over head by IS code method (Working Stress Method) - rectangular water tank with one-way roof slab resting on ground, underground and over head by IS code method (Working Stress Method).

### UNIT IV

**Design of Roof Trusses:** Types of roof trusses - loads on trusses - estimation of wind loads as per IS 875 - purling design - truss design - design of joints and end bearings.

### UNIT V

**Plastic analysis:** Introduction - idealized stress – strain diagrams - shape factor for various sections – moment curvature relationship – ultimate moment - plastic hinge - collapse mechanism for beams – lower and upper bound theorems – ultimate strength of fixed and continuous beams.

**TEXT BOOKS:**

1. A.K. Jain, Reinforced Concrete – Limit State Design, 7/e Standard book house, 2012.
2. Pillai and Menon, Reinforced Concrete Design, 3/e, Tata McGraw Hill, 2009.
3. P.C. Varghese, Limit State Design of Reinforced Concrete, 2/e, Prentice Hall of India, 2013.
4. Design of Steel Structures by Ramchandra
5. **Codes:** Relevant IS: codes.

**REFERENCES:**

1. Advanced Reinforced Concrete Design by P.C. Varghese, Prentice Hall India.
2. Design drawing of concrete and steel structures by N.Krishna Raju University Press.
3. Design of steel structures by N. Subramanyam
4. Design of steel structures by Arya and Azmani

# ANURAG ENGINEERING COLLEGE

## (AN AUTONOMOUS INSTITUTION)

IVYear B.Tech. CE-I Sem

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### (A56007) GROUND IMPROVEMENT TECHNIQUES (PROFESSIONAL ELECTIVE-IV)

(Prerequisite: Soil Mechanics & Foundation Engineering)

#### Course Objectives:

- To understand the techniques required in improving in-situ soil.
- To identify basic deficiencies of various soil deposits
- To know the problems of expansive soils and application of geosynthetics.

#### Course Outcomes:

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

- Understand the ground improvement techniques such as dewatering, insitu densification, soil stabilization to improve the load bearing capacity of soils
- Methods involving the improvement of expansive soils and utilization of geosynthetics

#### UNIT I

**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.

#### UNIT II

**In-situ densification methods in granular Soils:** Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth.

In – situ densification methods in Cohesive soils:– preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

#### UNIT III

**Stabilization:** Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls –design principles of reinforced earth walls.

#### UNIT IV

**Dewatering:** 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.

**Grouting:** Objectives of grouting- grouts and their properties- grouting methods-ascending, descending and stage grouting- hydraulic fracturing in soils and rocks-post grout test.

## **UNIT V**

**Geosynthetic:** Geotextiles- Types, Functions and applications – geogrids and geomembranes – functions and applications.

**Miscellaneous:** Pre-stressed Anchors, Rock Anchoring, Contiguous Pile Foundations, Soil Nailing and Uplift Anchors.

### **TEXT BOOKS:**

1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
2. Purushotham Raj. Ground Improvement Techniques, Laxmi Publications, New Delhi

### **REFERENCES:**

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons, New York, USA.
3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy, USA



# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

IVYear B.Tech. CE-I Sem

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## (A58001) FINITE ELEMENT METHOD (PROFESSIONAL ELECTIVE-IV)

(Prerequisite: Advanced Structural Analysis)

### UNIT I

**Introduction:** Concepts of FEM, steps involved, merits and demerits, matrix displacement method vs FEM, element definition: interpolation functions, stress-strain relationship, strain displacement relationship, stiffness matrix and load vector from the energy principles, Raleigh-Ritz method of functional approximation.

One dimensional problem: Stiffness matrix for a two-noded and three-noded bar elements and their shape functions, equivalent nodal force vector due to surface and body forces, analysis of 1D structures using 2-noded and 3-noded bar elements.

### UNIT-II

**CST element – two dimensional problems:** Plane stress and plane strain problems, stiffness matrix of constraint strain triangle (CST) element, shape functions, equivalent nodal force vector, applications, introduction to linear strain triangle.

### UNIT III

**Shape functions:** Shape functions for 1D elements in Cartesian coordinators of 2-noded and 3-noded elements, methods of constants, Lagrange polynomial, in natural coordinates.

