

**ACADEMIC REGULATIONS,  
COURSE STRUCTURE  
and  
DETAILED SYLLABUS  
R22**

**B.Tech – Civil Engineering**

**B.Tech - Regular Four Year Degree Program  
(For batches admitted from the academic year 2022 - 2023)**



**Holy Mary Institute of Technology & Science**

**Bogaram (V), Keesara (M), Medchal (Dist) - 501 301**

## **FOREWORD**

The autonomy is conferred on Holy Mary Institute of Technology & Science by UGC, based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the UGC in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

Holy Mary Institute of Technology & Science is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a two decades in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTU Hyderabad to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the college in order to produce quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications, if needed, are to be sought, at appropriate time with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

**PRINCIPAL**

# **ACADEMIC REGULATIONS**

**B. Tech. - Regular Four Year Degree Programme  
(For batches admitted from the academic year 2022-23)  
&  
B. Tech. - Lateral Entry Scheme  
(For batches admitted from the academic year 2023-24)**

For pursuing four year Under Graduate Degree Programme of study in Engineering & Technology (UGP in E&T) offered by Holy Mary Institute of Technology & Science under Autonomous status is herein referred to as HITS (Autonomous):

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2022-23 onwards. Any reference to “Institute” or “College” in these rules and regulations shall stand for Holy Mary Institute of Technology & Science (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, Holy Mary Institute of Technology & Science shall be the chairman Academic Council.

## **1. ADMISSION**

### **1.1. Admission into first year of four year B. Tech. degree programmes of study in Engineering**

#### **1.1.1. Eligibility:**

A candidate seeking admission into the first year of four year B. Tech. degree Programmes should have:

- (i) Passed either Intermediate Public Examination (I.P.E) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per guidelines defined by the Regulatory bodies of Telangana State Council for Higher Education (TSCHE) and AICTE.
- (ii) Secured a rank in the EAMCET examination conducted by TSCHE for allotment of a seat by the Convener, EAMCET, for admission.

#### **1.1.2. Admission Procedure:**

Admissions are made into the first year of four year B. Tech. Degree Programmes as per the stipulations of the TSCHE.

- (a) Category ‘A’ seats are filled by the Convener, TSEAMCET.
- (b) Category ‘B’ seats are filled by the Management.

### **1.2 Admission into the second year of four year B. Tech. degree Program in Engineering**

#### **1.2.1 Eligibility:**

A candidate seeking admission under lateral entry into the II year I Semester B. Tech. degree Programmes should have passed the qualifying exam (B.Sc. Mathematics or Diploma in concerned course) and based on the rank secured by the candidate at Engineering Common Entrance Test ECET (FDH) in accordance with the instructions received from the Convener, ECET and Government of Telangana.

#### **1.2.2 Admission Procedure:**

Admissions are made into the II year of four year B. Tech. degree Programmes through Convener, ECET (FDH) against the sanctioned strength in each Programmes of study as lateral entry students.

## **2. PROGRAMMES OFFERED**

**Holy Mary Institute of Technology & Science**, an autonomous college affiliated to JNTUH, offers the following B.Tech Programmes of study leading to the award of B. Tech degree under the autonomous scheme.

- 1) B.Tech – Civil Engineering
- 2) B.Tech – Computer Science and Engineering
- 3) B.Tech – Computer Science and Engineering (Artificial Intelligence & Machine Learning)
- 4) B.Tech – Computer Science and Engineering (Data Science)
- 5) B.Tech – Computer Science and Engineering (IoT)
- 6) B.Tech – Electronics and Communication Engineering
- 7) B.Tech – Electrical & Electronics Engineering
- 8) B.Tech – Mechanical Engineering
- 9) B.Tech – Artificial Intelligence (AI) and Data Science

The medium of instructions for the entire under graduate programme in Engineering & Technology will be **English** only.

## **3. DURATION OF THE PROGRAMMES**

### **3.1 Normal Duration**

**3.1.1** B. Tech. degree programme extends over a period of four academic years leading to the Degree of Bachelor of Technology (B.Tech.) of the Jawaharlal Nehru Technological University Hyderabad.

**3.1.2** For students admitted under lateral entry scheme, B. Tech. degree programme extends over a period of three academic years leading to the Degree of Bachelor of Technology (B. Tech.) of the Jawaharlal Nehru Technological University Hyderabad.

### **3.2 Maximum Duration**

**3.2.1** The maximum period within which a student must complete a full-time academic programme is 8 years for B. Tech. If a student fails to complete the academic programme within the maximum duration as specified above, he shall forfeit the seat in B.Tech and his admission shall stand cancelled.

**3.2.2** For students admitted under lateral entry scheme in B. Tech. degree programme, the maximum period within which a student must complete a full-time academic programme is 6 years. If a student fails to complete the academic programme within the maximum duration as specified above, he shall forfeit the seat in B.Tech and his admission shall stand cancelled.

**3.2.3** The period is reckoned from the academic year in which the student is admitted first time into the degree Programme.

## **4. AWARD OF B.Tech DEGREE**

A student will be declared eligible for the award of the B.Tech degree if he/she fulfils the following academic regulations:

**4.1** The candidate shall pursue a course of study as specified in section 3.1 and 3.2.

**4.2** The candidate shall register for **160** credits and secure **160** credits (Excluding Mandatory Courses).

## **5. PROGRAMME STRUCTURE**

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

### **Semester Scheme:**

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

**5.1.1** The B.Tech. Programme of Holy Mary Institute of Technology & Science is Semester pattern, with 8 Semesters constituting 4 Academic Years, each Academic Year having TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 16-18 Weeks duration with a minimum of 90 Instructional Days per Semester.

**5.1.2** Credit Courses:

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

- One Credit - for One hour / Week / Semester for Theory / Lecture(L) / Tutorial(T) Courses; and
- One Credit - for Two hours/Week/Semester for Laboratory/Practical (P) Courses, Mini Project...
- Mandatory Courses Credits shall not be counted for credit requirements for award of degree. However all the mandatory courses have to be passed by the student.

**5.1.3 Course Classification:**

All Courses offered for the UGP are broadly classified as:

- **Basic Science Courses (BSC):** Includes Mathematics, Physics, Chemistry, Biology etc.
- **Engineering Science Courses (ESC):** Courses include Materials, Workshop, Basics of Electrical/Electronics/ Mechanical/Computer Science & Engineering, Engineering Graphics, Instrumentation, Engineering Mechanics, Instrumentation etc.
- **Humanities and Social Science including Management Courses (HSMC):** Courses include English, Communication skills, Management etc.
- **Professional Core Courses (PCC):** Relevant to the chosen specialization/branch.
- **Professional Elective Courses (PEC):** Relevant to the chosen specialization/ branch offered as electives.
- **Open Elective Courses (OEC):** Other technical and/or emerging subject areas offered in the College by the Departments of Engineering, Science and Humanities.
- **Mandatory Course:** Course work on peripheral subjects in a programme, wherein familiarity considered mandatory. To be included as non-Credit, Mandatory Courses, with only a pass in each required to qualify for the award of degree from the concerned institution.
- **Project Work:** and/or internship in industry or elsewhere, seminar.
- **MOOCS –** Massive Open Online Courses in a variety of disciplines available at both introductory and advanced levels, accessible from e-resources in India and abroad.

**5.1.4 Course Nomenclature:**

The Curriculum Nomenclature or Course-Structure Grouping for the each of the UGP E&T (B.Tech Degree Programme) is as listed below.

<b>S. No</b>	<b>Broad Course Classification</b>	<b>Course Group/ Category</b>	<b>Course Description</b>	<b>Credits</b>
1)	Foundation Courses (FnC)	BSC – Basic Sciences Courses	Includes - Mathematics, Physics and Chemistry Subjects	25
2)		ESC - Engineering Sciences Courses	Includes fundamental engineering subjects.	24
3)		HSMC – Humanities and Social Sciences including Management	Includes subjects related to Humanities, Social Sciences and Management.	12
4)	Core Courses (CoC)	PCC – Professional Core Courses	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	57
5)	Elective Courses (EIC)	PEC– Professional Elective Courses	Includes Elective subjects related to the Parent Discipline / Department / Branch of Engg.	18

6)		OEC – Open Elective Courses	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department / Branch of Engg.	09
7)	Core Courses	Project Work	Major Project.	15
8)		Industrial Training/ Mini- Project	Industrial Training/ Internship/ Mini-Project.	
9)		Seminar	Seminar / Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engg.	
10)	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)	--
<b>Total Credits for UGP (B. Tech)Programme</b>				<b>160</b>

- Minor variations as per AICTE / UGC guidelines

## 6. COURSE REGISTRATION

- 6.1** A ‘Faculty Advisor or Counselor’ shall be assigned to each student, who advises him/her about the UGP, its Course Structure and Curriculum, Choice/Option for Subjects/Courses, based on his/her competence, progress, pre-requisites and interest.
- 6.2** Academic Section of the College invites ‘Registration Forms’ from students prior (before the beginning of the Semester), ensuring ‘DATE and TIME Stamping’. The Registration Requests for any ‘CURRENT SEMESTER’ shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the ‘PRECEDING SEMESTER’.
- 6.3** A Student can apply for Registration, which includes approval from his faculty advisor, and then should be submitted to the College Academic Section through the Head of Department (a copy of the same being retained with Head of Department, Faculty Advisor and the Student).
- 6.4** A student may be permitted to register for his/her course of CHOICE with a Total of prescribed credits per Semester (permitted deviation being  $\pm 12\%$ ), based on his PROGRESS and SGPA/CGPA, and completion of the ‘PRE-REQUISITES’ as indicated for various courses in the Department Course Structure and Syllabus contents.
- 6.5** Choice for ‘additional Courses’ must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Counselor.
- 6.6** If the Student submits ambiguous choices or multiple options or erroneous (incorrect) entries during Registration for the Course(s) under a given/specified Course Group/ Category as listed in the Course Structure, only the first mentioned Course in that Category will be taken into consideration.
- 6.7** Dropping of Courses or changing of options may be permitted, ONLY AFTER obtaining prior approval from the Faculty Advisor, ‘within 15 Days of Time’ from the commencement of that Semester. Course Options exercised through Registration are final and CAN NOT be changed, and CAN NOT be inter-changed; further, alternate choices will also not be considered. However, if the Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

## 7. COURSES TO BE OFFERED

- 7.1** A typical section (or class) strength for each semester shall be 60.
- 7.2** Courses may be offered to the Students, only if minimum of 20 students ( $1/3^{\text{rd}}$  of the section strength) opt for it.

- 7.3** More than ONE TEACHER may offer the SAME SUBJECT (Lab/Practical's may be included with the corresponding Theory Subject in the same Semester) in any Semester. However, selection choice for students will be based on - 'CGPA Basis Criterion' (i.e., the first focus shall be on early Registration in that Semester, and the second focus, if needed, will be on CGPA of the student).
- 7.4** If more entries for Registration of a Subject come into picture, then the concerned Head of the Department shall take necessary decision, whether to offer such a Subject/Course for TWO (or multiple) SECTIONS or NOT.
- 7.5** OPEN ELECTIVES will be offered by a department to the students of other departments.

## **8. ATTENDANCE REQUIREMENTS**

- a.** A student will be eligible to appear for the End Semester Examinations, if he acquires a minimum of 75% of attendance in aggregate of all the Subjects/Courses (excluding Mandatory or Non-Credit Courses) for that Semester.
- b.** Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each Semester may be granted by the College Academic Committee on genuine and valid grounds, based on the student's representation with supporting evidence by following the govt. rules in vogue.
- c.** A stipulated fee shall be payable towards condoning of shortage of attendance.
- d.** Shortage of Attendance below 65% in aggregate shall in No case be condoned.
- e.** A student shall not be promoted to the next Semester unless he/she satisfies the attendance requirements of the current Semester. The student may seek readmission for the Semester when offered next. He / She shall not be allowed to register for the subjects of the Semester while he/she is in detention. A student detained due to shortage of attendance, will have to repeat that Semester when offered next. The academic regulations under which the student has been readmitted shall be applicable.
- f.** Students whose attendance is less than 75% are not entitled to get the scholarship / fee reimbursement in any case as per the TS Govt. Rules in force.

## **9. ACADEMIC REQUIREMENTS FOR PROMOTION / COMPLETION OF REGULAR B.TECH PROGRAMME COURSE STUDY.**

- 9.1** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks) in the internal examinations, not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject/ course.
- 9.2** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.
- 9.3** A Student will not be promoted from I Year to II Year, unless he/she fulfills the Attendance and Academic Requirements and secure a Total 50% of Credits up to I Year II Semester from all the relevant regular and supplementary examinations.
- 9.4** A Student will not be promoted from II Year to III Year, unless he/she fulfills the Attendance and Academic Requirements and secure a Total 60% of Credits up to II Year II Semester from all the relevant regular and supplementary examinations.
- 9.5** A Student will not be promoted from III Year to IV Year, unless he/she fulfills the attendance and Academic Requirements and secure a Total 60% of Credits up to III Year II Semester, from all the regular and supplementary examinations.



**9.6** After securing the necessary 160 Credits as specified for the successful completion of the entire UGP, resulting in 160 Credits for UGP performance evaluation, i.e., the performance of the Student in these 160 Credits shall alone be taken into account for the calculation of the final CGPA.

If a Student registers for some more 'extra courses' (in the parent Department or other Departments/Branches of Engg.) other than those listed courses Totaling to 160 Credits as specified in the Course Structure of his/her Department, the performances in those 'extra courses' (although evaluated and graded using the same procedure as that of the required 160 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 8 and 9.1-9.5.

**9.7** Students who fail to earn minimum of 160 Credits as per the Course Structure, and as indicated above, within 8 Academic Years from the Date of Commencement of their I Year shall forfeit their seats in B.Tech Programme and their admissions shall stand cancelled. **There is NO exemption of credits in any case.**

**When a Student is detained due to shortage of attendance/lack of credits in any Semester, he may be re-admitted into that Semester, as and when offered. However the regulations at the time of admissions hold good.**

## **10. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS**

**10.1** The performance of a student in each Semester shall be evaluated Course-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory. The B.Tech Project Work (Major Project) will be evaluated for 100 marks in Phase-I and 100 Marks in Phase-II.

**10.2** For all Theory Courses as mentioned above, the distribution shall be 40 marks for CIE, and 60 marks for the SEE.

### **10.3 Continuous Internal Evaluation:**

In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Mid-Term examination for 30 marks, consist of two parts.

i) Part – A for 10 marks,

✓ Part - A: Objective/quiz paper for 10 marks. (The objective/ quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks.)

ii) Part – B for 20 marks with a total duration of 2 hours as follows:

✓ Part - B : Descriptive paper for 20 marks (The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.)

iii) The remaining 10 marks of Continuous Internal Evaluation are distributed as

a) Assignment for 5 marks (Average of 2 Assignments each for 5 marks)

b) Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.

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

**10.4.1** Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks before II Mid-Term examination.

**10.4.2** The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores  $\geq 35\%$  (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned Subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

**There is NO Computer Based Test (CBT) for R22 regulations.**

### **10.5 Practical Examination Evaluation:**

**10.5.1** For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks.
2. **10 marks for viva-voce** (or) tutorial (or) case study (or) application (or) poster Presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the institution.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment/program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment/program in the same laboratory course
5. 10 marks for viva-voce on concerned laboratory course.

**10.5.2** The Student, in each subject, shall have to earn **35% of marks** (i.e. 14 marks out of 40 marks) in CIE, **35% of marks** (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. **40 marks out of 100 marks**) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores  $\geq 35\%$  (14 marks) of **40 Continuous Internal Examination (CIE) marks**.

In case, the student appears for Semester End Examination (SEE) of the concerned Subject but not scored minimum **35% of CIE marks** (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

**10.6** The evaluation of courses having ONLY internal marks in I-Year I Semester and II Year II Semester is as follows:

**10.6.1** I Year I Semester course (ex., Elements of CE/ME/EEE/ECE/CSE): The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

**10.6.2** II Year II Semester Real-Time (or) Field-based Research Project course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-

Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

**10.7 Open Elective Course:** The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

**10.8 Professional Electives:** The students have to choose Five Professional Electives (PE-I to V/VI) from the list of professional electives given.

**10.9** There shall be Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be NO internal marks for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.

**10.10**

a) UG project work shall be carried out in two stages: Project Stage – I during IV Year I Semester, Project Stage – II during IV Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in IV Year I semester and second report includes project work carried out in IV Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations.

b) For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall evaluate the project work and project supervisor shall evaluate for 100 marks. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks in the total of the CIE.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such ‘one reappearance’ evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

c) For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the project supervisor shall evaluate it for 40 marks. The topics for industrial oriented mini project and Project Stage – I shall be different from one another. The student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project stage – II, Chief Controller of Examinations selects an external examiner from the list of experts in the relevant branch submitted by the department HODs of the College.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

**10.11 Semester End Examination:**

- a) Question paper contains 2 Parts (Part-A and Part-B) having the questions distributed equally among all units.
- b) The distribution of marks for i) PART-A for 10 marks ii) PART-B for 50 marks. Pattern of the question paper is as follows:

**PART-A**

Consists of one question which is compulsory. The question consists of ten sub-questions two from each unit and carries 1 mark each.

**PART-B**

Consists of 5 questions carrying 10 marks each. Each of these questions is from one unit and may contain sub questions. 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).

- 10.12** For Mandatory Non-Credit Courses offered in a Semester, The internal evaluation is for 100 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 100 marks and has secured not less than 40% marks in the CIE, then the student is **PASS** and will be qualified for the award of the degree. No marks or Letter Grade shall be allotted for these courses/activities. However, for non-credit courses '**Satisfactory**' or "**Unsatisfactory**' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

- 10.13** A student shall be given only one time chance to re-register for a maximum of two Subjects in a semester:

- If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Vivavoce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.
- A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork in next academic year. Also, the student has to earn 35% of total internal marks (14 out of 40 marks including Mid-Term examinations, Assignment & Subject Viva-voce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject).
- In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

- 10.14** SWAYAM: College intends to encourage the students to do a minimum of one MOOC in discipline and open elective during third year. The respective departments shall give a list of standard MOOCs providers including SWAYAM whose credentials are endorsed by the BoS. In general, MOOCs providers provide the result in percentage. In such case, specified by the college shall follow the grade table mentioned in 12.2. The Credits for MOOC(s) shall be transferred same as given for the respective discipline or open electives. In case a student fails to complete the MOOCs he/she shall re-register for the same with any of the providers from the list provided by the department. The equivalence of the courses shall be established by the department committee. Still if a student fails to clear the course/s, or in case a provider fails to offer a MOOC in any semester, then in all such cases the college shall conduct the end semester examinations for the same as per the college end semester examination pattern. The syllabi for the supplementary examinations shall be same as that of MOOCs. There shall be no internal assessment however the marks obtained out of 70 shall be scaled up to 100 marks and the respective letter grade shall be allotted. The details of MOOC(s) shall be displayed in Memorandum of Grades of a student, provided he/she submits the proof of completion of it or them to the examination branch through the Coordinator/Mentor, before the end semester examination of the particular semester.

**11 AWARD OF DEGREE**

- 11.1** A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA  $\geq 5.0$ ), within 8 academic years from the date of commencement of the first academic year, shall be declared to have **‘qualified’** for the award of B.Tech. degree in the branch of Engineering selected at the time of admission.
- 11.2** A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.
- 11.3** A student with final CGPA (at the end of the undergraduate programme)  $> 8.00$ , and fulfilling the following conditions - shall be placed in **‘First Class with Distinction’**. However, he
- (i) Should have passed all the subjects/courses in **‘First Appearance’** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.
  - (ii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason. A student not fulfilling any of the above conditions with final CGPA  $> 8$  shall be placed in **‘First Class’**.
- 11.4** Students with final CGPA (at the end of the undergraduate programme)  $\geq 7.0$  but  $< 8.00$  shall be placed in **‘First Class’**.
- 11.5** Students with final CGPA (at the end of the undergraduate programme)  $\geq 6.00$  but  $< 7.00$ , shall be placed in **‘Second Class’**.
- 11.6** All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme)  $\geq 5.00$  but  $< 6$ , shall be placed in **‘pass class’**.
- 11.7** A student with final CGPA (at the end of the undergraduate programme)  $< 5.00$  will not be eligible for the award of the degree.

**12 LETTER GRADE AND GRADE POINT**

- 12.1** Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practical’s, or Seminar, or Project, or Internship\*/Mini-Project, Minor Course etc., based on the %marks obtained in CIE+SEE (Continuous Internal Evaluation + Semester End Examination, both taken together), 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 (UGC Guidelines) and corresponding percentage of marks shall be followed...

<b>% of Marks Secured (Class Intervals)</b>	<b>Letter Grade (UGC Guidelines)</b>	<b>Grade Points</b>
90% and above ( $\geq 90\%$ , $\leq 100\%$ )	O (Outstanding)	10
Below 90% but not less than 80% ( $\geq 80\%$ , $< 90\%$ )	A <sup>+</sup> (Excellent)	9
Below 80% but not less than 70% ( $\geq 70\%$ , $< 80\%$ )	A (Very Good)	8
Below 70% but not less than 60% ( $\geq 60\%$ , $< 70\%$ )	B <sup>+</sup> (Good)	7
Below 60% but not less than 50% ( $\geq 50\%$ , $< 60\%$ )	B (Average)	6
Below 50% but not less than 40% ( $\geq 40\%$ , $< 50\%$ )	C (Pass)	5
Below 40% ( $< 40\%$ )	F (FAIL)	0
Absent	AB	0

- 12.3** A student obtaining F Grade in any Subject shall be considered ‘failed’ and will be required to reappear as ‘Supplementary Candidate’ in the End Semester Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.
- 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 Subject/Course (s) only for the sake of ‘Grade Improvement’ or ‘SGPA/CGPA Improvement’. However, he has to repeat all the Subjects/Courses pertaining to that Semester, when he is detained.
- 12.6** A student earns Grade Point (GP) in each Subject/Course, on the basis of the Letter Grade obtained by him in that Subject/Course (excluding Mandatory non-credit Courses). Then the corresponding ‘Credit Points’ (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/Course.

$$\text{Credit Points (CP)} = \text{Grade Point (GP)} \times \text{Credits} \dots \text{ For a Course}$$

- 12.7** The Student passes the Subject/Course only when he gets  $GP \geq 4$  (P Grade or above).
- 12.8** The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points ( $\Sigma CP$ ) secured from ALL Subjects/Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

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

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

**Illustration of Computation of SGPA Computation**

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course1	3	A	8	3 x 8 = 24
Course2	4	B+	7	4 x 7 = 28
Course3	3	B	6	3 x 6 = 18
Course4	3	O	10	3 x 10 = 30
Course5	3	C	5	3 x 5 = 15
Course6	4	B	6	4 x 6 = 24

Thus,  $\text{SGPA} = 139/20 = 6.95$

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

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

(i.e., up to and inclusive of S Semesters,  $S \geq 2$ ),

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

**For CGPA Computation**

Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
Credits : 19.5	Credits : 20.5	Credits : 18.0	Credits : 19.0	Credits : 21.5	Credits : 21.5	Credits : 23	Credits : 17
SGPA : 6.9	SGPA : 7.8	SGPA : 5.6	SGPA : 6.0	SGPA : 6.3	SGPA : 8.0	SGPA : 8.0	SGPA : 8.0

Thus, **CGPA** =  $\frac{19.5 \times 6.9 + 20.5 \times 7.8 + 18.0 \times 5.6 + 19.0 \times 6.0 + 21.5 \times 6.3 + 21.5 \times 8.0 + 23 \times 8.0 + 17 \times 8.0}{160} = 7.10$

- 12.10** For Merit Ranking or Comparison Purposes or any other listing, ONLY the ‘ROUNDED OFF’ values of the CGPAs will be used.
- 12.11** For Calculations listed in Item 12.5–12.10, performance in failed Subjects/Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.
- 12.12** Conversion formula for the conversion of GPA into indicative percentage is  
 $\% \text{ of marks scored} = (\text{final CGPA} - 0.50) \times 10$

**13 AWARD OF 2-YEAR B.TECH. DIPLOMA CERTIFICATE**

- 13.1** A student is awarded 2-Year UG Diploma Certificate in the concerned engineering Branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) up to B.Tech. II Year II Semester, if the student wants to exit the 4-Year B.Tech. Program and requests for the 2 -Year B.Tech. (UG) Diploma Certificate.
- 13.2** The student **once opted and awarded 2-Year UG Diploma Certificate, the Student will be permitted to join** in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of class work for that semester.
- 13.3** The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech. Program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.
- 13.4** A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

**14. DECLARATION OF RESULTS**

Computation of SGPA and CGPA are done using the procedure listed in 12.5 – 12.10. No SGPA/CGPA is declared, if a candidate is failed in any one of the courses of a given Semester.

**15. WITH HOLDING OF RESULTS**

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

**16. REVALUATION**

Students shall be permitted for revaluation after the declaration of end Semester examination results within due dates by paying prescribed fee. After revaluation if there is any betterment in the grade, then improved grade will be considered. Otherwise old grade shall be retained.