Shape functions for 2D elements: rectangular elements of Lagrange family, Serendipity family, shape functions of triangular elements in area coordinator.

Introduction to shape functions of 3D element, Conditions which shape functions should satisfy.

### UNIT IV

**Isoparametric elements and numerical integration:** isoparametric concept, isoparametric elements for 1D analysis, isoparametric elements for 2D analysis (Serendipity Family), stiffness matrix for linear isoparametric element, equivalent nodal force vector, numerical integration, applications, convergence and compatibility requirements, Validity of isoparametric elements.

### UNIT V

Two-noded beam element stiffness matrix of a beam element from a cubic polynomial, Hermitian polynomials and their properties, equivalent nodal force vector.

### TEXT BOOKS:

1. Introduction to finite element method by P.N. Godbole, I.K. International Publishing House Pvt. Ltd., New Delhi.

2. Introduction to finite elements in engineering by T.R. Chandrupatla and A.D. Belegundu, Prentice Hall
3. The finite element method, O.C. Zienkiewicz, Tata McGraw-Hill Publishing Company, New Delhi.

**REFERENCES:**

1. C.S. Krishna Murthy, Finite Element Analysis, Mc Graw Hill., 1997
2. C.S. Desai and J.F. Abel, Introduction to the Finite Method, Van Nostrand, 2002

# ANURAG ENGINEERING COLLEGE (AN AUTONOMOUS INSTITUTION)

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## (A57009) BUILDING SERVICES (PROFESSIONAL ELECTIVE-IV)

(Prerequisite: Design of RC Structures)

### **Courses Objective:**

- To design a building with all essential facilities for better life style
- To create a sustainable structure
- To design a green building

### **Course Outcomes:**

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

- Understand the essential requirement of a building and their installations
- Design a building with sound proof
- Know the requirement of fire fighting and safety measures of a building
- Understand the mechanical instruments requirement and their installation in a building

### **UNIT I**

**Plumbing work:** Water supply and sanitary provisions, Accessories of sanitary provision, methods of plumbing, problems associated with plumbing work.

### **UNIT II**

**Acoustics, Sound Insulation and Noise Control:** Basic terminology and definitions, Physics of sound, behaviour of sound in an enclosed space, requisites for acoustic environment, acoustic design approaches for different building types, with reference to applicable standards, selection of acoustic materials, noise and its control, control of structure borne sound and noise from different mechanical equipment.

### **UNIT III**

**Electrical and Allied Installations: day lighting , basic design, artificial lighting**  
.Different types of wiring, need of earthing, comparison between fuse and MCB, substation, types of lightening fixtures, electricity distribution in multi-storeyed building. Building protection against lightening, Planning and layout of electrical installations within a building complex.

### **UNIT IV**

**Ventilation:** Functions of ventilation, supply of fresh air, convective cooling, Stack effect, physiological cooling, provision for air movement; wind effect, Air flow through buildings, cross-ventilation, position and size of openings, air flow around buildings, humidity control.

**Air Conditioning, Heating and Mechanical** (Thermodynamics of human body.)  
Ventilation: Requirement of air conditioning, air conditioning system, elements of air conditioning, Working and p-H diagram of vapour compression cycle, refrigeration effect,

#### **UNIT V**

**Mechanical Equipment & Installation:** Installation of lifts and escalators, different types of Security and alarm systems. Hot Water Provision (Solar and Electrical), Special features required for physically handicapped and elderly.

**Firefighting and safety measures :** Planning considerations in buildings using non-combustible materials, escapes, Fire detection and fire fighting systems. Heat and smoke detectors, Fire alarm system, Automatic sprinklers.

**Assignment:** Case Study of any Building & its services

#### **REFERENCE BOOKS:**

- 1 Building Services Engineering by David V Chadderton
- 2 General Specification for Electrical Work – Part – I, II & III, Government of India Publication, Jain Book Depot.
- 3 General Specification of Heating & Ventilation - 2004, Government of India Publication, Jain Book Depot.
- 4 Handbook on Functional Requirement of Buildings.
- 5 Building Services Environmental & Electro – Mechanical Services, by S M Patil, Jain Book Depot.