**17. SUPPLEMENTARY EXAMINATIONS**

Supplementary examinations for the odd Semester shall be conducted with the regular examinations of even Semester and vice versa, for those who appeared and failed or absent in regular examinations. Such candidates writing supplementary examinations may have to write sometimes one or two examinations per day.

**ADVANCED SUPPLEMENTARY EXAMINATION**

Advanced supplementary examinations will be conducted for IV year II Semester after announcement of regular results.

**18. TRANSCRIPTS**

After successful completion of prerequisite credits for the award of degree a Transcript containing performance of all academic years will be issued as a final record. Duplicate PC, CMM & Transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

**19. RULES OF DISCIPLINE**

- 19.1** Any attempt by any student to influence the teachers, Examiners, faculty and staff of controller of Examination for undue favors in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.
- 19.2** When the student absents himself, he is treated as to have appeared and obtained zero marks in that course(s) and grading is done accordingly.
- 19.3** When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).
- 19.4** When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Examiner is final.

**20. MALPRACTICE PREVENTION COMMITTEE**

A malpractice prevention committee shall be constituted to examine and punish the students who involve in malpractice / indiscipline in examinations. The committee shall consist of:

- a) Controller of examinations - Chairman
- b) Addl. Controller of examinations.- Member Convener
- c) Subject expert - member
- d) Head of the department of which the student belongs to. - Member
- e) The invigilator concerned - member

The committee shall conduct the meeting after taking explanation of the student and punishment will be awarded by following the malpractice rules meticulously.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations, in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and will be recommended for appropriate punishment after thorough enquiry.

**21. TRANSITORY REGULATIONS**

- A. For students detained due to shortage of attendance:
  - 1. A Student who has been detained in I year of R18/R21 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.



2. A student who has been detained in any semester of II, III and IV years of R18/R21 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of R18/R21 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both R18/R21 & R22 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in R22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case.**
6. If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the University.

**Note:** If a student readmitted to R22 Regulations and has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the College Principals concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

## **22. STUDENT TRANSFERS**

**22.1** There shall be no branch transfers after the completion of admission process.

**22.2** There shall be no transfers from one college/stream to another within the constituent colleges and units of Jawaharlal Nehru Technological University Hyderabad.

**22.3** The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of HITS, and also pass the subjects of HITS which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of HITS, the students have to study those subjects in HITS in spite of the fact that those subjects are repeated.

**22.4** The transferred students from other Universities/Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the **equivalent subject(s)** as per the clearance letter issued by the University.

**22.5** The college has to provide one chance to write the internal examinations in the **equivalent subject(s)** to the students transferred from other universities/institutions to HITS who are on rolls, as per the clearance (equivalence) letter issued by the University.

**23. AMENDMENTS TO REGULATIONS**

The Academic Council of Holy Mary Institute of Technology & Science reserves the right to revise, amend, or change the regulations, scheme of examinations, and / or syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice. There shall be no Branch transfers after the completion of Admission Process. Transfer of student is permitted subjected to the rules and regulations of TSCHE (TE Department) and JNTUH in vogue.

The College shall have its own Annual Graduation Day for the award of Degrees issued by the College/University.

Institute will award Medals to the outstanding students who complete the entire course in the first attempt within the stipulated time.

- i) Where the words “he”, “him”, “his”, occur in the write-up of regulations, they include “she”, “her”.
- ii) Where the words “Subject” or “Subjects”, occur in these regulations, they also imply “Course” or “Courses”.
- iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.
- iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.

**Academic Regulations for B. Tech. (Lateral Entry Scheme)  
(Effective for the students getting admitted into II year  
from the Academic Year 2023-2024 on wards)**

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**1. ELIGIBILITY FOR THE AWARD OF B.TECH DEGREE (LES)**

- i. The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.
- ii. The Students have to acquire 120 credits from II to IV year of B.Tech Programme (Regular) for the award of the degree.
- iii. Students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.
- iv. The same attendance regulations are to be adopted as that of B. Tech. (Regular)

**2. PROMOTION RULE:**

A Student will not be promoted from II Year to III Year, unless he/she fulfills the Attendance and Academic Requirements and (i) secure a Total of 60% Credits up to III Year II Semester, from all the regular and supplementary examinations.

A Student will not be promoted from III Year to IV Year, unless he/she fulfills the Attendance and Academic Requirements and (i) secure a Total of 60% Credits up to III Year II Semester, from all the regular and supplementary examinations.

**3. AWARD OF DEGREE:**

After the student has satisfied the requirements prescribed for the completion of the programme and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes: The marks obtained for 120 credits will be considered for the calculation of CGPA.

All other regulations as applicable for B. Tech. Four-year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme).

## Malpractices Rules - Disciplinary Action For /Improper Conduct In Examinations

S. No	Nature of Malpractices / Improper Conduct	Punishment
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Principal.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	Refuses to obey the orders of the Addl. Controller of examinations / 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 addl. Controller of examinations 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 addl. Controller of examinations, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive Semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

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

# **COURSE STRUCTURE**

## Dept. of Civil Engineering

<b>I B.Tech.- I-Semester</b>									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2MA101BS	Matrices and Calculus	BSC	3	1	0	4	40	60	100
A2AP104BS	Applied Physics	BSC	3	1	0	4	40	60	100
A2CS106ES	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
A2ME116ES	Workshop Manufacturing Practice	ESC	0	1	3	2.5	40	60	100
A2EN105HS	English for Skill Enhancement	HSMC	2	0	0	2	40	60	100
A2CE106ES	Elements of Civil Engineering	ESC	0	0	2	1	50	0	50
A2AP112BS	Applied Physics Lab	BSC	0	0	3	1.5	40	60	100
A2AP113HS	English Language Communication Skills Lab	HSMC	0	0	2	1	40	60	100
A2EN114ES	Programming for Problem Solving Lab	ESC	0	0	2	1	40	60	100
<b>Total</b>			<b>11</b>	<b>3</b>	<b>12</b>	<b>20</b>	<b>370</b>	<b>480</b>	<b>850</b>
<b>Mandatory Course (Non-Credit)</b>									
A2CE101MC	Technical Seminar-I	MC	0	0	2	0	100	0	100
<b>I B.Tech.- II-Semester</b>									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2MA201BS	Ordinary Differential Equations and Vector Calculus	BSC	3	1	0	4	40	60	100
A2CH202BS	Engineering Chemistry	BSC	3	1	0	4	40	60	100
A2ME208ES	Computer Aided Engineering Graphics	ESC	1	0	4	3	40	60	100
A2ME209ES	Applied Mechanics	ESC	3	0	0	3	40	60	100
A2CE203PC	Surveying	PCC	2	0	0	2	40	60	100
A2CS202ES	Python Programming Laboratory	ESC	0	1	2	2	40	60	100
A2CH210DS	Engineering Chemistry Lab	BSC	0	0	2	1	40	60	100
A2CE204PC	Surveying Lab-I Lab	PCC	0	0	2	1	40	60	100
<b>Total</b>			<b>12</b>	<b>3</b>	<b>10</b>	<b>20</b>	<b>320</b>	<b>480</b>	<b>800</b>
<b>Mandatory Course (Non-Credit)</b>									
A2CE202MC	Technical Seminar-II	MC	0	0	2	0	100	0	100



<b>II B.Tech.- I-Semester</b>									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2CE301PC	Probability and Statistics	BSC	3	0	0	3	40	60	100
A2CE302PC	Building Materials, Construction and Planning	PCC	3	1	0	4	40	60	100
A2CE303PC	Engineering Geology	PCC	3	0	0	3	40	60	100
A2CE304PC	Strength of Materials – I	PCC	3	0	0	3	40	60	100
A2EE307ES	Fluid Mechanics	PCC	3	0	0	3	40	60	100
A2CE305PC	Surveying Lab -II	PCC	0	0	3	1.5	40	60	100
A2CE306PC	Strength of Materials Laboratory	PCC	0	0	2	1	40	60	100
A2EE215ES	Computer Aided Drafting Laboratory	ESC	0	0	3	1.5	40	60	100
<b>Total</b>			<b>15</b>	<b>1</b>	<b>8</b>	<b>20</b>	<b>320</b>	<b>480</b>	<b>800</b>
<b>Mandatory Course (Non-Credit)</b>									
A2CE303MC	Constitution of India	MC	2	0	0	0	100	0	100
<b>II B.Tech.- II-Semester</b>									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2CE401PC	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60	100
A2MA402BS	Concrete Technology	PCC	3	0	0	3	40	60	100
A2CE403PC	Strength of Materials – II	PCC	3	0	0	3	40	60	100
A2CE404PC	Hydraulics and Hydraulics Machinery	PCC	3	0	0	3	40	60	100
A2CE405PC	Structural Analysis-I	PCC	3	0	0	3	40	60	100
A2CE406PW	Fluid Mechanics and Hydraulics Machinery	PCC	0	0	4	2	40	60	100
A2CE407PC	Basic Electrical and Electronics Engineering Laboratory	ESC	0	0	2	1	40	60	100
A2CE408ES	Concrete Technology Laboratory	PCC	0	0	2	1	40	60	100
A2CE409PW	Real-time Research Project/ Field-Based Project	PWC	0	0	2	1	50	00	50
<b>Total</b>			<b>15</b>	<b>0</b>	<b>10</b>	<b>20</b>	<b>370</b>	<b>480</b>	<b>850</b>
<b>Mandatory Course (Non-Credit)</b>									
A2CE404MC	Gender Sensitization Laboratory	MC	3	0	0	0	100	0	100

<b>III B.Tech.- I-Semester</b>									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2CE501PC	Structural Analysis-II	PCC	3	0	0	3	40	60	100
A2CE502PC	Geotechnical Engineering	PCC	3	1	0	4	40	60	100
A2CE503PC	Design of Reinforced Concrete Structures	PCC	3	0	0	3	40	60	100
A2CE504HS	Business Economics & Financial Analysis	HSMC	3	0	0	3	40	60	100
A2CE505HS	Transportation Engineering	PCC	3	0	0	3	40	60	100
A2CE506PC	Hydrology and Water Resource Engineering	PCC	2	0	0	2	40	60	100
A2CE507PC	Transportation Engineering Laboratory	PCC	0	0	2	1	40	60	100
A2CE508PW	Geotechnical Engineering Laboratory	PCC	0	0	2	1	40	60	100
<b>Total</b>			<b>15</b>	<b>1</b>	<b>4</b>	<b>20</b>	<b>320</b>	<b>480</b>	<b>800</b>
<b>Mandatory Course (Non-Credit)</b>									
A2CE505MC	Intellectual Property Rights	MC	3	0	0	0	100	0	100
<b>III B.Tech.- II-Semester</b>									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2CE601PC	Environmental Engineering	PCC	3	0	0	3	40	60	100
A2CE602PC	Foundation Engineering	PCC	3	0	0	3	40	60	100
A2CE603PC	Design of Steel Structures	PCC	3	0	0	3	40	60	100
	Professional Elective – I	PEC	3	0	0	3	40	60	100
	Open Elective - I	OEC	3	0	0	3	40	60	100
A2CE603PC	Environmental Engineering Laboratory	PCC	0	0	2	1	40	60	100
A2CE604PC	Computer Aided Design Laboratory	ESC	0	0	3	1.5	40	60	100
A2EN603HS	Advanced English Communications Skills Lab	HSMC	0	0	3	1.5	40	60	100
A2CE604PW	Industry Oriented Mini Project/ Internship	PWC	0	0	0	1	00	100	100
<b>Total</b>			<b>15</b>	<b>0</b>	<b>8</b>	<b>20</b>	<b>320</b>	<b>580</b>	<b>900</b>
<b>Mandatory Course (Non-Credit)</b>									
A2CE606MC	Environmental Science	MC	3	0	0	0	100	0	100

<b>IV B.Tech.- I-Semester</b>									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2CE701PC	Quantity Survey & Valuation	PCC	3	0	0	3	40	60	100
A2CE702PC	Project Management	PCC	2	0	0	2	40	60	100
	Professional Elective – II	PEC	3	0	0	3	40	60	100
	Professional Elective – III	PEC	3	0	0	3	40	60	100
	Professional Elective - IV	PEC	3	0	0	3	40	60	100
	Open Elective - II	OEC	0	0	2	1	40	60	100
A2CE703PC	Civil Engineering Software Laboratory	PCC	0	0	2	1	40	60	100
A2CE704PW	Project Stage - I	PWC	0	0	8	4	100	0	100
<b>Total</b>			<b>14</b>	<b>0</b>	<b>12</b>	<b>20</b>	<b>380</b>	<b>420</b>	<b>800</b>
<b>IV B.Tech.- II-Semester</b>									
Course Code	Course Title	Course Area	Hours per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
A2CE801PW	Professional Elective – V	PEC	3	0	0	3	40	60	100
	Professional Elective - VI	PEC	3	0	0	3	40	60	100
	Open Elective - III	OEC	3	0	0	3	40	60	100
A2CE802PW	Project Stage – II	PWC	0	0	22	11	40	60	100
<b>Total</b>			<b>9</b>	<b>0</b>	<b>22</b>	<b>20</b>	<b>120</b>	<b>240</b>	<b>400</b>

<b>PROFESSIONAL ELECTIVES</b>			
<b>PE-I</b>		<b>PE-II</b>	
A2CE501PE	Green Building Technologies	A2CE604PE	Prestressed Concrete Structure
A2CE502PE	Geomatics Applications in Civil Engineering	A2CE605PE	Elements of Earthquake Engineering
A2CE503PE	Smart Cities Planning and Management	A2CE606PE	Advanced Structural Analysis
<b>PE-III</b>		<b>PE-IV</b>	
A2CE607PE	Earth Retaining Structures	A2CE710PE	Design of Hydraulic Structures
A2CE608PE	Ground Improvement Techniques	A2CE711PE	Advanced Water Resource Engineering
A2CE609PE	Stability Analysis of Slopes	A2CE712PE	Ground Water Hydrology
<b>PE-V</b>		<b>PE-VI</b>	
A2CE813PE	Solid Waste Management	A2CE916PE	Airport Railways and Waterways
A2CE814PE	Environmental impact Assessment for Civil Engineers	A2CE917PE	Pavement Asset Management
A2CE815PE	Ground Water Hydrology	A2CE918PE	Pavement Analysis & Design

<b>OPEN ELECTIVES</b>			
<b>OE-I</b>		<b>OE-II</b>	
A2CE601OE	Disaster Preparedness & Planning Management	A2CE703OE	Remote Sensing & Geographical Information Systems
A2CE602OE	Building Management Systems	A2CE704OE	Sustainable Infrastructure Development
A2CE603OE	Environmental Impact Assessment	A2CE705OE	Solid Waste Management
A2CE604OE	Hydrogeology	A2CE706OE	Smart Cities
<b>OE-III</b>			
A2CE805OE	Energy Efficient Buildings		
A2CE806OE	Multi Criterion Decision Making		
A2CE807OE	Environmental Pollution		

**\*Open Elective** – Students should take Open Electives from List of Open Electives Offered by Other Departments / Branches Only

**Ex:** - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

# **DETAILED SYLLABUS**

# I-YEAR (I-SEMESTER)

## **MATRICES AND CALCULUS**

**I-B.TECH I-SEMESTER**  
**Course code: A2MA101BS**

**L T P C**  
**3 1 0 4**

### **COURSE OBJECTIVES:**

To learn

1. Types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form
4. Geometrical approach to the mean value theorems and their application to the mathematical problems
5. Evaluation of surface areas and volumes of revolutions of curves.
6. Evaluation of improper integrals using Beta and Gamma functions.
7. Partial differentiation, concept of total derivative
8. Finding maxima and minima of function of two and three variables.
9. Evaluation of multiple integrals and their applications

### **COURSE OUTCOMES:**

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

1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
2. Find the Eigen values and Eigen vectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Solve the applications on the mean value theorems.
5. Evaluate the improper integrals using Beta and Gamma functions
6. Find the extreme values of functions of two variables with/ without constraints.
7. Evaluate the multiple integrals and apply the concept to find areas, volumes

### **UNIT-I MATRICES**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

### **UNIT –II EIGEN VALUES AND EIGEN VECTORS**

Linear Transformation and Orthogonal Transformation: Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

### **UNIT-III CALCULUS**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

### **UNIT –IV MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS)**

Definitions of Limit and continuity.

Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

applications, Cauchy's Mean value Theorem. Taylor's Series . Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT-V      MULTIVARIABLE CALCULUS (INTEGRATION)**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5<sup>th</sup> Edition, 2016.

**REFERENCE BOOKS:**

1. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.



**APPLIED PHYSICS****I-B.TECH I-SEMESTER****L T P C****Course code: A2AP104BS****3 1 0 4****COURSE OBJECTIVES:**

To learn

1. The objectives of this course for the student are to:
2. Understand the basic principles of quantum physics and band theory of solids.
3. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
4. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
5. Identify the importance of nanoscale, quantum confinement and various fabrication techniques.
6. Study the characteristics of lasers and optical fibres.

**COURSE OUTCOMES:**

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

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

**UNIT-I QUANTUM PHYSICS AND SOLIDS**

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment – Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands-classification of solids

**UNIT –II SEMICONDUCTORS AND DEVICES**

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)– LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

**UNIT-III DIELECTRIC, MAGNETIC AND ENERGY MATERIALS**

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics. Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

**UNIT –IV NANOTECHNOLOGY**

Nan scale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM & TEM - applications of nanomaterials.

## **UNIT-V LASER AND FIBER OPTICS**

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser, CO<sub>2</sub> laser, Argon ion Laser, Nd:YAG laser- semiconductor laser- applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

### **TEXT BOOKS:**

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S. Chand Publications, 11<sup>th</sup> Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4<sup>th</sup> Edition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2<sup>nd</sup> Edition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1<sup>st</sup> Edition, 2021.

### **REFERENCE BOOKS:**

1. Quantum Physics, H.C. Verma, TBS Publication, 2<sup>nd</sup> Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 11<sup>th</sup> Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhyaya - Nano Materials, New Age International, 1<sup>st</sup> Edition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group Energy Materials Taylor & Francis Group, 1<sup>st</sup> Edition, 2022.

**PROGRAMMING FOR PROBLEM SOLVING****I-B.TECH I-SEMESTER****Course Code: A2CS106ES**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

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

**COURSE OUTCOMES:** The student will learn

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

**UNIT - I: INTRODUCTION TO PROGRAMMING**

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

**UNIT - II: ARRAYS, STRINGS, STRUCTURES AND POINTERS**

Arrays: one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings Structures: Defining structures, initializing structures, unions, Array of structures Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in selfreferential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

**UNIT - III: PREPROCESSOR AND FILE HANDLING IN C**

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

**UNIT - IV: FUNCTION AND DYNAMIC MEMORY ALLOCATION**

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

## **UNIT - V: SEARCHING AND SORTING**

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

### **TEXT BOOKS:**

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3<sup>rd</sup> Edition)

### **REFERENCE BOOKS:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

## WORKSHOP MANUFACTURING PRACTICE

**I-B.TECH I-SEMESTER**  
**Course code: A2ME116ES**

L	T	P	C
0	1	3	2.5

### COURSE OBJECTIVES:

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipmentS and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.
8. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

1. CO 1: Study and practice on machine tools and their operations
2. CO 2: Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
3. CO 3: Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
4. CO 4: Apply basic electrical engineering knowledge for house wiring practice.

### TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
2. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
3. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
4. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
5. Welding Practice – (Arc Welding & Gas Welding)
6. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
7. Black Smithy – (Round to Square, Fan Hook and S-Hook)

### TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and WoodWorking

### TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

### REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

## ENGLISH FOR SKILL ENHANCEMENT

**I-B.TECH I-SEMESTER**  
**Course code: A2EN105HS**

**L T P C**  
**2 0 0 2**

### COURSE OBJECTIVES:

To learn

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

### COURSE OUTCOMES:

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

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

### UNIT-I

Chapter entitled '*Toasted English*' by R.K.Narayan from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Vocabulary:** The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

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

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

**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

### UNIT –II

Chapter entitled '**Appro JRD**' by **Sudha Murthy** from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Words Often Misspelt - Homophones, Homonyms and Homographs

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

**Reading:** Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

**Writing:** Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

### UNIT-III

Chapter entitled '**Lessons from Online Learning**' by **F.Haider Alvi, Deborah Hurst et al** from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Words Often Confused - Words from Foreign Languages and their Use in English.

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

**Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

**Writing:** Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

### UNIT –IV

Chapter entitled '**Art and Literature**' by **Abdul Kalam** from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in Oral and Written Communication.

**Reading:** Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

**Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

## **UNIT-V**

Chapter entitled 'Go, Kiss the World' by Subroto Bagchi from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Technical Vocabulary and their Usage

**Grammar:** Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

**Reading:** Reading Comprehension-Exercises for Practice

**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats-Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

**Note:** Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.

**Note: 1.** As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is **Open-ended**, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

**Note: 2.** Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40 percent of each topic from the syllabus in blended mode.

## **TEXT BOOKS:**

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022.Print.

## **REFERENCE BOOKS:**

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2<sup>nd</sup> ed.). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

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## ELEMENTS OF CIVIL ENGINEERING

### I-B.TECH I-SEMESTER

Course code: A2CE106ES

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### COURSE OBJECTIVES:

To learn

1. To provide practical knowledge about physical properties of minerals and rocks.
2. To determine the characteristics of cement, Coarse & Fine aggregates.

### COURSE OUTCOMES:

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

1. Understands the method and ways of investigations required for Civil Engineering projects
2. Identify the various rocks, minerals depending on geological classifications
3. Evaluate the properties of cement, fine and coarse aggregates and determine its suitability for construction.

### LIST OF EXPERIMENTS:

**Identification of Minerals** – Silica Group, Feldspar Group, Crystalline Group, Carbonate Group, Pyroxene Group, Mica Group, Amphibole Group.

**Identification of Rocks** – Igneous Petrology, Sedimentary Petrology, Metamorphic Petrology.

1. Study of topographical features from Geological maps.
2. Identification of symbols in maps.
3. Simple structural Geology Problems (Folds, Faults & Unconformities)
4. **Tests on Cement**
  1. Fineness test & Normal Consistency test.
  2. Specific gravity test,
  3. Initial and Final setting time of cement.
5. **Tests on Fine Aggregates**
  1. Specific Gravity test.
  2. Bulking of sand & Fineness modulus of Fine aggregate.
6. **Tests on Coarse Aggregate**
  1. Specific Gravity test.
  2. Fineness modulus of Coarse aggregate.

### TEXT BOOKS:

1. IS 383:1993 “Specification for Coarse and Fine Aggregates from Natural Sources for Concrete”.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5<sup>th</sup> Edition, 2016.

### REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.



## APPLIED PHYSICS LAB

**I-B.TECH I-SEMESTER**

**Course code: A2AP112BS**

L	T	P	C
0	0	3	1.5

### COURSE OBJECTIVES:

To learn

1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

### COURSE OUTCOMES:

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

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

### LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
  - a) V-I and L-I characteristics of light emitting diode (LED)
6. V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
  - a) Determination of the beam divergence of the given LASER beam
11. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

*Note: Any 8 experiments are to be performed.*

### REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

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## ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

**I-B.TECH I-SEMESTER**

**L T P C**

**Course code: A2AP113HS**

**0 0 2 1**

### COURSE OBJECTIVES:

To learn

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

### COURSE OUTCOMES:

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

1. Understand the nuances of English language through audio- visual experience and group activities
2. Neutralise their accent for intelligibility
3. Speak with clarity and confidence which in turn enhances their employability skills

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

### Computer Assisted Language Learning (CALL) Lab

Interactive Communication Skills (ICS) Lab

#### Listening Skills:

##### Objectives

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

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

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

Listening for general content

Listening to fill up information

Intensive listening

Listening for specific information

#### Speaking Skills:

##### Objectives

To involve students in speaking activities in various contexts

To enable students express themselves fluently and appropriately in social and professional contexts

Oral practice

Describing objects/situations/people

Role play – Individual/Group activities

Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab.Exercise – I**

**CALL Lab:**

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker-*Testing Exercises*

**ICS Lab:**

*Understand:* Spoken vs. Written language- Formal and Informal English.

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

**Exercise – IICALL Lab:**

*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

**ICS Lab:**

*Understand:* Features of Good Conversation – Strategies for Effective Communication.

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

**Exercise - IIICALL Lab:**

*Understand:* Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI). *Practice:* Common Indian Variants in Pronunciation –Differences between British and AmericanPronunciation -*Testing Exercises*

**ICS Lab:**

*Understand:* Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing *Practice:*Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

**Exercise – IVCALL Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests - *Testing Exercises*

**ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

*Practice:* Making a Short Speech – Extempore- Making a Presentation.

**Exercise – VCALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests -*Testing Exercises*

**ICS Lab:**

*Understand:* Group Discussion

*Practice:* Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

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

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

System Requirement (Hardware component):

*Computer network with LAN facility (minimum 40 systems with multimedia) with the followingspecifications:*

Computers with Suitable Configuration

High Fidelity Headphones

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. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material (Master Copy):

*Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press*

**Note:** Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

Suggested Software:

Cambridge Advanced Learners' English Dictionary with CD.

Grammar Made Easy by Darling Kindersley.

Punctuation Made Easy by Darling Kindersley.

Oxford Advanced Learner's Compass, 10<sup>th</sup> Edition.

English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.

English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.

English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.

TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

Digital All

Orell Digital Language Lab (Licensed Version)

**REFERENCE BOOKS:**

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook*. Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook*. Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook*. Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities*.
5. Orient Black Swan Pvt. Ltd.
6. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach*. Cambridge University Press

**PROGRAMMING FOR PROBLEM SOLVING LAB****I-B.TECH I-SEMESTER****Course code: A2EN114ES**

L	T	P	C
0	0	2	1

[Note: The programs may be executed using any available Open Source/ Freely available IDE

Some of the Tools available are:

CodeLite: <https://codelite.org/>

Code::Blocks: <http://www.codeblocks.org/>

DevCpp : <http://www.bloodshed.net/devcpp.html>

Eclipse: <http://www.eclipse.org>

This list is not exhaustive and is NOT in any order of preference]

**COURSE OBJECTIVES:** The students will learn the following:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like
4. operators, control statements etc. To develop modular, reusable and readable C Programs using the concepts like functions
5. arrays etc. To Write programs using the Dynamic Memory Allocation concept.
6. To create, read from and write to text and binary files

**COURSE OUTCOMES:** The candidate is expected to be able to:

1. formulate the algorithms for simple problems
2. translate given algorithms to a working and correct program
3. correct syntax errors as reported by the compilers
4. identify and correct logical errors encountered during execution
5. represent and manipulate data with arrays, strings and structures
6. use pointers of different types
7. create, read and write to and from simple text and binary files
8. modularize the code with functions so that they can be reused

**LIST OF EXPERIMENTS:**

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following: i) Addition of Two Matrices ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations: i) To insert a sub-string in to a given main string from a given position. ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or - 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.

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

18. i. Write a C program which copies one file to another. ii. Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line)

19. i. Write a C program to display the contents of a file. ii. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

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

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

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

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

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

**TEXT BOOKS:**

1. C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Let us C, Yeswanth Kanitkar
3. C Programming, Balaguruswamy

**I-YEAR (II-SEMESTER)**

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## ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

**I-B.TECH II-SEMESTER**  
**Course code: A2MA201BS**

**L T P C**  
**3 1 0 4**

### COURSE OBJECTIVES:

To learn

1. Methods of solving the differential equations of first and higher order.
2. Concept, properties of Laplace transforms
3. Solving ordinary differential equations using Laplace transforms techniques.
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals

### COURSE OUTCOMES:

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

1. Identify whether the given differential equation of first order is exact or not
  2. Solve higher differential equation and apply the concept of differential equation to real world problems.
  3. Use the Laplace transforms techniques for solving ODE's.
- Evaluate the line, surface and volume integrals and converting them from one to another

### UNIT-I: FIRST ORDER ODE

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

### UNIT-II: ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$  and  $xV(x)$ , method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits.

### UNIT-III: LAPLACE TRANSFORMS

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

### UNIT-IV: VECTOR DIFFERENTIATION

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

### UNIT-V: VECTOR INTEGRATION

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

### TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5<sup>th</sup> Edition, 2016.



**REFERENCE BOOKS:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint,2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

## ENGINEERING CHEMISTRY

**I-B.TECH II-SEMESTER**  
**Course code: A2CH202BS**

**L T P C**  
**3 1 0 4**

### **COURSE OBJECTIVES:**

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

### **COURSE OUTCOMES:**

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

### **UNIT - I: WATER AND ITS TREATMENT:**

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and breakpoint chlorination. Defluoridation - Determination of F<sup>-</sup> ion by ion-selective electrode method.

Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion-exchange processes. Desalination of water – Reverse osmosis.

### **UNIT – II BATTERY CHEMISTRY & CORROSION**

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

**Corrosion:** Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

### **UNIT - III: POLYMERIC MATERIALS:**

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene **Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP). **Rubbers:** Natural rubber and its vulcanization.

**Biodegradable polymers:** Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

### **UNIT - IV: ENERGY SOURCES:**

Introduction, Calorific value of fuel – HCV, LCV- Dulong's formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

**UNIT - V: ENGINEERING MATERIALS:**

**Cement:** Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinylamides

**Lubricants:** Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

**TEXT BOOKS:**

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

**REFERENCE BOOKS:**

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

## COMPUTER AIDED ENGINEERING GRAPHICS

**I-B.TECH II-SEMESTER**

**Course code: A2ME208ES**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **COURSE OBJECTIVES:**

1. To develop the ability of visualization of different objects through technical drawings
2. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

### **COURSE OUTCOMES:**

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

1. Apply computer aided drafting tools to create 2D and 3D objects
2. sketch conics and different types of solids
3. Appreciate the need of Sectional views of solids and Development of surfaces of solids
4. Read and interpret engineering drawings
5. Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

### **UNIT – I:**

**Introduction to Engineering Graphics:** Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

### **UNIT- II:**

**Orthographic Projections:** Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

### **UNIT – III:**

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

### **UNIT – IV:**

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

### **UNIT – V:**

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

### **TEXT BOOKS:**

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapooan, Vikas: S. Chand and company Ltd.

### **REFERENCE BOOKS:**

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

**Note:** - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

## APPLIED MECHANICS

**I-B.TECH II-SEMESTER**  
**Course code: A2ME209ES**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:** The objectives of this course are to

1. Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
2. Perform analysis of bodies lying on rough surfaces.
3. Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
4. Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
5. Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

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

1. Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
2. Solve problem of bodies subjected to friction.
3. Find the location of centroid and calculate moment of inertia of a given section.
4. Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.

### UNIT - I

**Introduction to Engineering Mechanics-** Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

### UNIT - II

**Friction:**Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, ladder friction  
Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus.

### UNIT - III

**Area moment of inertia-** Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem.  
Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

### UNIT - IV

**Kinematics of Particles:** Kinematics of particles – Rectilinear motion – Curvilinear motion – Projectiles. Kinetics of Particles: Kinetics of particles – Newton's Second Law – Differential equations of rectilinear and curvilinear motion – Dynamic equilibrium – Inertia force – D. Alembert's Principle applied for rectilinear and curvilinear motion.

### UNIT - V

**Work - Energy Principle:** Equation of translation, principle of conservation of energy, work - energy principle applied to particle motion and connected systems, fixed axis rotation. Impulse – Momentum Principle: Introduction, linear impulse momentum, principle of conservation of linear momentum, elastic impact and types of impact, loss of kinetic energy, co efficient of restitution.

**TEXT BOOKS:**

1. Shames and Rao (2006), Engineering Mechanics, Pearson Education
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics & Dynamics

**REFERENCE BOOKS:**

1. Timoshenko S.P and Young D.H., "Engineering Mechanics", McGraw Hill International Edition, 1983.
2. Andrew Pytel, Jaan Kiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
3. Beer F.P & Johnston E.R Jr. Vector, "Mechanics for Engineers", TMH, 2004.
4. Hibbeler R. C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
5. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
7. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.
8. P.C Dumir et al. "Engineering Mechanics", University press

## SURVEYING

**I-B.TECH II-SEMESTER**  
**Course code: A2CE203PC**

**L T P C**  
**2 0 0 2**

### **COURSE OBJECTIVES:**

The first step in engineering practice is surveying and the soundness of any civil engineering work is dependent on the reliability and accuracy of surveying. Therefore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

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

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

### **UNIT - I**

**Introduction and Basic Concepts:** Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. Measurement of Distances and Directions

**Linear distances-** Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

**Prismatic Compass-** Bearings, included angles, Local Attraction, Magnetic Declination and dip.

### **UNIT - II**

**Levelling and Contouring Leveling-** Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

**Contouring-** Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Computation of Areas and Volumes

**Areas -** Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

**Volumes -** Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

### **UNIT - III**

**Theodolite Surveying:** Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

**Traversing:** Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

### **UNIT - IV**

**Tacheometric Surveying:** Principles of Tacheometry, stadia and tangential methods of Tacheometry.

**Curves:** Types of curves and their necessity, elements of simple curve, setting out of simple Curves,

## **UNIT - V**

**Modern Surveying Methods:** Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

### **TEXT BOOKS:**

1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.
2. Chandra A M, “Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Hoffman. B, H. Lichtenegger and J. Collins, Global Positioning System - Theory and Practice, Springer - Verlag Publishers, 2001.

### **REFERENCE BOOKS:**

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000.
2. Arora K R “Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
3. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M, “Plane Surveying”, New Age International Pvt. Ltd., New Delhi, 2002.
5. Surveying by Bhavikatti; Vikas publishing house ltd.
6. Duggal S K, “Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. Surveying and leveling by R. Agor Khanna Publishers 2015.



## PYTHON PROGRAMMING LAB

**I-B.TECH II-SEMESTER**

**Course code: A2CS202ES**

**L T P C**  
**0 1 2 2**

### COURSE OBJECTIVES:

1. To install and run the Python interpreter
2. To learn control structures.
3. To Understand Lists, Dictionaries in python
4. To Handle Strings and Files in Python

**COURSE OUTCOMES:** After completion of the course, the student should be able to

1. Develop the application specific codes using python.
2. Understand Strings, Lists, Tuples and Dictionaries in Python
3. Verify programs using modular approach, file I/O, Python standard library
4. Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples

### Week -1:

1. Use a web browser to go to the Python website <http://python.org>. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
2. Start the Python interpreter and type help() to start the online help utility.  
Start a Python interpreter and use it as a Calculator.
3. Write a program to calculate compound interest when principal, rate and number of periods are given.  
Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

### Week - 2:

Print the below triangle using for loop.5

```
4 4
3 3 3
2 2 2 2
1 1 1 1 1
```

Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)

Python Program to Print the Fibonacci sequence using while loop

Python program to print all prime numbers in a given interval (use break)

### Week - 3:

i) Write a program to convert a list and tuple into arrays.

ii) Write a program to find common values between two arrays.

Write a function called gcd that takes parameters a and b and returns their greatest common divisor.

Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

### Week - 4:

Write a function called is\_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.

Write a function called has\_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

Write a function called remove\_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.

The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.

Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

Remove the given word in all the places in a string?

Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

Writes a recursive function that generates all binary strings of n-bit length

### **Week - 5:**

i) Write a python program that defines a matrix and prints

Write a python program to perform addition of two square matrices

Write a python program to perform multiplication of two square matrices

How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

Use the structure of exception handling all general purpose exceptions.

### **Week-6:**

a. Write a function called draw\_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

Add an attribute named color to your Rectangle objects and modify draw\_rectangle so that it uses the color attribute as the fill color.

Write a function called draw\_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw\_circle that draws circles on the canvas.

Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.

Write a python code to read a phone number and email-id from the user and validate it for correctness.

### **Week- 7**

Write a Python code to merge two given file contents into a third file.

Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

Write a Python code to Read text from a text file, find the word with most number of occurrences

Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

### **Week - 8:**

Import numpy, Plotpy and Scipy and explore their functionalities.

a) Install NumPy package with pip and explore it.

Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR

Write a program to implement Half Adder, Full Adder, and Parallel Adder

Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

### **TEXT BOOKS:**

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

**REFERENCE BOOKS:**

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W. Chun, Pearson
6. Introduction to Python, Kenneth A. Lambert, Cengage

## ENGINEERING CHEMISTRY LAB

**I-B.TECH II-SEMESTER**  
**Course code: A2CH210DS**

**L T P C**  
**0 0 2 1**

### COURSE OBJECTIVES:

1. The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:
2. Estimation of hardness of water to check its suitability for drinking purpose.
3. Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
4. Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
5. Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

**COURSE OUTCOMES:** The experiments will make the student gain skills on:

1. Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
2. Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
3. Students are able to prepare polymers like bakelite and nylon-6.
4. Estimations saponification value, surface tension and viscosity of lubricant oils.

### LIST OF EXPERIMENTS:

**Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.

**Conductometry:** Estimation of the concentration of an acid by Conductometry.

**Potentiometry:** Estimation of the amount of  $\text{Fe}^{+2}$  by Potentiometry.

**pH Metry:** Determination of an acid concentration using pH meter.

#### Preparations:

Preparation of Bakelite.

Preparation Nylon – 6.

#### Lubricants:

Estimation of acid value of given lubricant oil.

Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

**Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

#### Virtual lab experiments

Construction of Fuel cell and its working.

Smart materials for Biomedical applications

Batteries for electrical vehicles.

Functioning of solar cell and its applications.

### REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

## SURVEYING LABORATORY – I

**I-B.TECH II-SEMESTER**

**Course code: A2CE204PC**

L	T	P	C
0	0	2	1

### **COURSE OBJECTIVES:**

1. Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
2. Student will be able to learn and understand various instrument used in surveying.
3. Student will learn and understand how to calculate Area of plot and Ground.
4. Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile.

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

1. Student will be able to prepare Map and Plan for required site with suitable scale.
2. Student will be able to prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
3. Student will be able to judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
4. Student will be able to judge the profile of ground by observing the available existing contourmap.

### **CYCLE - I**

Chaining of a line using chain, measurements of area by cross staff survey.

1. Measurement of distance between two points when there is an obstacle for both chaining and ranging. Compass survey
2. Traversing by compass and adjustments in included angles and measurement of area - graphical adjustments.
3. Distance between two inaccessible points by compass. Plane Table Surveying
4. Measurement & Plotting of the area by Radiation method.
5. Determination of Positions objects by Intersection Method – Plane Table Survey.
6. Traverse by Plane table Survey.

### **CYCLE – II**

#### **Leveling**

7. Measurement of elevation of various given points.
8. Elevation difference between two given points by reciprocal leveling.
9. Longitudinal Leveling
10. Cross – section Leveling
11. Plotting of Contours by Indirect Method

**II-YEAR (I-SEMESTER)**

## PROBABILITY AND STATISTICS

**II-B.TECH I-SEMESTER**  
**Course code: A2CE301PC**

**L T P C**  
**3 0 0 3**

**PRE-REQUISITES:** Mathematics courses of first year of study.

**COURSE OBJECTIVES:** To learn

1. The theory of Probability, and probability distributions of single and multiple random variables
2. The sampling theory and testing of hypothesis and making statistical inferences

**COURSE OUTCOMES:** After learning the contents of this paper the student must be able to

1. Apply the concepts of probability and distributions to some case studies.
2. Correlate the concepts of one unit to the concepts in other units.

### UNIT - I: PROBABILITY

Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule.

**Random Variables and Probability Distributions:** Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

### UNIT - II: EXPECTATION AND DISCRETE DISTRIBUTIONS

Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.

**Discrete Probability Distributions:** Binomial Distribution, Poisson distribution.

### UNIT - III: CONTINUOUS DISTRIBUTIONS AND SAMPLING

Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.

**Fundamental Sampling Distributions:** Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t –Distribution, F-Distribution.

### UNIT - IV: ESTIMATION & TESTS OF HYPOTHESES

Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

### UNIT - V: APPLIED STATISTICS

Curve fitting by the method of least squares, fitting of straight lines, second degree parabolas and more general curves, Correlation and regression, Rank correlation.

### TEXT BOOKS:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9<sup>th</sup> Ed. Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

### REFERENCE BOOKS:

1. T. T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.

## BUILDING MATERIALS, CONSTRUCTION AND PLANNING

**II-B.TECH I-SEMESTER**

**Course code: A2CE302PC**

**L T P C**  
**3 1 0 4**

**COURSE OBJECTIVES:** The objectives of the course is to

1. List the construction material.
2. Explain different construction techniques
3. Understand the building bye-laws
4. Highlight the smart building materials

**COURSE OUTCOMES:** After the completion of the course student should be able to

1. Understand the different construction material.
2. Understand the different component parts of building and their construction practices and techniques
3. Understand the functional requirements to be considered for design and construction of building
4. Identify the factors to be considered in planning and construction of buildings
5. Plan a building based on the factors and principles of planning

### UNIT - I

**Stones and Bricks, Tiles:** Building stones – classifications and quarrying – properties – structural requirements – dressing. Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics.

**Timber, Aluminum, Glass, Paints and Plastics:** Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fiber – reinforced glass bricks, steel & aluminum, Plastics.

### UNIT - II

**Cement & Admixtures:** Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests. Admixtures – mineral & chemical admixtures – uses.

### UNIT - III

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

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

### UNIT - IV

**Mortars, Masonry and Finishing's Mortars:** Cement Mortar, Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.

**Finishers:** Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.

**Form work: Types:** Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

### UNIT – V

**Building Planning:** Classification of buildings ,functional Planning of buildings: Sustainability and concept of Green building, General aspects to consider for planning, bye-laws and regulations, Selection of site for building construction, Principles of planning, Orientation of building and its relation to outside environment.

### TEXT BOOKS:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.



**REFERENCE BOOKS:**

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Building Construction by PC Varghese PHI.
4. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
5. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.

## ENGINEERING GEOLOGY

**II-B.TECH I-SEMESTER**

**Course code: A2CE303PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:** The objective of this Course is

1. To give the basics knowledge of Geology that is required for constructing various Civil Engineering Structures, basic Geology, Geological Hazardous and Environmental Geology.
2. To focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Planning and construction of major Civil Engineering projects.

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

1. Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice.
2. The fundamentals of the engineering properties of Earth materials and fluids.
3. Rock mass characterization and the mechanics of planar rock slides and topples.

### UNIT - I

**Introduction:**Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.

**Weathering of Rocks:** Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like “Granite”

### UNIT - II

**Mineralogy:** Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

**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, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

### UNIT - III

**Structural Geology:** Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and case studies. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilization of soils. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

### UNIT - IV

**Earth Quakes:** Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence.

**Importance of Geophysical Studies:** Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

## **UNIT - V**

**Geology of Dams, Reservoirs, and Tunnels:** Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Tithological, structural and ground water) in tunneling over break and lining in tunnels.

### **TEXT BOOKS:**

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014
4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications

### **REFERENCE BOOKS:**

1. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers – P.C. Varghese PHI

## STRENGTH OF MATERIALS – I

**II-B.TECH I-SEMESTER**

**Course code: A2CE304PC**

**L T P C**  
**3 0 0 3**

**PRE-REQUISITES:** Engineering Mechanics

**COURSE OBJECTIVES:** The objective of this Course is

1. To understand the nature of stresses developed in simple geometries such as bars, cantilevers and beams for various types of simple loads.
2. To calculate the elastic deformation occurring in simple members for different types of loading.
3. To show the plane stress transformation with a particular coordinate system for different orientation of the plane.
4. To know different failure theories adopted in designing of structural members.

**COURSE OUTCOME:** On completion of the course, the student will be able to:

1. Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, related to the strength of structured and mechanical components.
2. Recognize various types loads applied on structural components of simple framing geometries and understand the nature of internal stresses that will develop within the components.
3. To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
4. Analyze various situations involving structural members subjected to plane stresses by application of Mohr's circle of stress.

### UNIT – I

**Simple Stresses and Strains:** Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - 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  
Pure shear and Complementary shear - Elastic moduli, Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

**Strain Energy** – Resilience – Gradual, sudden, and impact loadings – simple applications.

### UNIT – II

**Shear Force and Bending Moment:** Types of beams – Concept of shear force and bending moment

S.F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple 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- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

**Shear Stresses:** Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle and channel sections.

### UNIT – IV

**Deflection of Beams:** Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load and couple -Mohr's theorems – Moment area method – Application to simple cases.

**Conjugate Beam Method:** Introduction – Concept of conjugate beam method - Difference between a real beam and a conjugate beam - Deflections of determinate beams with constant and different moments of inertia.

**UNIT – V**

**Principal Stresses:** Introduction – Stresses on an oblique plane 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 –Principal stresses – Mohr’s circle of stresses – ellipse of stress - Analytical and graphical solutions.

**Theories of Failure:** Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory- Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

**TEXT BOOKS:**

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
2. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
3. Strength of Materials by R. Subramanian, Oxford University Press

**REFERENCE BOOKS:**

1. Mechanics of material by R.C. Hibbeler, Prentice Hall publications
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3<sup>rd</sup> Edition, UniversitiesPress

## FLUID MECHANICS

**II-B.TECH I-SEMESTER**

**Course code: A2EE307ES**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:** The objectives of the course are to

1. Introduce the concepts of fluid mechanics useful in Civil Engineering applications.
2. Provide a first level exposure to the students to fluid statics, kinematics and dynamics.
3. Learn about the application of mass, energy and momentum conservation laws for fluid flows.
4. Train and analyses engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students
5. To obtain the velocity and pressure variations in various types of simple flows.
6. To prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology.

**COURSE OUTCOMES:** Upon completion of this course, students should be able to:

1. Understand the broad principles of fluid statics, kinematics and dynamics.
2. Understand definitions of the basic terms used in fluid mechanics and characteristics of fluids and its flow.
3. Understand classifications of fluid flow.
4. Be able to apply the continuity, momentum and energy principles.

### UNIT – I

#### Properties of Fluid

Distinction between a fluid and a solid; Properties of fluids – Viscosity, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics**  
Fluid Pressure: Pressure at a point, Pascals law, Hydrostatic law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

### UNIT - II

#### Fluid Kinematics

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; One, two- and three-dimensional flows; Streamline, path line, streak line and stream tube; stream function, velocity potential function, flow net, One, two- and three-dimensional continuity equations in Cartesian coordinates applications.

#### Fluid Dynamics

Surface and Body forces -Euler's and Bernoulli's equation; Momentum equation. correction factors. Bernoulli's equation to real fluid flows.

### UNIT - III

#### Flow Measurement in Pipes

Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube, applications of Momentum equations; Forces exerted by fluid flow on pipe bend, sudden enlargement in pipes.

#### Flow Over Notches & Weirs

Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

### UNIT – IV

#### Flow through Pipes

Reynolds experiment, Reynolds number, Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy line, hydraulic grade line, Pipes in series, equivalent pipes, pipes in parallel, siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis of pipe networks: Hardy Cross method and EPA NET, water hammer in pipes and control measures.

## **UNIT - V**

### **Laminar & Turbulent Flow**

Laminar flow through circular pipes, and fixed parallel plates.

Boundary Layer Concepts

Prandtl contribution, Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness concepts of laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Drag and Lift and types of drag, magnus effect.

### **TEXT BOOKS:**

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015.
3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

### **REFERENCE BOOKS:**

1. Fluid Mechanics – Frank M. White – 8<sup>th</sup> Edition – Mc Graw Hill Education.
2. \*Theory and Applications of Fluid Mechanics, K.Subramanya, Tata McGraw Hill
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
4. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
5. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai & Co
6. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publication Pvt Ltd.

## SURVEYING LAB – II

**II-B.TECH I-SEMESTER**

**Course code: A2CE305PC**

**L T P C**  
**0 0 3 1.5**

### **COURSE OBJECTIVES:**

1. Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
2. Student will be able to learn and understand about theodolite and total station in surveying.
3. Student will learn and understand how to calculate Area of plot and Ground.
4. Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile using total station.

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

1. Prepare Map and Plan for required site with suitable scale.
2. Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
3. Judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
4. Judge the profile of ground by observing the available existing contour map.

### **CYCLE - I**

#### **Theodolite surveying:**

1. Measurement of horizontal angles and vertical angles.
2. Distance between two inaccessible points.
3. Measurement of area by theodolite traversing (Gales traverse table).
4. Determination of tachometer constants.
5. Distance between two inaccessible points using the principles of tachometer surveying.
6. Distance between two inaccessible points using the principles of trigonometric surveying

### **CYCLE - II**

#### **Total Station:**

1. Area Measurement
2. Stake Out
3. Remote Elevation Measurement
4. Missing Line Measurement
5. Longitudinal & Cross Section Profile
6. Contouring
7. Providing a Simple Circular Curve
8. Demonstration using DGPS



## STRENGTH OF MATERIALS LABORATORY

**II-B.TECH I-SEMESTER**

**Course code: A2CE306PC**

L	T	P	C
0	0	2	1

### **COURSE OBJECTIVES:**

1. To conduct the Tension test, Compression test on various materials
2. To conduct the Shear test, Bending test on determinate beams
3. To conduct the Compression test on spring and Hardness test using various machines
4. To conduct the Torsion test, Impact test on various materials

**COURSE OUTCOMES:** After the completion of the course, students should be able to

1. Determine the yield stress, ultimate tensile stress, percentage elongation of steel, compressive strength of brick and concrete
2. Determine the ultimate shear stress, modulus of elasticity of steel
3. Determine the stiffness of the close coiled helical spring and hardness number of mild steel, brass, copper and aluminium.
4. Determine the modulus of rigidity and impact strength of steel.

### **LIST OF EXPERIMENTS:**

1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on concrete.
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.

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## COMPUTER AIDED DRAFTING LABORATORY

### II-B.TECH I-SEMESTER

Course code: A2EE215ES

L	T	P	C
0	0	3	1.5

### COURSE OBJECTIVES:

1. To be able to plan buildings as per NBC.
2. To understand various types of conventional signs and brick bonds.
3. To draw the plan section and elevation for doors, trusses and staircases.
4. To use AutoCAD tools to draw building plans, sections and elevations from a given line diagram and specifications.
5. To develop working drawings of residential buildings.