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## (A57201) TRANSPORTATION ENGINEERING LAB (Prerequisite: Transportation Engineering)

### Course Objectives:

- To impart the knowledge on road aggregates, bitumen and bitumen mixes
- To provide the knowledge of methods of tests conducted on various road materials.

### Course Outcomes:

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

- Understand the limiting properties of various road materials used in pavement design.
- Have the knowledge of consultancy potential.

### LIST OF EXPERIMENTS

#### I. TESTS ON ROAD AGGREGATES

1. Aggregate crushing value
2. Aggregate impact value
3. Specific gravity and water absorption
4. Los Angeles abrasion test
5. Shape tests: (a) Elongation index, (b) Flakiness index and (c) Angularity number

#### II. TESTS ON BITUMEN

1. Penetration tests
2. Softening point tests
3. Ductility tests
4. Viscosity grading
5. Bitumen extraction tests

#### III. FIELD STUDIES (any one)

1. Traffic volume studies.
2. Spot speed studies.
3. Parking studies.

Note: Students are expected to perform minimum of ten experiments

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## (A57202)ENVIRONMENTAL ENGINEERING LAB

### Objectives:

To know **Course**

- the various lab tests involve in knowing the properties of water and sewage
- To provide the knowledge of methods of conducting the lab test

### Course Outcomes:

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

- Know the standard limits of water and sewage.
- Have the knowledge of consultancy potential of water and sewage test.

### 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 optimum dose of coagulant
9. Determination of chlorine demand
10. Determination of total phosphorous
11. Determination of B. O. D.
12. Determination of C. O. D.

**Note:** Minimum of 10 experiments are to be conducted from the above list.

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### (A58001) PRESTRESSED CONCRETE (PROFESSIONAL ELECTIVE-V)

(Prerequisite: Design of RC Structures)

#### Course Objectives:

- To impart the knowledge of systems of pre-stress concrete and their disadvantages
- Know the analysis of pre and post tensioning simple structures
- Design the flexural members for shear, bond and torsion and design the end blocks.
- Analysis and design of composite section and their application in design of prestressed concrete bridges.

#### Course Outcomes:

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

- Understand the advantages of pre-stressed concrete structural elements over the conventional elements
- Analysis and design of simple pre-stressed concrete structures

#### UNIT I

Definition, classification and systems of pre stress ship, properties of materials in PSC, loss of prestress, losses of prestress in pretension and post tensioned members

#### Unit II

Cable profile, Kern points, load balancing concept, Analysis of simple sections and stress diagrams for prestress, dead and live loads., Analysis of composite section and stress diagrams for prestress, dead and live loads

#### UNIT III

Simply supported and continuous beams. Concordant cable profile, design of sections, flexural strength of rectangular I and T sections using IS code provisions

#### UNIT IV

**Design for shear:** shear failure, web shear failure, flexural shear failure, shear compression failure , shear tension failure. shear strength of beams of uncracked and cracked in flexure

#### UNIT V

Deflections of PSC members for simply supported beams with point loads and UDLs. analysis and design of end block by Guyon's method for not more than two cables.

**TEXT BOOKS:**

1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

**REFERENCE:**

1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.
2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.

**Codes:** BIS code on prestressed concrete, IS 1343.



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## (A58002) HAZARDOUS SOLID WASTE MANAGEMENT (PROFESSIONAL ELECTIVE-III)

(Prerequisite: Environmental Engineering)

### Course Objectives:

- To understand the source of solid waste, their properties and its handling
- To know the types of hazardous waste and their disposal
- To aware the legal aspects of hazardous waste management

### Course Outcomes:

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

- Know the various type solid waste, their properties and their treatment
- Know the types of hazardous waste, their disposal and their legal aspects
- Understand the methods of solid and hazardous waste disposal
- Aware the site remedial technology

### UNIT I

**Solid Wastes:** sources, types, composition, physical, chemical, and biological properties of solid wastes / sources and types of hazardous and infectious wastes in municipal solid wastes.