**COURSE OUTCOMES:** After completion of the course, the student should be able to

1. Plan buildings as per NBC.
2. Use different Commands of selected drafting software to draw Conventional signs and brick bonds, Plan, Section and Elevation of buildings.
3. Draw section and elevation of panelled doors and trusses.
4. Draw and detail the different components of Stair cases.
5. Develop and draw single /two storey residential building and public building as per the buildingby-laws.
6. Draw Electrical layout, Plumbing layout for residential buildings.

### LIST OF EXPERIMENTS:

1. Planning Aspects of Building systems as per National Building Code (NBC).
2. Brick bonds: English bond & Flemish bond – Odd and Even courses.
3. Developing plan and section of dog-legged staircase.
4. Developing plan of single storied residential building.
5. Developing section and elevation of single storied residential building.
6. Developing plan of single /two storied Residential building as per Building by-laws.
7. Developing plan of public building as per building by-laws.
8. Developing section and elevation of public building.
9. Development of working drawing of building –Electrical Layout.
10. Development of working drawing of building – Plumbing Layout.

### TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sessa Praksh & Dr. G. S. Servesh –Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.
3. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao – Radiant Publishing House.
4. Civil Engineering Drawing-II by N. Sreenivasulu – Radiant Publishing House.

### REFERENCE BOOKS:

1. Engineering Graphics by P. J. Sha - S. Chand & Co
2. Civil Engineering Drawing-I by S. Mahaboob Basha – Falcon Publishers
3. Building drawing by M. G. Shah - Tata McGraw-Hill Education
4. Structural Engineering Drawing by S. Mahaboob Basha – Falcon Publishers

## CONSTITUTION OF INDIA

**II-B.TECH I-SEMESTER**  
**Course code: A2CE303MC**

**L T P C**  
**2 0 0 0**

**COURSE OBJECTIVES:** Students will be able to:

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

**COURSE OUTCOMES:** Students will be able to:

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

**UNIT – 1** History of Making of the Indian Constitution- History of Drafting Committee.

**UNIT – 2** Philosophy of the Indian Constitution- Preamble Salient Features

**UNIT – 3** Contours of Constitutional Rights & Duties - Fundamental Rights

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

**UNIT – 4**

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

**UNIT – 5**

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

**UNIT - 6**

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

**SUGGESTED READING:**

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

**II-YEAR (II-SEMESTER)**

## BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

**II-B.TECH II-SEMESTER**

**Course code: A2CE401PC**

**L T P C**  
**3 0 0 3**

### COURSE OBJECTIVES:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To impart the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

### COURSE OUTCOMES:

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

### UNIT - I:

**D.C. Circuits:** Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

**A.C. Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits , Three-phase balanced circuits, voltage and current relations in star and delta connections.

### UNIT - II:

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

### UNIT - III:

**Electrical Machines:** Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

### UNIT - IV:

**P-N Junction and Zener Diode:**Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

**Rectifiers and Filters:**P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L-section Filters, $\pi$ - section Filters.

### UNIT - V:

**Bipolar Junction Transistor (BJT):** Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

**Field Effect Transistor (FET):**Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

**TEXT BOOKS:**

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

**REFERENCE BOOKS:**

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9<sup>th</sup> Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6<sup>th</sup> edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2<sup>nd</sup> edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

## CONCRETE TECHNOLOGY

### II-B.TECH II-SEMESTER

Course code: A2MA402BS

L	T	P	C
3	0	0	3

**PRE-REQUISITES:** Building Materials

**COURSE OBJECTIVES:** The objectives of the course are to

1. **Know** different types of cement as per their properties for different field applications.
2. **Understand Design** economic concrete mix proportion for different exposure conditions and intended purposes.
3. **Know** field and laboratory tests on concrete in plastic and hardened stage.

**COURSE OUTCOMES:** After the completion of the course student should be able to

1. **Determine** the properties of concrete ingredients i.e., cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
2. **Apply** the use of various chemical admixtures and mineral additives to design cement-based materials with tailor-made properties
3. **Use** advanced laboratory techniques to characterize cement-based materials.
4. **Perform** mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fiber reinforced concrete.

### UNIT I

**Aggregate:** Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.

### UNIT - II

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

### UNIT – III

**Hardened Concrete:** Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.

**Testing of Hardened Concrete:** Compression tests– Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

### UNIT - IV

**Elasticity, Creep & Shrinkage** – 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

**Admixtures:** Types of admixtures – mineral and chemical admixtures.

**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.

**Special Concretes:** Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete, Nano silica and Nano Alumina concrete.

**TEXT BOOKS:**

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2<sup>nd</sup> Edition, Oxford university Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, 5<sup>TH</sup> Edition, New Delhi

**REFERENCE BOOKS:**

1. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, Mc- Graw Hill Publishers

**IS CODES:**

1. IS 383 : 2016
2. IS 516 : 2018 (Part -1 - 4)
3. IS 10262 - 2019



## STRENGTH OF MATERIALS – II

**II-B.TECH II-SEMESTER**

**Course code: A2CE403PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PRE-REQUISITES:** Strength of Materials - I

**COURSE OBJECTIVES:** The objective of this Course is

1. To understand the nature of stresses developed in simple geometries shafts, springs, columns & cylindrical and spherical shells for various types of simple loads.
2. To calculate the stability and elastic deformation occurring in various simple geometries for different types of loading.
3. To understand the unsymmetrical bending and shear center importance for equilibrium conditions in a structural member of having different axis of symmetry.

**COURSE OUTCOME:** On completion of the course, the student will be able to:

1. Describe the concepts and principles, understand the theory of elasticity, and perform calculations, relative to the strength of structures and mechanical components in particular to torsion and direct compression.
2. To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
3. Analyze strength and stability of structural members subjected to Direct, and Direct and Bending stresses.
4. Understand and evaluate the shear center and unsymmetrical bending.

### UNIT – I

**Torsion of Circular Shafts:** Theory of pure torsion – Derivation of Torsion equation -Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion – Design of shafts according to theories of failure.

**Springs:** Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

### UNIT – II

**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 a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory– Long columns subjected to eccentric loading – Secant formula – Empirical formulae — Rankine – Gordon formula- Straight line formula – Prof. Perry's formula.

**BEAM COLUMNS:** Laterally loaded struts – subjected to uniformly distributed and concentrated loads.

### UNIT - III

**Direct and Bending Stresses:** Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability- Overturning and sliding – stresses due to direct loading and bending moment about both axis.

### UNIT – IV

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

**Thick Cylinders:** Introduction - Lamé's theory for thick cylinders – Derivation of Lamé's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

## **UNIT – V**

### **Unsymmetrical Bending:**

Introduction – Centroidal principal axes of section – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis.

**Shear Centre:** Introduction - Shear center for symmetrical and unsymmetrical (channel, I, T and L) sections.

### **TEXT BOOKS:**

1. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.
2. Mechanics of Materials by Dr. B. C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
3. Strength of Materials by R. Subramanian, Oxford University Press.

### **REFERENCE BOOKS:**

1. Mechanics of Materials by R.C. Hibbeler, Pearson Education
2. Engineering Mechanics of Solids by Popov E.P. Prentice-Hall Ltd
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
4. Strength of Materials by R. K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd

## HYDRAULICS AND HYDRAULIC MACHINERY

**II-B.TECH II-SEMESTER**

**Course code: A2CE404PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:** The objective of the course is

1. To Define the fundamental principles of water conveyance in open channels.
2. To Discuss and analyze the open channels in uniform and Non-uniform flow conditions.
3. To Study the characteristics of hydroelectric power plant and its components.
4. To analyze and design of hydraulic machinery and its modeling.

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

1. Apply their knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
2. Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
3. Apply dimensional analysis and to differentiate the model, prototype and similitude conditions for practical problems.
4. Get the knowledge on different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages.

### UNIT - I

**Open Channel Flow – I:** Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient. Most economical sections. Computation of Uniform flow, Normal depth.

**Critical Flow:** Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

### UNIT - II

**Open Channel Flow – II:** Non-uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method. **Rapidly varied flow:** Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

### UNIT - III

**Dimensional Analysis and Hydraulic Similitude:** Dimensional homogeneity – Rayleigh's method and Buckingham's  $\pi$  methods– Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems. Distorted models.

**Basics of Turbo Machinery:** Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular.

### UNIT - IV

**Hydraulic Turbines – I:** Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.

**Hydraulic Turbines – II:** Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

**UNIT - V**

**Centrifugal Pumps:** Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.

Reciprocating pumps – Working, discharge, slip indicator diagrams.

**TEXT BOOKS:**

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015
3. Open channel flow by V.T. Chow (McGraw Hill Book Company).

**REFERENCE BOOKS:**

1. Fluid Mechanics by R. C. Hibbeler, Pearson India Education Services Pvt. Ltd
2. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt.Ltd.).
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
4. Hydraulic Machines by Banga & Sharma (Khanna Publishers).

## STRUCTURAL ANALYSIS – I

**II-B.TECH II-SEMESTER**

**Course code: A2CE405PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PRE-REQUISITES:** Strength of Materials – I

**COURSE OBJECTIVES:** The objective of the course is to

1. Differentiate the statically determinate and indeterminate structures.
2. To understand the nature of stresses developed in perfect frames and three hinged arches for various types of simple loads
3. Analyse the statically indeterminate members such as fixed bars, continuous beams and for various types of loading.
4. Understand the energy methods used to derive the equations to solve engineering problems
5. Evaluate the Influence on a beam for different static & moving loading positions

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

1. An ability to apply knowledge of mathematics, science, and engineering
2. Analyse the statically indeterminate bars and continuous beams
3. Draw strength behaviour of members for static and dynamic loading.
4. Calculate the stiffness parameters in beams and pin jointed trusses.
5. Understand the indeterminacy aspects to consider for a total structural system.
6. Identify, formulate, and solve engineering problems with real time loading

### UNIT – I

**Analysis of Perfect Frames:** Types of frames- Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

### UNIT – II

**Energy Theorems:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's theorem-Unit Load Method - Deflections of simple beams and pin-jointed plane frames - Deflections of statically determinate bent frames.

**Three Hinged Arches** –Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem - Analysis of Three hinged arches - Normal Thrust and radial shear and bending moment - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels.

### UNIT - III

**Propped Cantilever and Fixed Beams:** Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - Shear force, Bending moment diagrams and elastic curve for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams - effect of sinking of support, effect of rotation of a support.

### UNIT – IV

**Continuous Beams:** Introduction-Continuous beams - Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - effect of sinking of supports.

**Slope Deflection Method:** Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports -Determination of static and kinematic indeterminacies for frames Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway Shear force and bending moment diagrams and Elastic curve.

## **UNIT – V**

**Moving Loads and Influence Lines:** Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load ,uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length - Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span.

### **TEXT BOOKS:**

1. Structural Analysis Vol –I & II by V.N. Vazirani and M.M. Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G. S. Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt.Ltd.
3. Structural analysis T. S Thandavamoorthy, Oxford university Press

### **REFERENCE BOOKS:**

1. Structural Analysis by R. C. Hibbeler, Pearson Education
2. Basic Structural Analysis by K.U. Muthu *et al.*, I.K. International Publishing House Pvt. Ltd
3. Mechanics of Structures Vol – I and II by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd.
5. Fundamentals of Structural Analysis by M.L. Gamhir, PHI Learning Pvt. Ltd.

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## FLUID MECHANICS AND HYDRAULIC MACHINERY LABORATORY

**II-B.TECH II-SEMESTER**

**Course code: A2CE406PW**

**L T P C**

**0 0 4 2**

### COURSE OBJECTIVES

1. To **identify** the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
2. To **explain** the standard measurement techniques of fluid mechanics and their applications.
3. To **illustrate** the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
4. To **analyze** the laboratory measurements and to document the results in an appropriate format.

**COURSE OUTCOMES:** Students who successfully complete this course will have demonstrated ability to:

1. **Describe** the basic measurement techniques of fluid mechanics and its appropriate application.
2. **Interpret** the results obtained in the laboratory for various experiments.
3. **Discover** the practical working of Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
4. **Compare** the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
5. Write a technical laboratory report

### LIST OF EXPERIMENTS

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance Characteristics of Francis turbine
12. Performance characteristics of Kaplan Turbine
13. Performance Characteristics of a single stage / multi stage Centrifugal Pump

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## BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

**II-B.TECH II-SEMESTER**

**Course code: A2CE407PC**

L	T	P	C
0	0	2	1

**PRE-REQUISITES:** Basic Electrical and Electronics Engineering

### **COURSE OBJECTIVES:**

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To impart the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

### **COURSE OUTCOMES:**

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

### **LIST OF EXPERIMENTS/DEMONSTRATIONS:**

#### **PART A: ELECTRICAL**

1. Verification of KVL and KCL
  - (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
  - (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star) in a Three Phase Transformer
2. Measurement of Active and Reactive Power in a balanced Three-phase circuit
3. Performance Characteristics of a Separately Excited DC Shunt Motor
4. Performance Characteristics of a Three-phase Induction Motor
5. No-Load Characteristics of a Three-phase Alternator

#### **PART B: ELECTRONICS**

1. Study and operation of
2. Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
3. PN Junction diode characteristics
4. Zener diode characteristics and Zener as voltage Regulator
5. Input & Output characteristics of Transistor in CB / CE configuration
6. Full Wave Rectifier with & without filters
7. Input and Output characteristics of FET in CS configuration

### **TEXT BOOKS:**

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education



**REFERENCE BOOKS:**

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9<sup>th</sup> Ed, 2006.
2. Millman’s Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH,2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6<sup>th</sup> edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2<sup>nd</sup> edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
8. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
9. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

## CONCRETE TECHNOLOGY LABORATORY

**II-B.TECH II-SEMESTER**

**Course code: A2CE408ES**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### **COURSE OBJECTIVES:**

1. To know the various procedures to determine the characteristics of cement
2. To understand the test procedures to evaluate the characteristics of aggregates
3. To know the test procedures to find the properties of fresh concrete
4. To understand the test procedures to find mechanical properties of hardened concrete

**COURSE OUTCOMES:** After completion of the course, the student should be able to

1. Perform various tests required to assess the characteristics of cement
2. Test and evaluate the properties of fine and coarse aggregates and determine its suitability for construction
3. Evaluate the fresh and hardened properties of concrete
4. Design the concrete mix for required strength and test its performance characteristics

### **LIST OF EXERCISES:**

1. **Tests on Cement:**
  - a) Soundness.
  - b) Compressive strength.
2. **Tests on Aggregates:**
  - a) Specific gravity of fine aggregate.
  - b) Specific gravity of coarse aggregate.
  - c) Bulking of fine aggregate.
  - d) Grading of fine aggregate
3. IS method of mix design of normal concrete as per IS : 10262
4. **Tests on Fresh Concrete:**
  - a) Slump cone test.
  - b) Compacting factor test.
  - c) Vee-Bee consistometer test.
5. **Tests on Hardened Concrete:**
  - a) Compressive & Tensile strength tests.
  - b) Modulus of elasticity of concrete.
  - c) Non-destructive testing of concrete.

## **GENDER SENSITIZATION LABORATORY**

**II-B.TECH II-SEMESTER**

**Course code: A2CE404MC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

### **COURSE DESCRIPTION**

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

### **OBJECTIVES OF THE COURSE:**

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on 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 violence.
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 derived 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 labor and its relation to politics and economics.
5. Men and women students and professionals 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**

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men  
Preparing for Womanhood. Growing up Male. First lessons in Caste.

### **UNIT – II: GENDER ROLES AND RELATIONS**

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

### **UNIT – III: GENDER AND LABOUR**

Division and Valuation of Labour-Housework: The Invisible Labor- “My Mother doesn't Work.” “Share the Load.”-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.  
-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

#### **UNIT – IV: GENDER - BASED VIOLENCE**

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “*Chupulu*”.

Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-“I Fought for my Life....”

#### **UNIT – V: GENDER AND CULTURE**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

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

Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on “Gender”.

**ESSENTIAL READING:** The Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

#### **ASSESSMENT AND GRADING:**

Discussion & Classroom Participation: 20%

Project/Assignment: 30%

End Term Exam: 50%

**III-YEAR (I-SEMESTER)**

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## STRUCTURAL ANALYSIS-II

### III-B.TECH I-SEMESTER

L T P C  
3 0 0 3

Course code: A2CE501PC

### COURSE OBJECTIVES

#### To learn

1. Identify the various actions in arches.
2. Understand classical methods of analysis for statically indeterminate structures.
3. Differentiate the approximate and numerical methods of analysis for indeterminate structures.
4. Find the degree of static and kinematic indeterminacies of the structures.
5. Plot the variation of S.F and B.M when a moving load passes on indeterminate structure

### COURSE OUTCOMES

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

1. Analyze the two hinged arches.
2. Solve statically indeterminate beams and portal frames using classical methods
3. Sketch the shear force and bending moment diagrams for indeterminate structures.
4. Formulate the stiffness matrix and analyze the beams by matrix methods

### UNIT – I TWO HINGED ARCHES, CABLES AND SUSPENSION BRIDGES

Two Hinged Arches: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib. cables and suspension bridges: Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

### UNIT – II MOMENT DISTRIBUTION METHOD AND KANI'S METHOD

Moment Distribution Method - Analysis of continuous beams with and without settlement of supports - Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclined frames - Shear force and Bending moment diagrams, Elastic curve.

Kani's Method: Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two Storey Frames including Side Sway using Kani's Method - Shear force and bending moment diagrams - Elastic curve.

### UNIT – III APPROXIMATE METHODS OF ANALYSIS

Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method and Factor method - Analysis of multi-storey frames for gravity loads - Substitute Frame method - Analysis of Mill bents.

### UNIT – IV MATRIX METHODS OF ANALYSIS

Introduction to Flexibility and Stiffness matrix methods of analysis using 'system approach' upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods -Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods- Analysis of single bay single storey portal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

### UNIT- V INFLUENCE LINES FOR INDETERMINATE BEAMS

Introduction – influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

**TEXT BOOKS**

1. Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3. Indeterminate Structural Analysis by K.U. Muthu et al., I.K. International Publishing House Pvt. Ltd

**REFERENCE BOOKS**

1. Structural analysis by T. S Thandavamoorthy, Oxford university Press
2. Mechanics of Structures Vol –II by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.
4. Examples in Structural Analysis by William M.C. McKenzie, Taylor & Francis.
5. Structural Analysis by R. C. Hibbeler, Pearson Education
6. Structural Analysis by Devdas Menon, Narosa Publishing House.
7. Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros.

**WEB REFERENCES**

1. <https://civilengineering.files.wordpress.com/2014/10/advance-method-of-structural-analysis-book.pdf>
2. <https://civilengforall.com/structural-analysis-textbook-by-civilengforall-free-download-pdf/>

**E-TEXT BOOKS**

1. <https://www.freebookcentre.net/civil-books-download/Advanced-Structural-Analysis.html>

**MOOCS COURSE**

1. <https://swayam.gov.in/>
2. <https://onlinecourses.nptel.ac.in/>

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## GEOTECHNICAL ENGINEERING

### III-B.TECH I-SEMESTER

Course code: A2CE502PC

L	T	P	C
3	1	0	4

### COURSE OBJECTIVES:

The objectives of the course are to

1. Understand the formation of soil and classification of the soils
2. Determine the Index & Engineering Properties of Soils
3. Determine the flow characteristics & stresses due to externally applied loads
4. Estimate the consolidation properties of soils
5. Estimate the shear strength and seepage loss

### COURSE OUTCOMES

At the end of the course the student will able to

1. Characterize and classify the soils
2. Able to estimate seepage, stresses under various loading conditions
3. Able to know compaction and its characteristics
4. Able to analyze the compressibility of the soils
5. Able to understand the strength of soils under various drainage conditions

### UNIT-I INTRODUCTION

**Introduction:** Origin and Classification of Soils-Soil structures – moisture content – Mass, volume relationships – Specific Gravity. –Unit weight of soil by Core-cutter method and Sand-replacement method - Relative density.

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

### UNIT -II PERMEABILITY AND EFFECTIVE STRESS

**Permeability:** Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting permeability – Determination of coefficient of permeability by constant-head method and falling-head method –Permeability of layered soils.

**Effective Stress:** Total, neutral and effective stress – principle of effective stress.

**Seepage Analysis:** Seepage through soils – Flownets: Characteristics and Use- quick sand condition.

### UNIT-III STRESS DISTRIBUTION IN SOILS AND COMPACTION OF SOIL

**Stress Distribution in Soils:** Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

**Compaction of Soil:**-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Factors affecting compaction. Compaction in field and compaction control.

### UNIT-IV CONSOLIDATION

**Consolidation:** Difference between compaction and consolidation, Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.



## **UNIT-V SHEAR STRENGTH OF SOILS**

**Shear strength of soils :** Importance of shear strength-Mohr's – Coulomb's Failure theories – Shear Parameters-Laboratory tests for determination of strength tests –Direct shear test, Tri-axial compression test(UU, CU and CD) and unconfined compression tests- Vane shear test. Factors affecting shear strength of cohesion less and cohesive soils- liquefaction.

### **TEXT BOOKS:**

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt Ltd,
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
3. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.

### **REFERENCE BOOKS:**

1. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.
2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).
3. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi.
5. Soil Mechanics and Foundation by by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
6. Foundation Engineering by P.C. Varghese, PHI

### **WEB REFERENCES:**

1. <https://www.classcentral.com/course/swayam-advanced-soil-mechanics-22886>
2. <https://www.classcentral.com/course/swayam-soil..>

### **E-TEXT BOOKS:**

1. <https://drive.google.com/u/0/uc?id=1eA2nVv0PxxrlFRTpgP9sl6p4OcGUgbqu&export=download>

### **MOOCS COURSE**

1. <https://nptel.ac.in/courses/105/103/105103097/>

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## DESIGN OF REINFORCED CONCRETE STRUCTURES

### III-B.TECH I-SEMESTER

Course code: A2CE503PC

L	T	P	C
3	0	0	3

### COURSE OBJECTIVES

The course should enable the students to:

1. Identify the basic components of any structural system and the standard loading for the RC structure
2. Identify and tell the various codal provisions given in IS. 456
3. Describe the salient feature of limit state method, compare with other methods and
4. Describe the concepts of limit state of collapse and limit state of serviceability
5. Evaluate the behavior of RC member under flexure, shear and compression, torsion and bond.

### COURSE OUTCOMES:

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

1. Compare and Design the singly reinforced, doubly reinforced and flanged sections.
2. Design the axially loaded, uniaxial and biaxial bending columns.
3. Classify the footings and Design the isolated square, rectangular and circular footings
4. Distinguish and Design the one-way and two-way slabs
5. Design of stair case

### UNIT-I INTRODUCTION TO CONCRETE STRUCTURES

**Introduction:** Structure - Components of structure - Different types of structures. Concepts of RC Design - Limit State method - Material Stress - Strain Curves - Safety factors - Characteristic values. Stress Block parameters - IS - 456 - 2000 - Working Stress Method.

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

### UNIT -II DESIGN OF BOND, SHEAR&TORSION

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond – Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement.

### UNIT -III DESIGN OF SLABS

Design of one way slab and two- way slabs, continuous slab Using I S Coefficients, Cantilever slab / Canopy slab, problems on one way slab, two way slab and continuous slab.

### UNIT -IV DESIGN OF COMPRESSION MEMBERS

Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions.

### UNIT-V DESIGN OF FOOTINGS & STAIRCASE

Different types of footings – Design of flat isolated square, rectangular, circular footings and combined footings for two columns, design of stair case.

### TEXT BOOKS:

1. Limit state design of reinforced concrete – P.C. Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill.
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers.

**REFERENCE BOOKS:**

1. Reinforced concrete structures, Vol. 1, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd.
2. Fundamentals of Reinforced concrete design by M. L. Gambhir, Prentice Hall of India Pvt. Ltd.,
3. Design of Reinforced Concrete Structures by N. Subramanian, Oxford University Press
4. Design of concrete structures by J.N. Bandhyopadhyay PHI Learning Private Limited.
5. Design of Reinforced Concrete Structures by I. C. Syal and A. K. Goel, S. Chand & company.
6. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India.

**WEB REFERENCES:**

1. <http://kgr.ac.in/wp-content/uploads/2019/12/DRCS-course-file.pdf>
2. <https://cbic-gst.gov.in/pdf/Advisory/DSR/DRC-03-04-05-User-Manual-Final.pdf>

**E-TEXT BOOKS:**

1. <https://civildatas.com/download/design-of-reinforced-concrete-structures-by-ramamrutham>
2. [https://easyengineering.net/design-of-reinforced-concrete-structures-by-subramanian/?cfchl\\_captchtk=fef2495833aff5f39ce44f93bf8b4e3f2471d04d-1615800536-0AaRxzNUJOkRa3T9z\\_wkXcMEZqa4GHHNgUGxrmLAinp0\\_io0eDXq2v9AHJ5g\\_pAmUbP0dN0aEj-SdPLdH](https://easyengineering.net/design-of-reinforced-concrete-structures-by-subramanian/?cfchl_captchtk=fef2495833aff5f39ce44f93bf8b4e3f2471d04d-1615800536-0AaRxzNUJOkRa3T9z_wkXcMEZqa4GHHNgUGxrmLAinp0_io0eDXq2v9AHJ5g_pAmUbP0dN0aEj-SdPLdH)

**MOOCS COURSE**

1. <https://nptel.ac.in/courses/105/105/105105105/>
2. <https://nptel.ac.in/courses/105/105/105105105/>
3. [https://onlinecourses.nptel.ac.in/noc20\\_ce39/preview](https://onlinecourses.nptel.ac.in/noc20_ce39/preview)

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**BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**

**III-B.TECH I-SEMESTER**

**Course code: A2CE504HS**

**L T P C**

**3 0 0 3**

**COURSE OBJECTIVES**

The course should enable the students to

1. Understand the market dynamics namely demand elasticity of demand
2. Understand the pricing in different market structures.
3. Analyze how capital budgeting decisions are carried out for selecting the best investment proposal.
4. Learn how organizations make important investment and financing decisions.
5. Analyze a company's financial statements and come to a reasoned conclusion about the financial situation of the company.

**COURSE OUTCOMES**

1. Understand microeconomic factors in related to demand analysis and its forecasting.
2. Apply the theory of production function and Cost concepts to determine the Break Even Analysis.
3. Remember different market structures, pricing strategies and different forms business organization.
4. Determine the investment decisions of organizations by applying capital budgeting methods and Strategies.
5. Interpret the financial statement by using Fundamental accounting concepts and Ratio analysis.

**UNIT-I INTRODUCTION AND DEMAND ANALYSIS**

Definition, nature and scope of business economics; Demand analysis; Demand determinants, law of demand and its exceptions; Elasticity of demand: Definition, types, measurement and significance of elasticity of demand, demand forecasting, factors governing demand forecasting.

**UNIT -II PRODUCTION AND COST ANALYSES**

Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs vs. Implicit costs, out of pocket costs vs. Imputed costs, Break-even analysis, Determination of Break – Even point (Simple Problems) , Managerial Significance of BEA.

**UNIT -III MARKETS & NEW ECONOMIC ENVIRONMENT**

Market structures: Types of competition, Features of perfect competition, Monopoly and monopolistic competition. Price determination& Price Statistics: Price Output determination in case of perfect competition and monopoly. Features and evaluation of different forms of Business organization: Sole proprietorship, partnership, Joint Stock Company, public enterprises and their types..

**UNIT -IV CAPITAL BUDGETING**

Capital and its significance, types of capital, estimation of fixed and working capital requirements, methods and sources of raising capital- Trading Forecast, Capital budget, Cash Budget. Features of capital budgeting proposals, methods of capital budgeting – payback method, Accounting rate of return (ARR), Net Present Value Method (simple problems).

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**UNIT-V INTRODUCTION TO FINANCIAL ACCOUNTING AND FINANCIAL ANALYSIS**

Accounting Concepts and Conventions, Introduction to IFRS– Double – Entry Book keeping, Journal, Ledger, Trial balance, Final accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments.) Financial Analysis through Ratios: Significance, limitations of Ratio Analysis and Ratios Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio).

**TEXT BOOKS:**

1. Aryasri, “Managerial Economics and Financial Analysis”, TMH publications, 4th Edition, 2012.
2. M. Kasi Reddy, Saraswathi, “Managerial Economics and Financial Analysis”, PHI Publications, New Delhi, 2nd Edition, 2012.
3. Varshney, Maheswari, “Managerial Economics”, Sultan Chand Publications, 11th Edition, 2009.

**REFERENCE BOOKS:**

1. Dwivedi, “Managerial Economics”, Vikas Publication House Pvt.Ltd, 2nd Edition, 2012.
2. S.N. Maheshwari & S.K.Maheshwari, “Financial Accounting”, Vikas Publication House Pvt.Ltd, 4th Edition, 2012.
3. R.Narayana Swamy, “Financial Accounting- A managerial Perspective”, Pearson publications, 1st Indian Reprint Edition, 2012.
4. J.V.Prabhakar Rao & P.V.Rao, “Managerial Economics & Financial Analysis”, Maruthi Publishers, 1<sup>st</sup> Revised Edition, 2011.
5. Kasi Reddy & Saraswathi, “Managerial Economics and Financial Analysis”, PHI Publications, New Delhi, 10th Revised Edition, 2012.
6. Varshney & Maheswari, “Managerial Economics”, Sulthan Chand Publishers, 1st Revised Edition, 2009

**WEB REFERENCES:**

1. [https:// www.slideshare.net/glory1988/managerial-economics-and- financial analysis.](https://www.slideshare.net/glory1988/managerial-economics-and-financial-analysis)
2. [https:// thenthata.web4kurd.net/mypdf/managerial-economics-and- financial analysis.](https://thenthata.web4kurd.net/mypdf/managerial-economics-and-financial-analysis)
3. [https:// bookshallcold.link/pdfread/managerial-economics-and-financial analysis.](https://bookshallcold.link/pdfread/managerial-economics-and-financial-analysis)
4. [https:// www.gvpce.ac.in/syllabi/Managerial Economics and financial analysis.](https://www.gvpce.ac.in/syllabi/Managerial%20Economics%20and%20financial%20analysis)

**E-TEXT BOOKS:**

1. [https:// books.google.co.in/books/about/Managerial economics and financial analysis.](https://books.google.co.in/books/about/Managerial_economics_and_financial_analysis)
2. [http://www. eBook take. in /pdf/title/managerial-economics-and-financial analysis.](http://www.eBooktake.in/pdf/title/managerial-economics-and-financial-analysis)
3. [http://all4ryou.blogspot.in/2012/06/mefa-managerial-economics and financial analysis.](http://all4ryou.blogspot.in/2012/06/mefa-managerial-economics-and-financial-analysis)
4. [http://books.google.com/books/about/Managerial economics and financial analysis.](http://books.google.com/books/about/Managerial_economics_and_financial_analysis)
5. [http://www.scribd.com/doc/37684926.](http://www.scribd.com/doc/37684926)

**MOOCS COURSE**

1. <https://nptel.ac.in/courses/110/101/110101005/>
2. [https://www.coursera.org/specializations/managerial-economics-business-analysis.](https://www.coursera.org/specializations/managerial-economics-business-analysis)
3. [https://onlinecourses.swayam2.ac.in/cec20\\_mg02/preview](https://onlinecourses.swayam2.ac.in/cec20_mg02/preview)

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**TRANSPORTATION ENGINEERING****III-B.TECH I-SEMESTER****Course code: A2CE505HS****L T P C**  
**3 0 0 3****COURSE OBJECTIVES**

1. This course aims at providing a comprehensive insight of various elements of Highway transportation engineering.
2. Know the traffic planning and characteristics
3. Know the geometric design the highway roads
4. Know the traffic survey and its applications
5. Know the safety, preventions and environmental hazard of traffic

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

1. An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance
2. An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways.
3. An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil sub grade and environmental conditions using the standards stipulated by Indian Roads Congress.
4. An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures or designed overlays using Indian Roads congress guidelines.
5. An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and behavioral patterns.

**UNIT-I TRAFFIC PLANNING AND CHARACTERISTICS**

Introduction, History and Importance of Highways, Characteristics of road transport, Current road development plans in India, Road Characteristics-Road user characteristics, PIEV theory, Vehicle Performance characteristics, Fundamentals of Traffic Flow, Urban Traffic problems in India, Integrated planning of town, country, regional and all urban infrastructures, Sustainable approach- land use & transport and modal integration.

**UNIT -II HIGHWAY GEOMETRIC DESIGN**

Introduction to Highway Geometric Design; Width of Pavement, Formation and Land, Cross Slopes etc; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves; Vertical Alignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves

**UNIT -III TRAFFIC SURVEYS**

Traffic Surveys- Speed, journey time and delay surveys, Vehicles Volume Survey including non-motorized transports, Methods and interpretation, Origin Destination Survey, Methods and presentation, Parking Survey, Accident analyses-Methods, interpretation and presentation, Statistical applications in traffic studies and traffic forecasting, Level of service- Concept, applications and significance.

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**UNIT -IV TRAFFIC SAFETY AND ENVIRONMENT**

Road accidents, Causes, effect, prevention, and cost, Street lighting, Traffic and environment hazards, Air and Noise Pollution, causes, abatement measures, Promotion and integration of public transportation, Promotion of non-motorized transport

**UNIT-V TRAFFIC DESIGN AND VISUAL AIDS**

Intersection Design- channelization, Rotary intersection design, Signal design, Coordination of signals, Grade separation, Traffic signs including VMS and road markings, Significant roles of traffic control personnel, Networking pedestrian facilities & cycle tracks

**TEXT BOOKS:**

1. S.K Khanna, , C.E.G. Justo and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros. Revised Tenth Edition, 2014
2. L R Kadiyali. and Dr N B Lal, Principles and Practices of Highway Engineering; Seventh Edition, First Reprint; Khanna Publishers, New Delhi, 2018

**REFERENCE BOOKS:**

1. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018.
2. Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.
3. Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBS Publishers and Distributors. New Delhi, 2014
4. C Venkatramaih, Transportation Engineering Volume 1 – Highway Engineering, 1st Edition, Universities Press, 2016
5. Garber, N.J. and Hoel, L.A. Traffic and Highway Engineering, Fourth Edition; Cengage Learning, Stamford, CT, USA, 2010
6. Partha chakroborty and Animesh Das, Principles of Transportation Engineering, PHI, 2013
7. Nicholas J Garber and Lester A Hoel, Traffic and Highway Engineering, 5th Edition, Cengage Learning India Private Limited, New Delhi, 5th Indian Reprint, 201

**WEB REFERENCES:**

1. <https://easyengineering.net/transportation-engineering-books/>
2. <https://thegatehunt.com/civil-engineering-made-easy-transportation-engineering-notes-part-1-free-download/>

**E-TEXT BOOKS:**

1. <http://www.freeengineeringbooks.com/Civil/Transportation-Engineering-Books.php>
2. <https://civilenggforall.com/highway-and-traffic-engineering-textbook-by-civilenggforall-free-download-pdf/>

**MOOCS COURSE**

1. <https://swayam.gov.in/>
2. <https://onlinecourses.nptel.ac.in/>

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**HYDROLOGY AND WATER RESOURCES ENGINEERING**

**III-B.TECH I-SEMESTER**

**Course code: A2CE506PC**

**L T P C**  
**2 0 0 2**

**COURSE OBJECTIVES:**

1. This course provides the description of hydrological cycle and derive various formulas used in estimation of different basic components of surface and Ground water cycle
2. It will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.
3. This course provides actual evapotranspiration, , interception, depression storage, infiltration
4. This course provides Hydrograph Analysis Flood Hydrograph
5. This course provides measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

**COURSE OUTCOMES**

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

1. Understand the different concepts and terms used in engineering hydrology
2. To identify and explain various formulae used in estimation of surface and Ground water hydrology components
3. Demonstrate their knowledge to connect hydrology to the field requirement
4. Understand the Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.
5. Understand the Occurrence, movement and distribution of groundwater, aquifers

**UNIT-I PRECIPITATION**

Introduction: Concepts of Hydrologic cycle, Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, density of rain gauge network: mean precipitation over an area: Arithmetic, Thiessen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

**UNIT -II ABSTRACTIONS FROM PRECIPITATION**

Evaporation: Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, Evapotranspiration: Evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, , interception, depression storage, infiltration: infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices. Runoff: Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

**UNIT-III HYDROGRAPH**

Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function - Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.



### **UNIT -IV GROUNDWATER HYDROLOGY**

Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law. Well Hydraulics - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

### **UNIT-V CROP WATER REQUIREMENTS**

Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

#### **TEXT BOOKS:**

1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers
3. Irrigation Engineering by G L Asawa, Wiley Eastern

#### **REFERENCE BOOKS:**

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications)
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni (New Age International)
5. Irrigation and water power engineering by Dr.B.C.Punmia(Laxmi publications)

#### **WEB REFERENCES:**

- 1 <https://www.mdpi.com/journal/hydrology>

#### **E-TEXT BOOKS:**

- 1 [https://drive.google.com/file/d/10yr-QALqgghZqZ5Si7KZ6Lbw\\_QYmzlaG/view](https://drive.google.com/file/d/10yr-QALqgghZqZ5Si7KZ6Lbw_QYmzlaG/view)
- 2 [https://www.academia.edu/42009173/Irrigation\\_and\\_Water\\_Resources\\_Engineering\\_G\\_L\\_Asaw](https://www.academia.edu/42009173/Irrigation_and_Water_Resources_Engineering_G_L_Asaw)

#### **MOOC COURSE**

- 1 <https://nptel.ac.in/courses/105/104/105104103/>

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**TRANSPORTATION ENGINEERING LAB**

**III-B.TECH I-SEMESTER**

**Course code: A2CE507PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**COURSE OBJECTIVES:**

To gain the practical knowledge of properties of Highway materials and surveys

**COURSE OUTCOMES:**

At the end of the course, the student will be able to Asses for Highway construction properties of highway materials

**I. ROAD AGGREGATES:**

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Abrasion Test
5. Flakiness and elongation Indices of coarse Aggregates.

**II. BITUMINOUS MATERIALS:**

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Marshal stability Test

**III. TRAFFIC STUDIES**

1. Traffic volume counts-Mid Blocks
2. Traffic volume counts-Junctions
3. Spot speed studies.
4. Parking Studies

**TEXT BOOKS:**

1. Laboratory Manual in Highway Engineering by Ajay K. Duggal and Vijay P. Puri - New age Publishers.
2. Highway Material Testing by Khanna S.K., Justo C.E.G, Nem Chand & Bros.
3. Principles and practice of Highway Engineering, L.R Kadiyali & N.B.Lal, Khanna, 2007.
4. Traffic Engineering and Transportation planning, L.R Kadiyali, Khanna publications, 2007.

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**GEOTECHNICAL ENGINEERING LAB**

**III-B.TECH I-SEMESTER**

**Course code: A2CE508PC**

**L T P C**  
**0 0 2 1**

**COURSE OBJECTIVES:**

Student will

1. Identify physical and mechanical properties of soil in the field and laboratory.
2. Develop an understand the relationships between physical characteristics and mechanical properties of soils;
3. Understand techniques used in soil mechanics for Darcy's Law
4. Understand Mohr-Coulomb theory for shear strength behavior of soils.
5. Choose different tests for soils according to IS standards.

**COURSE OUTCOMES:**

**Student should be able to:**

1. Identify soils with reference to their characteristics.
2. Evaluate and classify soils according to IS classification.
3. Calculate seepage volume for different soils.
4. Examine methods to improve soil stability of soils.
5. Conduct tests according to IS laboratory standards and procedures.

**LIST OF EXPERIMENTS**

<b>Experiment-1</b>	Grain size distribution by Sieve Analysis.
<b>Experiment-2</b>	Consistency limits - Liquid limit and Plastic limit using Casagrande's method.
<b>Experiment-3</b>	Compaction test: Standard Proctor test.
<b>Experiment-4</b>	Field Density using Sand Replacement method& Core Cutter method.
<b>Experiment-5</b>	Unconfined compression test.
<b>Experiment-6</b>	Specific gravity of soils.
<b>Experiment-7</b>	Vane shear test
<b>Experiment-8</b>	Direct Shear test.
<b>Experiment-9</b>	Permeability test using Falling-head method&constant head method.
<b>Experiment-10</b>	Differential free swell index (DFSI) test.

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**INTELLECTUAL PROPERTY RIGHTS**

**III-B.TECH I-SEMESTER**

**Course code: A2CE505MC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

**UNIT – I**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

**UNIT – III**

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT – V**

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd

**III-YEAR (II-SEMESTER)**

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**ENVIRONMENTAL ENGINEERING**

**III-B.TECH II-SEMESTER**

**Course code: A2CE601PC**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES**

**The course should enable the students to:**

1. This subject provides the knowledge of water sources, water treatment, design of distribution system waste
2. Water treatment, and safe disposal methods.
3. The topics of characteristics of waste water, sludge digestion are also included
4. To know B.O.D. Equation & C.O.D. Design of sewers
5. To know Sludge digestion and factors effecting, design of Digestion tank

**COURSE OUTCOMES:**

**At the end of the course students will be able to:**

1. Assess characteristics of water and wastewater and their impacts
2. Determine the water quality parameters
3. Estimate quantities of water and waste water and plan conveyance components
4. Design components of water and waste water treatment plant
5. Design the Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits

**UNIT-I INTRODUCTION**

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

**UNIT – II WATER TREATMENT UNITS**

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation 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 – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

**UNIT – III CHARACTERISTICS OF SEWAGE**

characteristics of sewage –waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self-purification of rivers.

**UNIT – IV WASTE WATER TREATMENT**

Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

**UNIT – V AIR POLLUTION**

Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior –Control of particulates – Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

**TEXT BOOKS:**

1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
3. Environmental Engineering, I and II by BC Punmia, Std. Publications
4. Environmental Engineering, I and II by SK Garg, Khanna Publications.
5. Environmental Pollution and Control Engineering CS Rao,Wiley Publications

**REFERENCE BOOKS:**

1. Water and Waste Water Technology by Steel, Wiley
2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.
5. Introduction to Environmental Engineering and Science by Gilbert Masters, PrenticeHall, New Jersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw HillPublication

**WEB REFERENCES:**

1. <https://ascelibrary.org/doi/10.1061/%28ASCE%29EE.1943-7870.0001734>
2. [https://www.hrpub.org/journals/jour\\_info.php?id=45](https://www.hrpub.org/journals/jour_info.php?id=45)

**E-TEXT BOOKS:**

1. <https://www.mdpi.com/2071-1050/12/18/7239/pdf>
2. [https://easyengineering.net/environmental-engineering-books\\_18/](https://easyengineering.net/environmental-engineering-books_18/)

**MOOCS COURSE:**

1. <https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ge22/>
2. <https://nptel.ac.in/courses/108/108/108108076/>
3. <https://nptel.ac.in/courses/108/105/108105053/>

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**FOUNDATION ENGINEERING**

**III-B.TECH II-SEMESTER**

**Course code: A2CE602PC**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES**

**To Learn**

1. To Understand The Nature Of Stresses Developed In Simple Geometries Such As Bars, Cantilevers And Beams For Various Types Of Simple Loads
2. To Calculate The Elastic Deformation Occurring In Simple Members For Different Types Of Loading.
3. To Show The Plane Stress Transformation With A Particular Coordinate System For Different Orientation Of The Plane.
4. To Understand The Nature Of Stresses Developed In Simple Geometries Shafts, Springs, Columns & Cylindrical And Spherical Shells For Various Types Of Simple Loads
5. To Understand The Nature Of Stresses Developed In Simple Geometries Shafts, Springs, Columns & Cylindrical Shells For Various Types Of Simple Loads

**COURSE OUTCOMES**

**At The End Of The Course, Student Will Be Able To:**

1. Describe The Concepts And Principles, Understand The Theory Of Elasticity Including Strain/Displacement And Hooke's Law Relationships.
2. Recognize Various Types Loads Applied On Structural Components Of Simple Framing Geometries And Understand The Nature Of Internal Stresses That Will Develop Within The Components.
3. To Evaluate The Strains And Deformation That Will Result Due To The Elastic Stresses Developed Within The Materials For Simple Types Of Loading
4. Analyze Various Situations Involving Structural Members Subjected To Plane Stresses By Application Of Mohr's Circle Of Stress
5. Describe The Concepts Perform Calculations, Relative To The Strength Of Structures And Mechanical Components In Particular To Torsion And Direct Compression

**UNIT-I SOIL INVESTIGATION**

Soil Investigation : Need – Methods Of Soil Exploration – Boring And Sampling Methods – Penetration Tests – Plate Load Test– Planning Of Soil Exploration Programme, Bore Logs And Preparation Of Soil Investigation Report-Soil Stabilization Method

**UNIT -II STABILITY OF SLOPES**

Stability Of Slopes: Infinite And Finite Earth Slopes – Types Of Failures – Factor Of Safety Of Infinite Slopes- Stability Analysis By Swedish Slip Circle Method, Method Of Slices, Bishop's Simplified Method Of Slices- Taylor's Stability Number- Stability Of Slopes Of Earth Dams Under Different Conditions.

Earth Pressure Theories: Types Of Lateral Earth Pressures (Active, Passive And At Rest Soil Pressures) Rankine's Theory Of Earth Pressure – Earth Pressures In Layered Soils – Coulomb's Earth Pressure Theory. Culmann's Graphical Method

**UNIT -III RETAINING WALLS**

Retaining Walls: Types Of Retaining Walls – Stability Of Gravity And Cantilever Retaining Walls Against Overturning, Sliding And, Bearing Capacity, Filter Material For Drainage.

Shallow Foundations - Types - Choice Of Foundation – Location And Depth - Safe Bearing Capacity-Shear Criteria – Terzaghi's, And Is Code Methods - Settlement Criteria – Allowable Bearing Pressure Based On Spt N Value And Plate Load Test – Allowable Settlements Of Structures.



**UNIT -IV PILE FOUNDATION**

Pile Foundation: Types Of Piles – Load Carrying Capacity Of Piles Based On Static Pile Formulae – Dynamic Pile Formulae –Pile Load Tests - Load Carrying Capacity Of Pile Groups In Sands And Clays – Settlement Of Pile Groups – Negative Skin Friction

**UNIT-V WELL FOUNDATION**

Well Foundation: Introduction –Different Shapes Of Wells–Grip Length–Forces Acting On Well Foundation–Terzaghi’s Analysis. Measures Of Rectification Of Tilts And Shifts

**TEXT BOOKS**

1. Basic And Applied Soil Mechanics By Gopal Ranjan & Asr Rao, New Age International Pvt . Ltd,
2. Principals Of Geotechnical Engineering By Braja M. Das, Cengage Learning Publishers.
3. Soil Mechanics And Foundation Engineering By K.R.Arora ,Standard Publishers Distributors

**REFERENCE BOOKS**

1. Analysis And Design Of Substructures – Swami Saran, Oxford And Ibh Publishing Company Pvt Ltd
2. Soil Mechanics And Foundation Engineering By Vns Murthy, Cbs Publishers And Distributors.
3. Geotechnical Engineering Principles And Practices By Cuduto, Phi International Engineering

**WEB REFERENCES**

1. <https://Easyengineering.Net/A-Textbook-Of-Strength-Of-Materials/>
2. <https://Civilenggforall.Com/Strength-Of-Materials-Textbook-Free-Download-Pdf-Civilenggforall/>

**E-TEXT BOOKS**

1. [https://Books.Google.Co.In/Books?Id=2iheqp8dnwwc&Printsec=Frontcover&Redir\\_Esc=Y#V=Onepage&Q&F=False](https://Books.Google.Co.In/Books?Id=2iheqp8dnwwc&Printsec=Frontcover&Redir_Esc=Y#V=Onepage&Q&F=False)

**MOOCS COURSE**

1. <https://Swayam.Gov.In/>

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## DESIGN OF STEEL STRUCTURES

### III-B.TECH II-SEMESTER

Course code: A2CE603PC

L	T	P	C
3	0	0	3

### COURSE OBJECTIVES

The course should enable the students to:

1. Explain the mechanical properties of structural steel, plasticity, yield.
2. Describe the salient features of Limit State Method of design of Steel structures.
3. Identify and explain the codal provisions given in IS. 800.
4. Analyze the behavior of steel structures under tension, compression and flexure.
5. Design the tension, compression, flexural members and plate girder

### COURSE OUTCOMES:

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

1. Analyze the tension members, compression members.
2. Design the tension members, compression members and column bases and joints and connections
3. Analyze and Design the beams including built-up sections and beam and connections.
4. Identify and Design the various components of welded plate girder including stiffeners
5. Analyze & design of the Flexural members.

### UNIT-I INTRODUCTION TO STEEL STRUCTURES

Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design –Load combinations - Design Strengths - deflection limits– serviceability – stability check. Design of Connections–types of connections – Bolted connections – Design strength – efficiency of joint– prying action - Welded connections – Types of welded joints – Design requirements  
Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle

### UNIT-II DESIGN OF COMPRESSION MEMBERS

Design of compression members – Buckling class – slenderness ratio – Design of simple compression members - laced – battened columns – splice – column base – slab base.  
Plastic Analysis; Plastic moment – Plastic section modulus - Plastic analysis of continuous beams

### UNIT -III DESIGN OF FLEXURAL MEMBERS

Design of Flexural Members – Laterally supported and unsupported Beams – Design of laterally supported beams - Bending and shear strength/buckling – Built-up sections - Beam splice  
Design of Beam-column connections - Eccentric connections - Type I and Type II connection – Framed connection– stiffened / seated connection

### UNIT -IV DESIGN OF WELDED PLATE GIRDERS

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediate stiffeners – Design of web splice and flange splice

### UNIT-V DESIGN OF TRUSSES

Design of Industrial Structures; Types of roof trusses - loads on trusses – wind loads - Purlin design – truss design – Design of welded Gantry girder

**TEXT BOOKS:**

1. Design of steel structures by S.K.Duggal, Tata Macgrawhill publishers, 2000, 2<sup>nd</sup> Edition.
2. Design of steel structures by N.Subramanian, Oxford University press, 2008.
3. Design of steel structures by K.S.Sairam, Pearson Educational India, 2<sup>nd</sup> Edition, 2013.