**Solid waste generation and collection:** Handling, Storage, Processing, Transportation.

### UNIT II

**Disposal of Solid waste:** materials separation and processing, thermal conversion, biological and chemical conversion, recycling of material in municipal solid wastes, Land-filling, Composting, gas generation, closure of land-fills.

**Hazardous Wastes:** Fundamentals, fate, and Transport of contaminants, Toxicology origin, quantity and quality parameters.

### UNIT III

**Biomedical / infectious Waste:** Composition, Collection, Handling and Disposal.

**Legal aspects of Hazardous Waste Management:** Collection, Conveyance, Treatment and Disposal.

### UNIT IV

**Hazardous Waste Management Practices:** Environmental Audits, Pollution Prevention.

**Treatment and Disposal Methods:** Physicochemical processes, Biological Methods, Stabilization & Solidification, Thermal Methods, Land Disposal.

### UNIT V

**Site Remediation:** Site & Subsurface Characterization, Remedial Technologies.

**TEXT/REFERENCE BOOKS:**

1. Integrated Solid Waste Management, Tchobanoglous, Thiesen and Vigil, McGraw Hill.
2. Hazardous Waste Management, Lagrega, Buckingham and Evans, McGraw Hill, N.Y.
3. Solid Waste Management in Developing Countries, A D Bhide, Nagpur Publications.

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### (A58003) URBAN PLANNING & DEVELOPMENT (PROFESSIONAL ELECTIVE-V)

(Prerequisite: Transportation Engineering)

#### Course Objectives:

- To enable students to have the knowledge on planning and development of urban areas
- To impart the knowledge of legislation and management of urban systems

#### Course Outcomes:

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

- Understand the basic issues, classification and planning of urban areas
- Know the planning and development of urban development projects
- Aware the legislation, development and management of urban systems

#### UNIT I

**Basic Issues:** Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, peri-urban areas, Central Business District (CBD), Classification of urban areas – trend of urbanisation at International, National, Regional and State level.

#### UNIT II

**Planning Process:** Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, Delineation of Planning Areas, Surveys and Questionnaire Design.

#### UNIT III

**Development Plans, Plan Formulation and Evaluation:** Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights , Special Economic Zones.

#### UNIT IV

**Planning And Design Of Urban Development Projects:** Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects.

#### UNIT V

**Legislation, Development And Management Of Urban System:** Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.

**REFERENCES:**

1. Chennai Metropolitan Development Authority, Second Master Plan for Chennai, Government of Tamil Nadu, Chennai, 2008
2. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai
3. Goel S.L., Urban Development and Management, Deep and Deep Publications, New Delhi,2002
4. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications,Chennai, 2005

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## (A58004) REHABILITATION AND RETROFITTING OF STRUCTURES (PROFESSIONAL ELECTIVE-VI)

(Prerequisite: Design of RC Structures)

### Course Objectives:

- To understand the maintenance and repair strategies required for concrete, steel, timber and masonry structures.
- To understand the advanced technologies available in repairing of structures
- To know the seismic retrofitting of structures

### Course Outcomes:

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

- Understand the behavior of existing constructions.
- Understand the main causes of structural failures and will be able to give the guidelines to their repairs and retrofitting.
- Give the guidelines and retrofitting procedures required for seismic prone structures

### UNIT I

#### Maintenance and Repair Strategies:

Maintenance, Facets of Maintenance, importance of Maintenance, various aspects of Inspection, Condition Assessment of a structure, Various methods of Condition assessment , NDT and NDE ,Repair Strategies , Repairs-Rehabilitation-Retrofitting-Strengthening-Upgradation of a Structure, Selection of Materials and Techniques for Repair

### UNIT II

#### Repairs to Masonry and Concrete Structures:

Methods of crack repair in masonry and concrete structures, routing and sealing of cracks, removal and surface preparation in masonry and concrete structures, reinforcement repair, anchorage, placement methods; Shot-creting and guniting, Grouting- Portland cement grouting, chemical grouting, Dry packing, polymer impregnation, Strengthening of structures flexural strengthening, Shear Strengthening, strengthening of columns- jacketing of Columns, strengthening by interior and external reinforcing, External Pre-stressing, Fiber wrapping, Corrosion Protection: surface treatment, joint sealants, cathodic protection

### UNIT-III

#### Repairs to Timber and Steel Structures:

Testing of Timber Structures for rots, Creosote retention, Planning for repairs in Timber Structures- Repairs to Timber Structures, Dynamic Loading and Fatigue, welding technology, weldability, Cleaning and surface Preparation of Corroded Structural Steel, replacement and addition of new members, different Types of Steel and Composite Joints.