**REFERENCE BOOKS:**

1. Design of steel structures by Edwin H. Gaylord and Charles N. Gaylord, Tata Mac-grawhill publishers, 1972
2. Design of steel structures by L.S. Jaya Gopal, D. Tensing, Vikas Publishing House

**WEB REFERENCES:**

1. <https://www.oreilly.com/library/view/design-of-steel/9789332511224/xhtml/bm001.xhtml>

**E-TEXT BOOKS:**

1. <https://onlinelibrary.wiley.com/doi/10.1002/9781118631201.ch2>
2. <https://www.sanfoundry.com/best-reference-books-design-steel-structures-alloy-steel-making-process/>

**MOOCS COURSE**

1. <https://nptel.ac.in/courses/105/106/105106112/>
2. <https://nptel.ac.in/courses/105/105/105105162/>
3. [https://onlinecourses.nptel.ac.in/noc19\\_ce25/preview](https://onlinecourses.nptel.ac.in/noc19_ce25/preview)

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**GREEN BUILDING TECHNOLOGIES  
(PROFESSIONAL ELLECTIVE-1)**

**III B.TECH II SEMESTER**

**Course code: A2CE501PE**

**L T P C  
3 0 0 3**

**COURSE OBJECTIVES**

**The course should enable the students to:**

1. To make the students knowledgeable with respect to the subject and its practicable applicability.
2. To promote understanding of basic and advanced concepts in Engineering materials aspects.
3. To expose the students to know the different types of materials used in engineering point of view.
4. To make the students learn about sustainability of engineering materials in economic point of view.
5. To know the testing and specification of said materials. various service and environmental loadings

**COURSE OUTCOMES:**

**The end of the course the student should be able to:**

1. The objective of this course is to expose the students to the concepts of sustainability in the context of building and conventional engineered building materials, such as Concrete, Bricks, and achieving the same through lower Carbon cements, Superior brick kilns and Recycled aggregate minimizing consumption of natural resources including water.
2. VOC and indoor air quality.
3. Exposing the student to concepts of embodied, Operational and Life Cycle Energy, Minimizing Energy consumption by optimal design, use of BIPV.
4. Exposing the student to concepts Use of Waste Water for Mixing and Curing, Modern Composite Concrete, Recycled Aggregate-ITZ and Processing
5. The objective of this course is to expose the students for testing and specification of said material

**UNIT-I: INTRODUCTION TO GREEN BUILDINGS**

Green Buildings: Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings- Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage

**UNIT- II: NATURAL AVAILABLE MATERIALS FOR GREEN BUILDINGS**

Environmentally friendly building materials and technologies: Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime- pozzolana cements, materials from agro and industrial waste, ferro-cement and Ferro-concrete, alternative roofing systems, various paints reducing the heat gain of the building, etc.

**UNIT – III: NATURAL AND RENEWABLE ENERGY RESOURCES FOR GREEN BUILDINGS**

Energy and resource conservation: Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings-water harvesting in buildings – waste to energy management in residential complexes or gated communities. Use of renewable energy resources: Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar appliances, success case studies of fully solar energy based buildings in India.

**UNIT- IV: ENVIRONMENTAL ASPECTS OF GREEN BUILDINGS**

Climate Design: Local climatic conditions – temperature, humidity, wind speed and direction-impact of climate change on built environment – comforts: the desirable conditions – Principles of thermal design – means of thermal –light and lighting-building acoustics- energy efficient lighting, Ventilation and air quality requirement, various techniques for passive cooling, garden roofs, case studies for passive cooling and thermal comfort.

**UNIT- V: GREEN BUILDING SYSTEMS**

Green Building Rating Systems: Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment – Modular wastewater treatment systems for built environment – Building automation and building management systems.

**TEXT BOOKS:**

1. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.
2. 'Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.
3. Solar Energy by Sukhatme S.P.

**E-TEXTBOOKS:**

1. <https://www.springer.com/gp/book/9783642006340>
2. <https://onlinelibrary.wiley.com/doi/book/10.1002/9781118984048>
3. <https://www.lap-publishing.com/catalog/details/store/gb/book/978-613-8-38918-7/a-text-book-on-green-buildings>

**MOOCS COURSE:**

1. <https://nptel.ac.in/courses/105/102/105102195/>
2. <https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40/>

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**GEOMATICS APPLICATIONS IN CIVIL ENGINEERING  
(PROFESSIONAL ELLECTIVE-1)**

**III B.TECH II SEMESTER**

**Course code: A2CE502PE**

**L T P C  
3 0 0 3**

**PART A:**

Common Engineering Mathematics - Surveying measurements, Accuracy, Precision, Most probable value, Errors and their adjustments, Regression analysis, Correlation coefficient, Least square adjustment, Statistical significant value, Chi square test.

Remote Sensing - Basic concept, Electromagnetic spectrum, Spectral signature, Resolutions Spectral. Spatial, Temporal and Radiometric, Platforms and Sensors, Remote Sensing Data Products - PAN, Multispectral, Microwave, Thermal, Hyper spectral, Visual and digital interpretation methods

GNSS - Principle used, Components of GNSS, Data collection methods, DGPS, Errors in observations and corrections.

GIS - Introduction, Data Sources, Data Models and Data Structures, Algorithms, DBMS, Creation of Databases (spatial and non-spatial), Spatial analysis - Interpolation, Buffer, Overlay, Terrain Modeling and Network analysis.

**PART B: SECTION I**

Maps - Importance of maps to engineering projects, Types of maps, Scales and uses, Plotting accuracy, Map sheet numbering, Coordinate systems- Cartesian and geographical, map projections, map datum – MSL, Geoid, spheroid, WGS-84.

Land Surveying - Various Levels, Levelling methods, Compass, Theodolite and Total Station and their uses, Tachometer, Trigonometric levelling, Traversing, Triangulation and Trilateration.

Aerial Photogrammetry - Types of photographs, Flying height and scale, Relief (height) displacement, Stereoscopy, 3-D Model, Height determination using Parallax Bar, Digital Elevation Model (DEM), Slope.

**PART B: SECTION II**

Data Quantization and Processing - Sampling and quantization theory, Principle of Linear System, Convolution, Continuous and Discrete Fourier Transform.

Digital Image Processing - Digital image characteristics: image histogram and scattergram and their significance, Variance-Covariance matrix, Correlation matrix and their significance.

Radiometric and Geometric Corrections – Registration and Resampling techniques.

Image Enhancement – Contrast Enhancement: Linear and Non-linear methods; Spatial Enhancement: Noise and Spatial filters

Image Transformation – Principal Component Analysis (PCA), Discriminant Analysis, Color transformations (RGB - IHS, CMYK), Indices (Ratios, NDVI, NDWI). Image Segmentation and Classification – Simple techniques.

**REFERENCES:**

1. <https://byjusexamprep.com/gate-geomatics-engineering-syllabus-i>
2. [https://cache.careers360.mobi/media/uploads/froala\\_editor/files/ge\\_2022.pdf](https://cache.careers360.mobi/media/uploads/froala_editor/files/ge_2022.pdf)

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**SMART CITIES PLANNING AND DEVELOPMENT  
(PROFESSIONAL ELLECTIVE-1)**

**III B.TECH II SEMESTER**

**Course code: A2CE503PE**

**L T P C**  
**3 0 0 3**

**COURSE MODULES:**

<b>MODULE 1</b>	Introduction to "City Planning"
<b>MODULE 2</b>	Understanding Smart Cities
<b>MODULE 3</b>	Dimensions of Smart Cities
<b>MODULE 4</b>	Global Experience of Smart Cities
<b>MODULE 5</b>	Smart Cities –Global Standards and Performance Benchmarks, Practice Codes
<b>MODULE 6</b>	India "100 Smart Cities" Policy and Mission
<b>MODULE 7</b>	Smart City Planning and Development
<b>MODULE 8</b>	Financing Smart Cities Development
<b>MODULE 9</b>	Governance of Smart Cities

**REFERENCES:**

1. [https://smartnet.niua.org/sites/default/files/resources/Brochure%20for%20GSSCD%20E-Courses\\_V01\\_11072016\\_3.pdf](https://smartnet.niua.org/sites/default/files/resources/Brochure%20for%20GSSCD%20E-Courses_V01_11072016_3.pdf)
2. <https://www.udemy.com/course/smart-cities/>

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**DISASTER PREPAREDNESS & PLANNING**  
**(OPEN ELLECTIVE-1)**

**III B.TECH II SEMESTER**

**Course code: A2CE601OE**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

1. The objectives of the course are
2. To Understand basic concepts in Disaster Management
3. To Understand Definitions and Terminologies used in Disaster Management
4. To Understand Types and Categories of Disasters
5. To Understand the Challenges posed by Disasters
6. To understand Impacts of Disasters Key Skills

**COURSE OUTCOMES:**

The student will develop competencies in

1. The application of Disaster Concepts to Management
2. Analyzing Relationship between Development and Disasters.
3. Ability to understand Categories of Disasters and
4. Realization of the responsibilities to society

**UNIT - I:**

Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

**UNIT - II**

Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

**UNIT - III**

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

**UNIT - IV**

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

**UNIT - V**

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.



**TEXT BOOKS:**

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

**REFERENCE BOOKS:**

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority)
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs). 3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
3. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

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**BUILDING MANAGEMENT SYSTEMS  
(OPEN ELLECTIVE-1)**

**III B.TECH II SEMESTER**

**Course code: A2CE602OE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

To impart knowledge on providing proper ventilation, fire protection measures and vertical transportation.

**COURSE OUTCOMES:**

The learner will be able to effectively plan for a green building.

**UNIT – I:**

Orientation and Planning – Grouping and circulation – lighting and ventilation.

**UNIT – II:**

Termite proofing of buildings- Lightning protection of buildings – Fire protection of buildings .

**UNIT – III:**

Vertical transportation – Prefabrication systems in residential buildings: Planning and modules and sizes of components in prefabrication.

**UNIT – IV:**

Shell structures – Domes – Folded plate structures – Skeletal and space frame structures  
Grain storage structures

**UNIT – V:**

Earthquake resistant structures – Air-conditioning and heating – Acoustics and Sound insulation – Plumbing services

**TEXT BOOKS:**

1. Arora and Bindra, Building Construction, Dhanpat Rai, 2012.
2. Hand Book of Housing Statistics, NBO, 2003.
3. National Building Code of India, Bureau of Indian Standards, 2005.

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**ENVIRONMENTAL IMPACT ASSESMENT  
(OPEN ELLECTIVE-1)**

**III B.TECH II SEMESTER**

**Course code: A2CE603OE**

**L T P C  
3 0 0 3**

**COURSE OBJECTIVES:**

This subject will cover various aspects of Environment Impact Assessment methodologies, impact of development activities. Impact on surface water, Air and Biological Environment, Environment legislation Environment.

**COURSE OUTCOMES:**

1. Identify the environmental attributes to be considered for the EIA study.
2. Formulate objectives of the EIA studies.
3. Identify the suitable methodology and prepare Rapid EIA.
4. Indentify and incorporate mitigation measures.

**UNIT – I**

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

**UNIT- II**

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

**UNIT- III**

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

**UNIT – IV**

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

**UNIT - V**

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

**TEXT BOOKS:**

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications

**REFERENCES:**

1. Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, PublishersRutledge, London, 1992

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**HYDROLOGY**  
**(OPEN ELLECTIVE-1)**

**III B.TECH II SEMESTER**

**Course code: A2CE604OE**

**L T P C**  
**3 0 0 3**

**UNIT — I**

Ground Water Occurrence and Movement: Ground water hydrologic cycle. origin of ground Water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention. Permeability, Darcy's law, storage coefficient, Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinates system, ground water flow contours their applications.

**UNIT—II**

Analysis of Pumping Test data-I: Steady flow ground water flow towards a well in confined and unconfined aquifers-Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests. Unsteady flow towards a well — Non equilibrium equations-Thesis solution-Jacob and Chow's simplifications, Leak aquifers.

**UNIT — III**

Surface and Subsurface Investigation: Surface methods of exploration-Electrical resistivity and Seismic refraction methods. Subsurface methods-geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

**UNIT – IV**

Artificial Recharge of Ground Water: Concept of artificial recharge-recharge methods, relative merits. Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

**UNIT – V**

Saline Water Intrusion In aquifers: Occurrence of saline water intrusions, GhybenHerzberg relation, Shape of interface, control of seawater intrusion.

**TEXT BOOKS**

1. Ground Water Hydrology by H. M. Raghunath, Wiley Eastern Ltd.
2. Introduction to Hydraulics & Hydrology: With Applications for Stormwater Management, 4th Edition, Cengage Learning.

**REFERENCES**

1. Ground water Hydrology by David Keith Todd, John Wiley & sons.New York.
2. Ground water by Bawver, John Wiley & sons.
3. Hydrology by Subramanya K.

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**ENVIRONMENTAL ENGINEERING LAB**

**III-B.TECH II-SEMESTER**

**Course code: A2CE603PC**

**L T P C**  
**0 0 2 1**

**COURSE OBJECTIVES:**

**The course should enable the students to:**

1. Perform the experiments to determine water and waste water quality
2. Understand the water & waste water sampling, their quality standards
3. Estimate quality of water, waste water, Industrial water
4. Know the COD, BOD and DO in a given water sample
5. Know the Residual Chlorine in a given water sample

**COURSE OUTCOMES:**

**By the end of the course students will be able:**

1. Understand about the equipment used to conduct the test procedures
2. Perform the experiments in the lab
3. Examine and Estimate water, waste water, air and soil Quality
4. Compare the water, air quality standards with prescribed standards set by the local governments
5. Develop a report on the quality aspect of the environment

**LIST OF EXPERIMENTS**

<b>Experiment-1</b>	Determination of pH in a given water sample
<b>Experiment-2</b>	Determination of Electrical Conductivity in a given water sample
<b>Experiment-3</b>	Determination of Total Solids (Organic and inorganic) in a given water sample
<b>Experiment-4</b>	Determination of Acidity in a given water sample
<b>Experiment-5</b>	Determination of Alkalinity in a given water sample
<b>Experiment-6</b>	Determination of Hardness (Total, Calcium and Magnesium Hardness) in a given water sample
<b>Experiment-7</b>	Determination of Chlorides in a given water sample
<b>Experiment-8</b>	Determination of optimum coagulant Dosage in a given water sample
<b>Experiment-9</b>	Determination of Dissolved Oxygen (Winkler Method) in a given water sample
<b>Experiment-10</b>	Determination of COD in a given water sample
<b>Experiment-11</b>	Determination of BOD/DO in a given water sample
<b>Experiment-12</b>	Determination of Residual Chlorine in a given water sample

**REFERENCE BOOKS:**

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2. Introduction to Environmental Engineering by P. Arne Vesilind, Susan M. Morgan,
3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.
4. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw- Hill, New Delhi.
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6. Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999

**WEB REFERENCES:**

1. <https://www.slideshare.net/RambabuPalaka/environmental-engineering-lab-manual>
2. [http://www.darshan.ac.in/Upload/DIET/Documents/CI/2150603\\_Environmental\\_Engineering\\_Lab\\_Manual\\_02072018\\_083846AM.pdf](http://www.darshan.ac.in/Upload/DIET/Documents/CI/2150603_Environmental_Engineering_Lab_Manual_02072018_083846AM.pdf)
3. <https://engineering.siu.edu/civil/common/documents/environmental-lab-manual.pdf>

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**COMPUTER AIDED DESIGN LABORATORY**

**III-B.TECH II-SEMESTER**

**Course code: A2CE604PC**

**L T P C**  
**0 0 3 1.5**

**COURSE OBJECTIVES:**

The objective of this lab is to teach the student basic drawing fundamentals in various civil engineering applications, specially in building drawing.

**COURSE OUTCOMES:**

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

Master the usage of Autocad commands for drawing 2D & 3D building drawings required for different civil engg applications.

**LIST OF EXEPERMENTS:**

- Experiment-1** Introduction to computer aided drafting
- Experiment-2** Software for CAD – Introduction to different softwares
- Experiment-3** Practice exercises on CAD software
- Experiment-4** Drawing of Single storied building plans of buildings using software
- Experiment-5** Drawing of multi storied building plans of buildings using software
- Experiment-6** Developing sections and elevations for multi storied buildings
- Experiment-7** Developing sections and elevations for Single storied buildings
- Experiment-8** Detailing of building components like Doors, Windows etc. using CAD
- Experiment-9** Detailing of Roof Trusses etc. using CAD

**TEXT BOOKS:**

1. Computer Aided Design Laboratory by Dr. M. N. Sessa Prakash & Dr. G. S. Suresh – Laxmi Publications.

**REFERENCE BOOKS:**

2. Engineering Graphics by P. J. Sha – S. Chand & Co.

**WEB REFERENCES:**

1. <https://nptel.ac.in/courses/105/104/105104148/>
2. <https://open.umn.edu/opentextbooks/textbooks/70>
3. <https://lecturenotes.in/download/material/41267-notes-of-autocad-civil-engineering-by-durgesh-pathak>

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**ADVANCED ENGLISH COMMUNICATION SKILLS LAB****III-B.TECH II-SEMESTER****Course code: A2EN603HS**

L	T	P	C
0	0	3	1.5

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context. The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

**COURSE OBJECTIVES:**

1. To provide students with a wide range of vocabulary to enable them to take language tests for higher education and employment
2. To assist students acquire effective and adequate presentation skills
3. To improve communication skills of students by making them participate in different language activities
4. To prepare students for facing interviews self-assuredly.
5. To help students to develop an awareness in studies about the significance of silent reading and comprehension.

**COURSE OUTCOMES:** Students will be able to

1. State meanings, synonyms, antonyms, analogies, idioms, phrases, one-word substitutes, word roots, prefixes and suffixes for words in general.
2. Present and interpret data on select topics using pre-existing slides.
3. Collect data extensively on a social issue and make it public for the sake of enlightening populace.
4. Contribute proactively and extrapolate in group discussions.
5. Make impromptu speeches.

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

- 1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
- 2. Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
- 3. Activities on Writing Skills** – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.
- 4. Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ emails/assignments etc.



- 5. Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008. 6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
6. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. Job Hunting by Colm Downes, Cambridge University Press 2008.
8. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

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**ENVIRONMENTAL SCIENCE****III-B.TECH II-SEMESTER****Course code: A2CE606MC**

L	T	P	C
3	0	0	0

**COURSE OBJECTIVES:**

1. Understanding the importance of ecological balance for sustainable development.
2. Acquire the knowledge of importance of natural resources & apply conservation techniques.
3. Analyzing the importance of Biodiversity.
4. Estimate the impacts of Environmental pollution, developmental activities and mitigation measures.
5. Evaluation of the environmental policies and regulations.

**COURSE OUTCOMES:**

1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles.
2. Able to apply the conservation methods of natural resources.
3. Able to analyze the conservation techniques of biodiversity.
4. Able to apply pollution control methods.
5. Able to understand and apply environmental regulations which in turn helps in sustainable development.

**UNIT-I: ECOSYSTEMS**

Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio-magnification.

**UNIT-II: NATURAL RESOURCES: CLASSIFICATION OF RESOURCES**

Living and Non-Living resources, Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

**UNIT-III: BIODIVERSITY AND BIOTIC RESOURCES**

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT-IV ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES**

Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Concepts of bioremediation.

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS).Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

**UNIT-V ENVIRONMENTAL POLICY, LEGISLATION & EIA**

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building,

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

**IV-YEAR (I-SEMESTER)**

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## QUANTITY SURVEY & VALUATION

**IV-B.TECH I-SEMESTER**

**Course code: A2CE701PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

**The course should enable the students to:**

1. The subject provide process of estimations required for various work in construction.
2. To have knowledge of using SOR & SSR for analysis of rates on various works.
3. To know the detailing of estimation
4. To know the detain of earthwork.
5. To detailing about contracts.

### **COURSE OUTCOMES:**

**At the end of the course students will be able to:**

1. Do estimation of Buildings, Roads and Canals.
2. Understand the using SOR & SSR for analysis of rates on various works.
3. Understand the detailing of estimation and earthwork.
4. Understand contracts and specification.
5. Do estimate the rate and value

### **UNIT-I INTRODUCTION TO ESTIMATION**

Introduction to estimates: Purpose of estimating; Different types of estimates - their function and preparation .General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating

### **UNIT -II DETAILING OF ESTIMATION**

Detailed Estimates of Buildings - Reinforcement bar bending and bar requirement schedule

### **UNIT -III DETAILING ON EARTHWORK**

Earthwork for roads and canals. Problems on earthwork for roads and canals.

### **UNIT -IV RATE ANALYSIS & VALUATION**

Rate Analysis – Working out data for various items of work over head and contingent charges.

Valuation: Purpose, difference between value and cost, qualifications and functions of a valuer, scrap & salvage value, sinking fund, capitalized value

### **UNIT-V DETAILING ABOUT CONTRACTS**

Contracts – Types of contracts – Contract Documents – Conditions of contract - Standard specifications for different items of building construction.

### **TEXT BOOKS:**

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie Dhanpat Rai Publisher
3. M. Chakraborti, Estimation, costing, specifications and valuation in civil engineering National Halftone Co. Calcutta, 2005.

**REFERENCE BOOKS:**

1. Standard Schedule of rates and standard data book by public works department.
2. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)

**WEB REFERENCES:**

1. <https://vintage.agency/blog/estimate-cost-and-timeframe-for-a-website-design-project/>
2. <https://www.nap.edu/read/14014/chapter/12>

**E-TEXT BOOKS:**

1. <https://www.civilnotess.com/2019/10/estimation-and-costing-book-by-m-chakraborti.html>
2. <https://www.schandpublishing.com/books/tech-professional/civil-engineering/a-textbook-estimating-costing-civil/9788121903325/>

**MOOCS COURSE**

1. <https://www.mooc-list.com/tags/cost-estimating>
2. <https://nptel.ac.in/courses/105/103/105103023/>
3. <https://nptel.ac.in/content/storage2/courses/105103023/pdf/mod5.p>

## PROJECT MANAGEMENT

### IV-B.TECH I-SEMESTER

Course code: A2CE702PC

L	T	P	C
2	0	0	2

### COURSE OBJECTIVES:

The course should enable the students to:

1. This subject deals with overall planning, coordination and control of project.
2. This course gives the students scientific principles involved in construction.
3. Understand the behavior of construction materials.
4. Know the fundamentals of structural mechanics.
5. Know the equipment used in construction

### COURSE OUTCOMES:

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

1. Understand the roles and responsibilities of a project manager
2. Prepare schedule of activities in a construction project
3. Identify the equipment used in construction
4. Understand safety practices in construction industry
5. Prepare tender and contract document for a construction project

### UNIT-I FUNDAMENTALS OF CONSTRUCTION PROJECT MANAGEMENT

Management -Fundamentals of construction project management: Introduction, Project Initiation and Planning. Coordination –scheduling – monitoring – bar charts – milestone charts – critical path method

### UNIT -II CONSTRUCTION METHODS

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering– decision making, Cement concrete construction- Construction of Piles - Construction of Cofferdams - Construction of Tunnels.

### UNIT -III PROJECT ACTIVITY NETWORKS

Development of project activity networks, Precedence Diagram Method, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), Line Balance Methods in scheduling, Time Value of Money, Investment Analysis, Cost-Benefit Analysis.

### UNIT -IV BUILDING INFORMATION MODELLING (BIM)

Introduction to Building Information Modelling (BIM), Lean construction, and Integrated Project Delivery in construction, Crashing of project, Cost Optimization, Invoicing, Preparation of RA bill, Safety in construction, Estimation

### UNIT-V CONTRACTS IN CONSTRUCTION

Contracts: Contracts in construction, fundamentals of delay analysis and claims; Advances in construction management, tender and tender document - Deposits by the contractor - Arbitration. Negotiation - M. Book - Muster roll –stores.

### TEXT BOOKS:

1. R.L. Peurifoy, W.B Ledbetter and schexnayder, C, construction planning and equipment methods, 5th Edition, McGraw Hill, Singapore, 1995.
2. Sharma S.C. Construction equipment and management, Khanna publishers, New Delhi, 2011.
3. M.R.S. Murthy, Cost Analysis for Management Decisions, Tata McGraw-Hill Publishing Company Ltd.,1988.

**REFERENCE BOOKS:**

1. James, J.O Brain, construction inspection handbook-quality assurance, and quality control, Van Nostrand, New York, 1989.
2. Kwaku A., Tenah and jose M. Guevera, fundamental of construction management and organization, PHI, 1995.

**WEB REFERENCES:**

1. <https://pgcm.xime.org/>
2. <https://ascelibrary.org/journal/jcemd4>

**E-TEXT BOOKS:**

1. <https://www.amazon.in/Construction-Engineering-Management-Seetharaman/dp/9382533095>
2. <https://easyengineering.net/civildatas.com/download/construction-engineering-and-management-by-seetharaman>

**MOOCS COURSE**

1. <https://nptel.ac.in/courses/105/107/105107123/>



## PRESTRESSED CONCRETE STRUCTURE (PROFESSIONAL ELECTIVE-II)

### IV-B.TECH I-SEMESTER

Course code: A2CE604PE

L	T	P	C
3	0	0	3

### COURSE OBJECTIVES

#### To learn

1. Understand basics of prestressing
2. Understand flexure and shear in prestressed beams
3. Understand deflection in prestressed beams
4. Analyze and design of composite beams
5. Understand the concept of partial prestressing

### COURSE OUTCOMES

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

1. Analysis prestressed concrete members
2. Design of prestressed concrete members using IS Code
3. Calculate deflections in prestressed members
4. Analyse and design of composite beams
5. Analyse and design of partial prestressing of members

### UNIT-I INTRODUCTION

Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics.