## **UNIT IV**

### **Repairs to Special Structures and Special Repairing Techniques:**

Repairs to Concrete Structures under water , Repairs to Bridges , Repairs to Water Tanks , Repairs to Tunnels , Repairs to Dams – At least one case study for each of these structures –

## **UNIT V**

### **Seismic Retrofitting of Structures:**

Retrofit of Reinforced Concrete Buildings - Retrofit of Steel Buildings - Retrofit of Foundations - Base Isolation and Energy Dissipation - Retrofit Case Studies

#### **TEXT BOOKS:**

1. Den Campbell, Allen and Harold Roper, "Concrete Structures Materials, Maintenance and Repair", Longman Scientific and Technical, UK, 1991.
2. Allen R.T and Edwards S.C, "Repair of Concrete Structures", Blakie and Sons, UK, 1987
3. Philip H. Perkins "Repair , Protection and Waterproofing of Concrete Structures", Elsevier Applied Science Publisher, London, New York, 1986
4. P.C. Guha " Maintenance and Repairs of Buildings " , New Central Book Agency , Kolkata 2006.

#### **REFERENCES:**

1. H.W.Kwon " Maintenance and Repair of Concrete under water" , 11th International Conference Proceedings , Conclinic Co. Ltd., 2013
- 2..CPWD " Handbook on Repair and Rehabilitation of RC buildings " , Director General of CPWD , New Delhi, 2002
3. IITM & CPWD " Hand book on Seismic Retrofit of buildings " , Narosa Publishing House
4. American Wood Council " National Design Specification " , 2005

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**(A58005) DESIGN AND DRAWING IRRIGATION STRUCTURES**  
**(PROFESSIONAL ELECTIVE-VI)**

Design and Drawing of the following hydraulic structures

Group A

1. Surpluse Wier
2. Syphon Well Drop
3. Trapezoidal notch Fall
4. Tank sluice with tower head

Group B

1. Sloping glacis weir
2. Canal regulator
3. Under tunnel
4. Type III siphon aqueduct

Text Books

1. Water Resource Engineering – Principal and Practice by Challa Satyanarayana murthy New age international Publishers
2. Irrigation Engineering and Hydraulic structures by S.K Garg Standard book House.

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## (A58006) GEOENVIRONMENTAL ENGINEERING (PROFESSIONAL ELECTIVE-VI)

### UNIT-I

**Sources and site Characterization** :- Scope of Geo- Environmental Engineering  
Various sources of contaminations Needs for Contaminated site characterization and  
characterization methods

### UNIT-II

**Solid and Hazardous waste management:-** Classification of waste  
Characterization solid wastes environmental concerns with waste waste  
management strategies

### UNIT-III

**Contaminant Transport:-** Transport process Mass transfer process, Modeling  
NAPL

### UNIT-IV

**Remediation Techniques** Objectives of site remediation various active and passive  
methods, Bioremediation, Phytoremediation, Remediation of NAPL sites

### UNIT-V

**Landfills:-** Types of landfills site selection waste Containment Liners, Leachate  
collection system Cover system Gas collection systems

### Textbook

1. Phillip B. Bedient Refai H.s & Newell C.J Ground watercontamination-  
Prentice Hall Publications 4<sup>th</sup> Edition 2008
2. Sharma H D and Reddy K R eoenviromental Engineering John Wiley & Sons  
(2004)

### References

1. Rowe R K Geotechnical & Geoenvironmental Engineering Handbook Kluwer  
Academic 2001
2. Reddi L N and inyang H. I Geoenviromental Engineering Principal and  
Applications Marcel Dekker



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<b>(A58201) PROJECT WORK</b>			

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<b>(A58202) TECHNICAL SEMINAR</b>			

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<b>(A58203) COMPREHENSIVE VIVA</b>			