### UNIT -II METHODS AND SYSTEMS OF PRESTRESSING

**Methods and Systems of prestressing:** Pretensioning and Post tensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.

**Losses of Prestress:** Loss of prestress in pretensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses IS 1343-2012 code provisions

### UNIT -III FLEXURE AND SHEAR

**Flexure:** Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.

**Shear:** General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions.

### UNIT -IV TRANSFER OF PRESTRESS IN PRETENSIONED MEMBERS

**Transfer of Prestress in Pretensioned Members :** Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS 1343-2012 code Provisions

### UNIT-V COMPOSITE BEAMS AND DEFLECTIONS

**Composite Beams:** Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

**Deflections:** Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

### **TEXT BOOKS**

1. Prestressed concrete by N Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.

### **REFERENCE BOOKS**

1. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.
2. Prestressed Concrete by N. Rajagopalan Narosa Publishing House

### **WEB REFERENCES**

1. <https://civiltoday.com/civil-engineering-materials/concrete/225-pre-stressed-concrete>

### **E-TEXT BOOKS**

1. <https://www.sanfoundry.com/best-reference-books-prestressed-concrete-design/>
2. [https://www.amazon.com/Prestressed-Concrete-Fifth-Upgrade-Version/dp/0136081509/ref=sr\\_1\\_1?dchild=1&keywords=Prestressed+Concrete&qid=1618045563&sr=8-1](https://www.amazon.com/Prestressed-Concrete-Fifth-Upgrade-Version/dp/0136081509/ref=sr_1_1?dchild=1&keywords=Prestressed+Concrete&qid=1618045563&sr=8-1)

### **MOOCS COURSE**

1. <https://swayam.gov.in/>
2. <https://onlinecourses.nptel.ac.in/>

**ELEMENTS OF EARTHQUAKE ENGINEERING  
(PROFESSIONAL ELECTIVE-II)**

**IV-B.TECH I-SEMESTER**

**Course code: A2CE605PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PRE REQUISITES:** Structural Engineering –II & RC Design

**COURSE OBJECTIVES:**

To understand the analysis of the behaviour of structures under dynamic loads and understand the principles of design for seismic and wind loads and relevant codal provisions

**COURSE OUTCOMES:**

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

1. Analyse the behaviour of structures under dynamic loads & design for seismic codal provisions.
2. Apply seismic coefficient and response spectrum methods for analysis of multi storied buildings
3. Apply concepts of ductility in the design of multi-storeyed structures
4. Understand the concepts of base isolation

**UNIT - I**

Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics- Seismic waves-Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy released-Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph-strong ground motions- Seismic zones of India. Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system-Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation-Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

**UNIT - II**

Conceptual design: Introduction-Functional planning-Continuous load path-Overall formsimplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildingsframing systems-choice of construction materials-unconfined concrete-confined concretemasonry-reinforcing steel. Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinationspermissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

**UNIT - III**

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC membersStructural models for frame buildings- Seismic methods of analysis- Seismic deign methodsIS 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 Buildings: 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 buildings- Load combinations and permissible stresses-Seismic design requirements- Lateral load analysis of masonry buildings.

## **UNIT - V**

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – 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 nonstructures. Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility Factors affecting Ductility- Ductile detailing considerations 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:**

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press 2nd Edition s
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

### **REFERENCES:**

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R. N. Iyengar, I. K. International Publishing House Pvt. Ltd.
4. Masory and Timber structures including earthquake Resistant Design – Anand S. Arya, Nem chand & Bros
5. Earthquake Tips – Learning Earthquake Design and Construction 6. C.V.R. Murthy

### **REFERENCE CODES:**

1. IS: 1893 (Part-1) -2002. “Criteria for Earthquake Resistant – Design of structures.” B.I.S., New Delhi
2. IS:4326-1993, “ Earthquake Resistant Design and Construction of Building”, Code of Practice B.I.S., New Delhi.
3. IS:13920-1993, “ Ductile detailing of concrete structures subjected to seismic force” – Guidelines, B.I.S., New Delhi.

**ADVANCED STRUCTURAL ANALYSIS  
(PROFESSIONAL ELECTIVE-II)**

**IV-B.TECH I-SEMESTER**

**Course code: A2CE606PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

1. To understand the influence line concepts for indeterminate structures
2. To understand the methods of analysis of intermediate trusses for external loads, lack of fit and thermal effect
3. To study behavior of arches and their methods of analysis
4. To know the concept and analysis of cable stayed bridge
5. To study the multi storey frames subjected to gravity loads and lateral loads

**COURSE OUTCOMES:**

1. Demonstrate the concepts of qualitative influence line diagram for continuous beams and frames.
2. Apply the methods of indeterminate truss analysis
3. Demonstrate the behavior of arches and their methods of analysis analyze cable suspension bridges
4. Analyze multistory frames subjected to gravity loads and lateral loads

**UNIT – I**

Analysis of Frames: Castigliano's second theorem Indeterminate Trusses: Determination of static and kinematic indeterminacies – Analysis of trusses having single and two degrees of internal and external indeterminacies. Two Hinged Arches: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

**UNIT - II**

Slope Deflection Method: Analysis of Single Bay – single storey Portal Frames by Slope Deflection Method Including Side Sway. Shear force and bending moment diagrams. Elastic curve, Analysis of inclined frames Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames including side Sway. Analysis of inclined frames.

**UNIT – III**

Kani's Method: Analysis of continuous beams including settlement of supports. Analysis of single bay single storey and single bay two Storey Frames by Kani's Method Including Side Sway. Shear force and bending moment diagrams. Elastic curve.

**UNIT – IV**

Matrix Methods of Analysis: Introduction – Static and Kinematic Indeterminacy - Analysis of continuous beams including settlement of supports, using stiffness method. Analysis of pin-jointed plane frames using stiffness method- Analysis of single bay single storey frames including side sway, using stiffness method. Analysis of continuous beams upto three degree of indeterminacy using flexibility method. Shear force and bending moment diagrams. .

**UNIT – V**

Approximate Methods of Analysis: Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method and Factor method. Analysis of multi-storey frames for gravity (vertical) loads. Substitute Frame method. Influence Lines for Indeterminate Beams: Introduction – ILD for two span continuous beams with constant and variable moments of inertia. ILD for propped cantilever beams. Muller Breslau's principle

**TEXT BOOKS:**

1. Structural Analysis Vol – I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by Pundit and Gupta. Tata McGraw Hill Publishers.
3. Structural Analysis SI edition by Aslam Kassimali, Cengage Learning

**REFERENCES:**

1. Matrix Analysis of Structures by Singh, Cengage Learning Pvt. Ltd.
2. Structural Analysis by R. C. Hibbeler Pearson Education.
3. Basic Structural Analysis by C. S. Reddy., Tata McGraw Hill Publishers
4. Matrix Analysis of Structures by Pundit and Gupta. Tata McGraw Hill Publishers.
5. Advanced Structural Analysis by A. K. Jain, Nem Chand Bros

## **EARTH RETAINING STRUCTURES (PROFESSIONAL ELECTIVE-III)**

### **IV-B.TECH I-SEMESTER**

**Course code: A2CE607PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

1. To understand lateral earth pressure theories and pressure theories and design of retaining walls.
2. To design anchored bulkheads by different methods.
3. To understand pressure envelopes and design of various components in braced cuts and cofferdams.
4. To understand stability of earth dams and its protection and construction.

### **COURSE OUTCOMES:**

1. Students will be able to design retaining walls, anchored bulkheads, braced cuts, coffer dams and earth dams.

### **UNIT-I**

Lateral Pressure: Basic concepts, Rankine and Coulomb earth pressure theories, graphical methods. Determining active and passive pressures: Culmanns, Rebhan's, logarithmic spiral methods, friction circle method. Consideration of surcharge, seepage, earth quake, wave effect, stratification, type of backfill, wall friction and adhesion. Retaining walls: Uses, types, stability and design principles of retaining walls, backfill drainage, settlement and tilting.

### **UNIT-II**

Anchored bulkheads: Classification of anchored bulkheads, free and fixed earth support methods. Rowe's theory for free earth supports and equivalent beam methods for fixed earth supports. Design of anchored rods and dead man Braced cuts and Cofferdams: Braced excavations and stability of vertical cuts, lateral pressures in sand and clay, Braced and cellular cofferdams: uses, types, components, stability, piping and heaving. Stability of cellular cofferdams, cellular cofferdams in rock and in deep soils.

### **UNIT-III**

Earth dams- Stability analysis: Classification, seepage control in embankments and foundations, seepage analysis, stability analysis: upstream and down stream for steady seepage, rapid draw down, end of construction, method of slices and Bishop's method.

### **UNIT-IV**

Earth dams -Protection & Construction: Slope protection, filters, embankment construction materials and construction, quality control, grouting techniques. Instrumentation and performance observations in earth dams.

### **NOTE**

Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

### **TEXT BOOKS:**

1. Basic & Applied soil mechanics – Gopal Ranjan & ASR Rao, New Age International Publishers, 2011.
2. Embankment Dams by Sharma Hd, Publisher: India Book House (IBH) Limited, 1991
3. Engineering for Embankment Dams By B. Singh & R. S. Varshney, A A Balkema Publishers, 1995

### **REFERENCE BOOKS:**

1. Foundation design by W. C. Teng, Prentice Hall, 1962
2. Analysis and design of foundations by Bowles. J. W McGraw Hill, 4th edition, 1955.
3. Earth and Rock-Fill Dams: General Design and Construction Considerations by United States Army Corps of Engineers, University Press of the Pacific, 2004
4. Soil mechanics in engineering and practice by Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri, 3rd Edition. Wiley India Pvt Ltd, 2010.

## GROUND IMPROVEMENT TECHNIQUES (PROFESSIONAL ELECTIVE-III)

### IV-B.TECH I-SEMESTER

Course code: A2CE608PE

L	T	P	C
3	0	0	3

### COURSE OBJECTIVES

To Learn

1. Gain Knowledge on Methods and Selection of Ground Improvement Techniques.
2. Understand Dewatering Techniques And Design For Simple Cases.
3. Get Knowledge on Insitu Treatment of Cohesion less and Cohesive Soils.
4. Understand The Concept Of Earth Reinforcement And Design Of Reinforced Earth.
5. Get To Know Types Of Grouts And Grouting Technique.

### COURSE OUTCOMES

At The End Of The Course, Student Will Be Able To:

1. Gain Knowledge on Methods And Selection Of Ground Improvement Techniques.
2. Understand Dewatering Techniques And Design For Simple Cases.
3. Get Knowledge On Insitu Treatment Of cohesion less And Cohesive Soils.
4. Understand The Concept Of Earth Reinforcement And Design Of Reinforced Earth.
5. Get To Know Types Of Grouts And Grouting Technique.

### UNIT-I GROUND IMPROVEMENT MECHANICAL MODIFICATION

**Ground improvement:** definition, objectives of soil improvement, classification of ground improvement techniques.

**Mechanical modification:** type of mechanical modification, aim of modification, compaction, principle of modification for various types of soils

### UNIT -II DEWATERING

Dewatering Techniques – Well points – Vacuum and electro osmotic methods – Seepage analysis for two dimensional flow for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

### UNIT -III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS

Insitu Densification Of Cohesionless Soils – Shallow As Deep Compaction – Dynamic Compaction - Vibroflotation, Sand Compaction Piles And Deep Compaction. Consolidation Of Cohesionless Soils -Preloading With Sand Drains, And Fabric Drains, Stabilization Of Soft Clay Ground Using Stone Columns And Lime Piles- Installation Techniques – Simple Design – Relative Merits Of Above Methods And Their Limitations.

### UNIT -IV GROUTING TECHNIQUES

Types Of Grouts – Grouting Equipments And Machinery – Injection Methods – Grout Monitoring -Stabilization With Cement, Lime And Chemicals – Stabilization Of Expansive Soil.

### UNIT-V PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES

Role of ground improvement in foundation engineering – methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions

### TEXT BOOKS

1. Purushothama Raj. P, Ground Improvement Techniques, Lakshmi Publications, 2nd Edition, 2016.
2. Koerner, R.M. Construction and Geotechnical Methods in Foundation Engineering, Mcgraw Hill, 1994.
3. Nihar Ranjan Patra, Ground Improvement Techniques, Vikas Publishing House, First Edition, 2012.
4. Mittal.S, an Introduction to Ground Improvement Engineering, Medtech Publisher, First Edition, 2013.



### **REFERENCE BOOKS**

1. Moseley, M.P., Ground Improvement Blockie Academic And Professional, 1992.
2. Moseley, M.P And Kirsch. K., Ground Improvement, Spon Press, Taylor And Francis Group, London, 2nd Edition, 2004.
3. Jones C.J.F.P. Earth Reinforcement And Soil Structure, Thomas Telford Publishing, 1996.
4. Winterkorn, H.F. And Fang, H.Y. Foundation Engineering Hand Book. Van Nostrand Reinhold, 1994.
5. Das, B.M., Principles Of Foundation Engineering (Seventh Edition), Cengage Learning, 2010

### **WEB REFERENCES**

1. <https://Easyengineering.Net/A-Textbook-Of-Strength-Of-Materials/>
2. <https://Civilenggforall.Com/Strength-Of-Materials-Textbook-Free-Download-Pdf-Civilenggforall/>

### **E-TEXT BOOKS**

1. [https://Books.Google.Co.In/Books?Id=2iheqp8dnwwc&Printsec=Frontcover&Redir\\_Esc=Y#V=Onepage&Q&F=False](https://Books.Google.Co.In/Books?Id=2iheqp8dnwwc&Printsec=Frontcover&Redir_Esc=Y#V=Onepage&Q&F=False)

### **MOOCS COURSE**

1. <https://Swayam.Gov.In/>
2. <https://Onlinecourses.Nptel.Ac.In/>

## STABILITY ANALYSIS OF SLOPES (PROFESSIONAL ELECTIVE-III)

**IV-B.TECH I-SEMESTER**

**Course code: A2CE609PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### COURSE OBJECTIVES

1. To study the basic concepts of stability.
2. To make the students aware of various causes of failures of slopes and study the remedial measure

### COURSE OUTCOMES

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

1. Select suitable materials for earth and rockfill dams, causes of failures
2. Check the stability of earth dams,
3. Understand safety measures to be undertaken to prevent the instability of slopes, earthen dams and embankments

### UNIT-I

Earth and Rockfill Dams: General features, Selection of site; Merits and demerits of the earth and rock fill dams, Classification of earth dams, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclometers, Stress measurements, Seismic measurements.

### UNIT-II

Failures, Damages and Protection of Earth Dams: Nature and importance of failure, piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters.

### UNIT-III

Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Non-circular surfaces, Limit equilibrium methods, Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long-term stability in slopes. Taylor Charts.

### UNIT-IV

Methods of Slope Stability: Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis, Sliding Block Analysis, Introduction to Seismic stability, Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete).

### UNIT-V

Slope Protection and Rockfill Dams: Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete). Requirements of compacted rockfill, Shear strength of rockfill, Rockfill mixtures, Rockfill embankments, Earth-core Rockfill dams, Stability, Upstream & Downstream slopes.

### REFERENCE:

1. Sherard, Woodward, Gizienski and Clevenger. Earth and Earth-Rock Dams. John Wiley & Sons. 1963.
2. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams, 1999.
3. Sowers, G. F. and Salley, H. I. – Earth and Rockfill Dams, Willams, R.C., and Willace, T.S. 1965.
4. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilisation methods – John Wiley & sons. (2002).
5. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional, London.

**DESIGN OF HYDRAULIC STRUCTURES  
(PROFESSIONAL ELECTIVE-IV)**

**IV-B.TECH I-SEMESTER**  
**Course code: A2CE710PE**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVE:**

This course is designed to study the fundamental concept , design and maintenance of hydraulic structures. Also to provide basic understanding of heavy structures like dam have to study. To give the basic idea of canal regulation, canal headwork and cross-drainage.

**COURSE OUTCOMES:**

1. Understanding of the design of canal and its maintenance.
2. To know the types of canal, distributories, canal headworks, cross-drainage and canal regulator works.
3. Understanding the various methods of analysis of canal.
4. Application of the canal, dam and distributaries in civil engineering structures.

**Design and Maintenance of canal :**

Design of canal based on tractive force approach, maintenance of unlined channels (based on IS 4839 – 1979 part I ), Maintenance of line channels (based on Is 4339 – 1979 part II ).

**Design of canal outlets.**

Canala headworks: Selection of site for storage and diversion headworks, weir or barrages, divide wall, scouring sluice or under sluices, fish ladder.

**Dams:** Gravity dams, earth and rockfill dams, buttress dams and arch dams. Spilleay and outlet works.

**Canal regulations works:** Head regulator, distributor head regulator, cross regulators. Necessity of channel falls, types of falls and design of vertical drop fall/sharda type falls

**Cross drainage works:** Types of C-D works, aqueducts, siphon aqueducts, super passages, siphon super passeges, level crossing, inlet and outlet. Fluming of channels and deign of channels transitions. An introduction to River basis development

**TEXT BOOKS**

1. Fundamental of Irrigation Engineering by Bharat Singh, Nemchand Bros., Roorkee, Uttarakhand.
2. Irrigation & Water Power Engineering by Punima B.C., Pande Lal B.B., Laxmi Publication Pvt. Ltd. New Delhi.
3. Water Resource Engineering by Garg S.K., Khanna Publishers, New Delhi
4. Water Power Engineering by Dandekar MM/ Sharma KN, Vikash Publishing Pvt. Ltd

**REFERENCE:**

1. Water Resources Engineering by R.K. Linsley & J.L.H. Paulhus, McGraw Hill
2. Hydroelectric Handbooks by W.P. Creager & J.D. Justin, John Wiley & Sons.

## **ADVANCED WATER RESOURCE ENGINEERING (PROFESSIONAL ELECTIVE-IV)**

**IV-B.TECH I-SEMESTER**

**Course code: A2CE711PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course provides the description of hydrological cycle and derive various formulas used in estimation of different basic components of surface and Ground water cycle. and its components. Further it will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.

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

1. Understand the different concepts and terms used in engineering hydrology
2. To identify and explain various formulae used in estimation of surface and Ground water hydrology components
3. Demonstrate their knowledge to connect hydrology to the field requirement

### **UNIT - I**

Introduction: Concepts of Hydrologic cycle, Global Water Budget, Applications in Engineering. Sources of data. Precipitation Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic, Thiessen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

### **UNIT - II**

Abstractions from precipitation evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, , interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices. Runoff Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

### **UNIT - III**

Hydrographs Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function - Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

### **UNIT - IV**

Groundwater Hydrology Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law. Well Hydraulics - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

Crop Water Requirements – Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

**UNIT - V**

Canal Systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Regime channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals-Types of lining-Advantages and disadvantages. Drainage of irrigated lands-necessity, methods.

**TEXT BOOKS:**

1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers
3. G L Asawa, Irrigation Engineering, Wiley Eastern

**REFERENCE BOOKS:**

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications)
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni (New Age International)

## GROUND WATER HYDROLOGY (PROFESSIONAL ELECTIVE-IV)

### IV B.TECH I SEMESTER

Course code: A2CE712PE

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

#### UNIT — I

Ground Water Occurrence and Movement: Ground water hydrologic cycle. origin of ground Water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention. Permeability, Darcy's law, storage coefficient, Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinates system, ground water flow contours their applications.

#### UNIT—II

Analysis of Pumping Test data-I: Steady flow ground water flow towards a well in confined and unconfined aquifers-Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests. Unsteady flow towards a well — Non equilibrium equations-Thesis solution-Jacob and Chow's simplifications, Leak aquifers.

#### UNIT — III

Surface and Subsurface Investigation: Surface methods of exploration-Electrical resistivity and Seismic refraction methods. Subsurface methods-geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

#### UNIT – IV

Artificial Recharge of Ground Water: Concept of artificial recharge-recharge methods, relative merits. Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

#### UNIT – V

Saline Water Intrusion In aquifers: Occurrence of saline water intrusions, GhybenHerzberg relation, Shape of interface, control of seawater intrusion.

#### TEXT BOOKS

1. Ground Water Hydrology by H. M. Raghunath, Wiley Eastern Ltd.
2. Introduction to Hydraulics & Hydrology: With Applications for Stormwater Management, 4th Edition, Cengage Learning.

#### REFERENCES

1. Ground water Hydrology by David Keith Todd, John Wiley & sons.New York.
2. Ground water by Bawver, John Wiley & sons.
3. Hydrology by Subramanya K.

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## REMOTE SENSING AND GRAPHICAL INFORMATION SYSTEMS (OPEN ELECTIVE-II)

**IV- B.TEC I-SEMESTER**  
**Course code: A2CE703OE**

**L T P C**  
**3 0 0 3**

### **COURSE OBJECTIVES:**

1. About the principles of GIS, Remote Sensing, Spatial Systems.
2. Understand the applications of GIS, remote sensing in different problem solving situations
3. Understanding the characteristics of satellites and sensors
4. Understanding the spatial data analysis by different data models
5. Understanding different GIS software

### **COURSE OUTCOMES:**

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems

### **UNIT-I REMOTE SENSING**

Remote sensing – history & development, definition, concept and principles -Energy resources, radiation principles, EM Radiation and EM Spectrum - Black body radiation, laws of radiation- Interaction of EMR with atmosphere and earth's surface, steps and elements of image interpretation, Techniques of visual interpretation and interpretation keys, multispectral and multidisciplinary concepts , Instruments for visual interpretation , Remote sensing data products and their procurement.

### **UNIT -II SATELLITES AND SENSORS**

Satellites and their characteristics – geo-stationary and sun-synchronous -Earth Resources Satellites -LANDSAT, SPOT, IRS, IKONOS satellite series - Meteorological satellites – INSAT, NOAA, GOES - Sensors – types and their characteristics, across track (whiskbroom) and along track (pushbroom) scanning- Optical mechanical scanners – MSS, TM, LISS, WiFS, PAN - Concept of resolution – spatial, spectral, temporal, radiometric- Basic concept and principles of thermal, microwave and hyperspectral sensing

### **UNIT -III GEO GRAPHICAL INFORMATION SYSTEM**

GIS – definition, concept and history of developments in the field of information systems Computer fundamentals for GIS, Hardware and software requirements for GIS, Coordinate system and projections in GIS – conic, cylindrical and planner , Data structure and formats , Spatial data models – raster and vector, data inputting & GIS , Spatial data quality and uncertainty , Data base design - editing and topology creation in GIS, linkage between spatial and non-spatial data

### **UNIT -IV VECTOR AND RASTER DATA MODEL**

Spatial data analysis – significance and type, attribute query, spatial query , Vector based spatial data analysis , Raster based spatial data analysis- local, neighborhood, regional and global operations, , Buffer analysis, network analysis , Data quality and sources of errors , Integration of RS and GIS data , Digital elevation model and derivation of parameters, Data analysis and modeling in GIS– types of GIS modeling

### **UNIT-V GIS SOFTWARES**

Open sources software, free software and cloud computing , Decision support systems , Overview of image processing & GIS Packages – ARC GIS, ERDAS, MAP INFO, ILWIS, GEOMEDIA, IDRISI, GRASS, SAGA, QGIS, Recent trends in GIS – AM/FM, Virtual 3D GIS, Mobile GIS, OLAP, Internet GIS, Open GIS

**TEXT BOOKS:**

1. Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications
2. Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
3. Anji Reddy, M. 2004: Geoinformatics for Environmental Management.B.S. Publications
4. Chang.T.K. 2002: Geographic Information Systems. Tata McGrawHill
5. Heywood.I, Cornelius S, CrverSteve. 2003: An Introduction to Geographical Information Systems. Pearson Education

**REFERENCE BOOKS:**

1. Ram Mohan Rao. 2002: Geographical Information Systems. Rawat Publication.
2. Skidmore A.2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis
3. Tar Bernhardsen. Geographical Information Systems. John Wiley.
4. Wise S.2002: GIS Basics. Taylor Publications
5. ESRI Map book: GIS the Language of Geography by ESRI-USA ESRI-2004
6. Satellite Geodesy: Gunter Seeba

**WEB REFERENCES:**

1. <https://rsgis.ait.ac.th/main/>
2. <https://www.cssteap.org/rs-gis-projects>
3. <https://civil.kiit.ac.in/rs-gis/>
4. [https://plugins.qgis.org/plugins/NITK\\_RS-GIS\\_17/](https://plugins.qgis.org/plugins/NITK_RS-GIS_17/)

**E-TEXT BOOKS:**

1. [http://www.gisresources.com/wp-content/uploads/2013/09/anji-reddy\\_GIS.pdf](http://www.gisresources.com/wp-content/uploads/2013/09/anji-reddy_GIS.pdf)
2. <https://www.scribd.com/book/411417231/Textbook-of-Remote-Sensing-and-Geographical-Information-Systems>

**MOOCS COURSE**

1. <https://nptel.ac.in/courses/105/103/105103193/>
2. [https://onlinecourses.nptel.ac.in/noc20\\_ce58/preview](https://onlinecourses.nptel.ac.in/noc20_ce58/preview)



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## SUSTAINABLE INFRASTRUCTURE DEVELOPMENT (OPEN ELECTIVE-II)

**IV- B.TEC I-SEMESTER**  
**Course code A2CE704OE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### LEARNING OBJECTIVES:

By the end of this course, students will be able to:

1. Understand the consequences of urban growth on the demand for infrastructure from a global perspective.
2. Assess the challenges for both developing and developed countries to devise new strategies, new technologies, new business models, and new financing techniques.
3. Equip students to think about some of these challenges, many of which present new business opportunities and partnership arrangements.
4. Learn how the private sector can make a difference in ways that can serve societal needs and contribute to improved living conditions that are essential to sustainability imperatives.

### UNIT-I

Principles of Sustainable Development: History and emergence of the concept of Sustainable Development, Definitions, Environmental issues and crisis, Resource degradation, greenhouse gases, desertification, social insecurity, Industrialization, Globalization and Environment.

### UNIT-II

Sustainable Development and International Contribution: Components of sustainability, Complexity of growth and equity, International Summits, Conventions, Agreements, Transboundary issues, Action plan for implementing sustainable development, Moral obligations and Operational guidelines.

### UNIT-III

Funding of infrastructure; Public Private Participation; Establishment of specific companies (SPVs) to develop and implement projects. Development of debt markets. Role of multilateral and bilateral agencies in infrastructure growth in developing countries.

### UNIT-VI

The need for independent regulation of infrastructure to ensure equity, quality, cost effective pricing, a level playing field for investors and consumer satisfaction; The evolution of independent regulation in India; The framework of independent regulation in different sectors in India and the variation of important legal provisions relating to the scope of regulation and the independence of the regulators; The impact of regulation on performance of the utilities.

### UNIT-V

Sustainability issues in infrastructure development; Land, forest and other environmental concerns; Green growth, judicious use of natural resources; Low carbon technologies in transport and energy; Incorporation of SDGs in infrastructure policies.

### REFERENCE BOOKS:

1. Sustainable Service Delivery in an Increasingly Urbanized World. USAID Policy Note. 2013.
2. Methodologies and Tools for Forecasting Infrastructure. Patterns of Potential Human Progress Volume 4: Building Global Infrastructure. The Frederick S. Pardee Center for International Futures, IFS.

## **SOLID WASTE MANAGEMENT (OPEN ELECTIVE-II)**

**IV-B.TECH I-SEMESTER**

**Course code: A2CE705OE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

The course should enable the students to:

1. To acquire the principles of treatment of solid waste management
2. To know the impact of solid waste management on the health of living beings
3. To learn the criterion for collection of land fill and its design
4. To plan the methods of processing such as composting the municipal organic waste
5. To learn how to reuse the solid waste

### **COURSE OUTCOMES**

The end of the course the student should be able to:

1. Identify the physical and chemical composition of wastes
2. Analyze the functional elements for solid waste management.
3. Analyze the functional elements for liquid waste management.
4. To Understand the effluent treatment Plants and its disposal
5. Understanding the benefits by using the disposed solid waste

### **UNIT-I INTRODUCTION TO ENVIRONMENT**

Ecosystem –meaning- Types -Components- Structure – Functions, Levels of organization in nature- Food chain and Trophic structure, Biogeochemical Cycles, Energy flow.

### **UNIT -II MUNICIPAL SOLID WASTE**

Definition - Sources and types of solid waste- composition and its determinants of Solid waste-factors influencing generation-quantity assessment of solid wastes-methods of sampling and characterization.

### **UNIT -III COLLECTION AND TRANSFER**

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

### **UNIT -IV PROCESSING TECHNIQUES AND RECOVERY OF ENERGY**

Processing techniques – purposes mechanical volume reduction – necessary equipments – chemical volume reduction – incinerators – mechanical size reduction selection of equipments – components separation – methods – drying and dewatering.

Recovery of Resources, conversion products and energy recovery – recoverable materials – processing and recovery systems – incineration with heat recovery.

### **UNIT-V DISPOSAL OF SOLID WASTES**

Refuse disposal – various methods – incinerations – principle features of an incinerator – site selection and plant layout of an incinerator - sanitary landfill- methods of operation – advantages and disadvantages of sanitary land fill - site selection – reactions accruing in completed landfills – gas and leachate movement and control – equipments necessary.

**TEXT BOOKS:**

1. Hazardous waste management by Prof. Anjaneyulu.
2. George Tchobanoglous et al, "Integrated Solid Waste Management" McGraw - Hill, 1993.

**REFERENCE BOOKS:**

1. Tchobanoglous Thiesen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.
2. R.E.Landrefh and P.A.Rebers, "Municipal Solid Wastes-Problems & Solutions", Lewis, 1997. Manual on Municipal 1 Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.
3. Blide A.D.& Sundaresan, B.B, "Solid Waste Management in Developing Countries", INSDOC, 1993.
4. Ecology Science and Practice; Claude Fourie, Christian Ferra, Paul Medori, Tean Devaux, Oxford and IBH Publishing Co (Pvt) LTD, special Indian edition.
5. Principles of Ecology- P.S.Verma, V.K.Agarwal.S.Chand & Company (Pvt) LTD 1989.

**WEB REFERENCES:**

1. <https://www.downtoearth.org.in/blog/waste/india-s-challenges-in-waste-management-56753>
2. <https://www.orfonline.org/research/solid-waste-management-in-urban-india-imperatives-for-improvement-77129/>
3. <https://www.sciencedirect.com/science/article/pii/S0921344998000330>
4. [http://icrier.org/pdf/4-Jan-2019/Utkarsh\\_Patel-SWM\\_%20in\\_India.pdf](http://icrier.org/pdf/4-Jan-2019/Utkarsh_Patel-SWM_%20in_India.pdf)

**E-TEXT BOOKS:**

1. <https://easyengineering.net/municipal-solid-waste-management-by-saravanan/>
2. <https://www.kopykitab.com/Solid-Waste-Management-by-Dr-D-K-Gupta-V-K-Sonarkar-S-B-Nimbalkar>
3. <https://libraryguides.uwsp.edu/c.php?g=525918&p=3595622>

**MOOCS COURSE**

1. <https://nptel.ac.in/courses/120/108/120108005/>
2. <https://nptel.ac.in/courses/105/103/105103205/>

**SMART CITIES  
(OPEN ELECTIVE-II)**

**IV-B.TECH I-SEMESTER**

**Course code: A2CE706OE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

The course should enable the students to:

1. Introduction and vision of IoT.
2. Use of IoT for smart cities
3. Use of GIS for the urban cities
4. Various levels of IoT and its advantages.
5. To study the applications of IOT & GIS

**COURSE OUTCOMES**

The end of the course the student should be able to:

1. The importance of National and International policies for smart cities
2. Applications of with GIS for urban cities.
3. Applications of IoT for smart cities
4. The concepts of GIS and IoT at analytics level.

**UNIT-I SMART CITIES**

Urban cities-development, Transportation polices, Smart City configurations with reference to land use and Infrastructure, international policies on urban cities development, National policies, Problems in urban areas of developing countries and developed countries.

**UNIT -II GIS FOR URBAN CITIES**

GIS- types of architectures-features for spatial planning and spectral planning, application of GIS for time and space-based planning, GIS for land use, GIS for infrastructure and supportive infrastructure in design and planning.

**UNIT -III IOT FOR SMART CITIES**

Introduction, communication systems, Local server design for data transfer, central sever design for data analytics, sensor and communication system to address various problems in urban cities.

**UNIT -IV GIS AND IOT AT ANALYTICS LEVEL:**

GIS for spatial analytics, IOT for spectral characteristics of urban problem in reference to pollution, security, congestion, accident risk and urban floods - different versions and features of open source GIS.

**UNIT-V APPLICATIONS OF IOT & GIS**

Urban Congestion and Mapping, pollution of water and air and measuring, risk of travel and advanced alert systems, urban floods and technology interface, 3<sup>rd</sup> dimension mapping and IOT interface, supportive infrastructure and smart city conversions. Case studies on World class cities.

**TEXT BOOKS:**

1. Lo, C.P. & Yeung A.K.W., Concepts and Techniques of Geographic Information Systems, Prentice Hall of India, New Delhi, 2002.
2. Burrough, P.A., Principles of Geographical Information Systems, Oxford Publication, 1998.

**REFERENCE BOOKS:**

1. Vijay Madiseti and Ashdeep banga “Internet of Things (a handson approach) 1<sup>st</sup> edn, VPT, 2014
2. Jan holter, Vlasios Tsiatsis Catherine mulligan, david boyle “From machine to machine to the Internet of things. Introduction to new age. Intelligence, 1<sup>st</sup> edition, academic press, 2014

**WEB REFERENCES:**

1. <https://www.esri.in/esri-news/publication/vol9-issue1/articles/gis-for-smart-cities>
2. <https://www.tandfonline.com/doi/full/10.1080/13658816.2019.1673397>

**E-TEXT BOOKS:**

1. <http://mediabooksharing.top/?download=013149502X>
2. [https://www.academia.edu/16045087/Geographic\\_Information\\_Systems\\_GIS\\_Techniques\\_Applications\\_and\\_Technologies](https://www.academia.edu/16045087/Geographic_Information_Systems_GIS_Techniques_Applications_and_Technologies)

**MOOCS COURSE**

1. <https://nptel.ac.in/courses/105/107/105107155/>
2. <https://nptel.ac.in/courses/107/105/107105088/>
3. <https://nptel.ac.in/courses/105/103/105103193/>

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## CIVIL ENGINEERING SOFTWARE LABORATORY

### IV-B.TECH I-SEMESTER

Course code: A2CE703PC

L T P C  
0 0 2 1

### COURSE OBJECTIVES:

The course should enable the students to:

1. To Learn the Numerical Programming Methods
2. To Use the Computer to Apply Numerical Methods
3. To Learn the Basics of Software Oriented Design
4. To Design the Structures using excel
5. To Analyze the structures using staad pro.

### COURSE OUTCOMES:

By the end of the course students will be able:

1. Develop the Programs for Numerical Methods
2. To Understand the Computer to Apply Numerical Methods
3. Apply Excel sheets to design of structural elements
4. Solve the structural design problem by using Software.
5. Analyse the structure for various loads by using Staad-Pro

### LIST OF EXPERIMENTS

Experiment-1	Design of Slab using Excel.
Experiment-2	Design of Column using Excel..
Experiment-3	Design of Beam using Excel.
Experiment-4	Design of Footing using Excel..
Experiment-5	Introduction to Staad Pro
Experiment-6	Analysis and Design of Continuous Beam
Experiment-7	Analysis and Design of Multi-Storey Frame
Experiment-8	Analysis and Design of Multi-Storey Building
Experiment-9	Wind load analysis on RCC Building
Experiment-10	Analysis and Design of Steel Truss

### REFERENCE BOOKS:

1. Learning Bentley Staad.Pro V8I for Structural Analysis
2. Design of R C C Buildings using Staad Pro V8i with Indian Examples
3. Excel 2019 All-in-One: Master the new features of Excel 2019

### WEB REFERENCES:

1. <https://open.umn.edu/opentextbooks/textbooks/70>
2. <https://spreadsheeto.com/excel-books/>
3. <https://www.scribd.com/book/241562296/Staad-Pro-v8i-for-beginners>
4. [https://www.academia.edu/32862611/Learning\\_Bentley\\_STAAD\\_Pro\\_V8i\\_for\\_Structural\\_Analysis\\_CA\\_DCIM\\_Technologies?auto=download](https://www.academia.edu/32862611/Learning_Bentley_STAAD_Pro_V8i_for_Structural_Analysis_CA_DCIM_Technologies?auto=download)

**IV-YEAR (II-SEMESTER)**

## **SOLID WASTE MANAGEMENT (PROFESSIONAL ELLECTIVE-V)**

**IV-B.TECH II-SEMESTER**

**Course code: A2CE813PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

The course should enable the students to:

6. To acquire the principles of treatment of solid waste management
7. To know the impact of solid waste management on the health of living beings
8. To learn the criterion for collection of land fill and its design
9. To plan the methods of processing such as composting the municipal organic waste
10. To learn how to reuse the solid waste

### **COURSE OUTCOMES**

The end of the course the student should be able to:

6. Identify the physical and chemical composition of wastes
7. Analyze the functional elements for solid waste management.
8. Analyze the functional elements for liquid waste management.
9. To Understand the effluent treatment Plants and its disposal
10. Understanding the benefits by using the disposed solid waste

### **UNIT-I INTRODUCTION TO ENVIRONMENT**

Ecosystem –meaning- Types -Components- Structure – Functions, Levels of organization in nature- Food chain and Trophic structure, Biogeochemical Cycles, Energy flow.

### **UNIT -II MUNICIPAL SOLID WASTE**

Definition - Sources and types of solid waste- composition and its determinants of Solid waste-factors influencing generation-quantity assessment of solid wastes-methods of sampling and characterization.

### **UNIT -III COLLECTION AND TRANSFER**

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

### **UNIT -IV PROCESSING TECHNIQUES AND RECOVERY OF ENERGY**

Processing techniques – purposes mechanical volume reduction – necessary equipments – chemical volume reduction – incinerators – mechanical size reduction selection of equipments – components separation – methods – drying and dewatering.

Recovery of Resources, conversion products and energy recovery – recoverable materials – processing and recovery systems – incineration with heat recovery.

### **UNIT-V DISPOSAL OF SOLID WASTES**

Refuse disposal – various methods – incinerations – principle features of an incinerator – site selection and plant layout of an incinerator - sanitary landfill- methods of operation – advantages and disadvantages of sanitary land fill - site selection – reactions accruing in completed landfills – gas and leachate movement and control – equipments necessary.



**TEXT BOOKS:**

3. Hazardous waste management by Prof. Anjaneyulu.
4. George Tchobanoglous et al, "Integrated Solid Waste Management" McGraw - Hill, 1993.

**REFERENCE BOOKS:**

6. Tchobanoglous Thiesen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.
7. R.E.Landrefh and P.A.Rebers, "Municipal Solid Wastes-Problems & Solutions", Lewis, 1997. Manual on Municipal 1 Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.
8. Blide A.D.& Sundaresan, B.B, "Solid Waste Management in Developing Countries", INSDOC, 1993.
9. Ecology Science and Practice; Claude Fourie, Christian Ferra, Paul Medori, Tean Devaux, Oxford and IBH Publishing Co (Pvt) LTD, special Indian edition.
10. Principles of Ecology- P.S.Verma, V.K.Agarwal.S.Chand & Company (Pvt) LTD 1989.

**WEB REFERENCES:**

5. <https://www.downtoearth.org.in/blog/waste/india-s-challenges-in-waste-management-56753>
6. <https://www.orfonline.org/research/solid-waste-management-in-urban-india-imperatives-for-improvement-77129/>
7. <https://www.sciencedirect.com/science/article/pii/S0921344998000330>
8. [http://icrier.org/pdf/4-Jan-2019/Utkarsh\\_Patel-SWM\\_%20in\\_India.pdf](http://icrier.org/pdf/4-Jan-2019/Utkarsh_Patel-SWM_%20in_India.pdf)

**E-TEXT BOOKS:**

4. <https://easyengineering.net/municipal-solid-waste-management-by-saravanan/>
5. <https://www.kopykitab.com/Solid-Waste-Management-by-Dr-D-K-Gupta-V-K-Sonarkar-S-B-Nimbalkar>
6. <https://libraryguides.uwsp.edu/c.php?g=525918&p=3595622>

**MOOCS COURSE**

3. <https://nptel.ac.in/courses/120/108/120108005/>
4. <https://nptel.ac.in/courses/105/103/105103205/>

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## ENVIRONMENTAL IMPACT ASSESMENT FOR CIVIL ENGINEERS (PROFESSIONAL ELECTIVE-V)

### IV-B.TECH II-SEMESTER

Course code: A2CE814PE

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### COURSE OBJECTIVES

1. Identify the need to assess and evaluate the impact on environment.
2. Major principles of environmental impact assessment.
3. Understand the different steps within environmental impact assessment
4. Know the assessing risks posing threats to the environment.
5. Know access different case studies/examples of EIA in practice.

### COURSE OUTCOMES

1. Overview of assessing risks posing threats to the environment.
2. Able to access different case studies/examples of EIA in practice.
3. Able to liaise with and the importance of stakeholders in the EIA process
4. Able to know the major principles of environmental impact assessment.
5. Able to understand the different steps within environmental impact assessment

### UNIT-I INTRODUCTION

Classification of Pollution and Pollutants, – Evolution of EIA (Global and Indian Scenario)- Elements of EIA — Screening – Scoping - Public Consultation - Environmental Clearance process in India - Key Elements in 2006 EIA(Govt. of India ) Notification.

### UNIT -II AIR POLLUTION

Primary and Secondary Types of Pollutants, sulfur dioxide- nitrogen dioxide, carbon monoxide, Water Pollution- Point and Non-point Source of Pollution, Major Pollutants of Water and Impact of pollutants.

### UNIT -III SOLID WASTE

Classification and sources of Solid Waste, Characteristics, effects, E waste, Effects of urbanization on land degradation, pesticide pollution NOISE POLLUTION: Sources of Noise, Effects of Noise ,Control measures

### UNIT -IV IMPACTS OF POLLUTANTS

Impacts of pollutants, types, scale of impact-Global, local pollutants. Climate change, Ozone layer depletion, Deforestation, land degradation, Impact of development on vegetation and wild life

### UNIT-V SOCIO-ECONOMIC IMPACTS

Socio-economic impacts - Impact assessment Methodologies Overlays, Checklist, Matrices, Fault Tree Analysis, Event Tree Analysis- Role of an Environmental Engineer- Public Participation assessment, Concepts of Environmental Management Plan (EMP).

Standards for Water, Air and Noise Quality - Environmental Management Plan- EIA- Case studies of EIA.

### TEXT BOOKS:

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications.

### REFERENCE BOOKS:

1. Prasad Modak and Asit K. Biswas (1999): Conducting Environmental Impact Assessment in Developing Countries, United Nations, University Press, 364pp.
2. A. Lawrence P. D. (2003): Environmental impact assessment. Practical solutions to recurrent problems. Wiley-Interscience, B. Larry Canter (1995): Environmental Impact Assessment.

**WEB REFERENCES:**

1. [https://www.researchgate.net/publication/222815199\\_Environmental\\_impact\\_assessment\\_Retrospect\\_and\\_prospect](https://www.researchgate.net/publication/222815199_Environmental_impact_assessment_Retrospect_and_prospect)
2. <https://www.elsevier.com/journals/environmental-impact-assessmentreview/01959255?generatepdf>
3. <https://orkustofnun.is/gogn/unu-gtp-sc/UNU-GTP-SC-05-28.pdf>

**E-TEXT BOOKS:**

1. [https://www.researchgate.net/publication/335467191\\_Introduction\\_To\\_Environmental\\_Impact\\_Assessment](https://www.researchgate.net/publication/335467191_Introduction_To_Environmental_Impact_Assessment)

**MOOCS COURSE:**

1. [https://onlinecourses.swayam2.ac.in/nou21\\_bt02/preview#](https://onlinecourses.swayam2.ac.in/nou21_bt02/preview#)
2. <https://onlinecourses.nptel.ac.in/>

## GROUND WATER HYDROLOGY (PROFESSIONAL ELECTIVE -V)

**IV-B.TECH II-SEMESTER**

**Course code: A2CE815PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

The course should enable the students to:

1. The objective of the course is to study the moment of ground water
2. To study the occurrence of ground water
3. To study the investigation methods of ground water
4. To get the knowledge related to artificial ground water recharge
5. To introduce about darcys law and dupits equation

### **COURSE OUTCOMES**

The end of the course the student should be able to:

1. Ability to understand the ground water occurrence, ground water movement.
2. Ability to understand the analysis of pumping test, surface and subsurface Investigation.
3. Ability to understand the artificial recharge of ground water, saline water intrusion in aquifer and groundwater basin management.
4. Ability to understand the types of floe and their importance and well construction.
5. Ability to understand types of ground water recharge

### **UNIT-I OCCURRENCE AND MOVEMENT OF GROUND WATER:**

Origin & age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration & saturation, aquifers and their characteristics/classification, groundwater basins & springs, Darcy's Law, permeability & its determination, Dupuit assumptions, heterogeneity &anisotropy, Ground water flow rates & flow directions, general flow equations through porous media.

### **UNIT -II WELL HYDRAULICS**

Steady ground water flow towards a well in confined and unconfined aquifers- Dupuit's and Theim's equations, Assumptions, Formation constants, yield of an open well, Well interface and well tests- Recuperation Test. Unsteady flow towards a well- Non equilibrium equations - Theis solution-Jacob and Chow's simplifications, Leaky aquifers- Well interference.

### **UNIT -III SURFACE/ SUB-SURFACE INVESTIGATION OF GROUND WATER**

Geological -geophysical exploration- remote sensing - electric resistivity -seismic refraction based methods for surface investigation of ground water, test drilling & ground water level measurement, sub-surface ground water investigation through geophysical -resistivity -spontaneous potential -radiation - temperature -caliper -fluid conductivity -fluid velocity -miscellaneous logging.

### **UNIT -IV ARTIFICIAL GROUND WATER RECHARGE**

Concept & methods of artificial ground water recharge, recharge mounds & induced recharge, wastewater recharge for reuse, water spreading.

### **UNIT-V SALINE WATER INTRUSION IN AQUIFER**

Ghyben-Herzberg relation between fresh & saline waters, shape & structure of the fresh & saline water interface, upcoming of saline water, fresh-saline water relations on oceanic islands, seawater intrusion in Karst terrains, saline water intrusion control.

**TEXT BOOKS:**

1. D.K. Todd and L. F. Mays, "Groundwater Hydrology", John Wiley and sons.
2. K. R.Karant, "Hydrogeology", TataMcGraw Hill Publishing Company.

**REFERENCE BOOKS:**

1. Groundwater Hydrology by BOWER, John Wiley & Sons.
2. Groundwater System Planning & Management - R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrology by C.W.Fetta, CBS Publishers & Distributers.

**WEB REFERENCES:**

1. <https://www.nap.edu/read/5498/chapter/4>

**E-TEXT BOOKS:**

1. <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470172797>

**MOOCS COURSE**

1. <https://nptel.ac.in/courses/105/103/105103026/>  
[https://onlinecourses.swayam2.ac.in/cec21\\_ge14/preview](https://onlinecourses.swayam2.ac.in/cec21_ge14/preview)

## AIRPORT, RAILWAY & WATERING (PROFESSIONAL ELECTIVE -VI)

### IV-B.TECH II-SEMESTER

Course code: A2CE916PE

L	T	P	C
3	0	0	3

### COURSE OBJECTIVES:

The course should enable the students to:

1. Deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage. To study the occurrence of ground water
2. Introduce component of railway tracks, train resistance, crossing, signaling, high speed tracks and Metro Rail.
3. Explain the classes of harbors, features, planning and design of port facilities.

### COURSE OUTCOMES

The end of the course the student should be able to:

1. An ability to design of runways and taxiways.
2. An ability to design the infrastructure for large and small airports
3. An ability to design various crossings and signals in Railway Projects.
4. An ability plan the harbors and ports projects including the infrastructure required for new ports and harbors.

### UNIT – I

Airport Engineering: Introduction to Air Transportation - Aircraft Characteristics - Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram

### UNIT – II

Introduction to Railways: Role of Indian Railways in national development – Railways for Urban Transportation – LRT , Mono Rail, Metro Rail & MRTS. Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Functions, Materials, Ballast, Subgrade and Embankments, Ballast less Tracks.

### UNIT – III

Geometric Design of Railway Track: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

### UNIT – IV

Track maintenance and Operation: Points and Crossings - Turnouts, Stations and Yards - Level Crossings. Signaling and Interlocking - Track Circuiting - Track Maintenance.

### UNIT – V

Dock & Harbour Engineering: Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

**TEXT BOOKS:**

1. Venkataramaiah C(2016), “Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels”, Universities Press (India) Private Limited, Hyderabad
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017

**REFERENCE BOOKS:**

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar Publishing House Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.
5. Transportaion Engineering by R. Srinivasa Kumar, University Press India

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**PAVEMENT ASSET MANGEMENT  
(PROFESSIONAL ELECTIVE -VI)**

**IV-B.TECH II-SEMESTER**

**Course code: A2CE917PE**

**L T P C  
3 0 0 3**

**COURSE OBJECTIVES:**

1. The ability to design and recognize specification and construction activities that can improve the performance of pavements.
2. Evaluating the condition of pavements through surface condition surveys, smoothness, friction, load/deflection and other evaluation techniques.
3. Understanding the basic components of pavement management systems and how they can be used to optimize funding expenditures.

**COURSE OUTCOMES**

The end of the course the student should be able to:

1. Prepare quality assurance and quality control plans in an attempt to construct better performing pavements.
2. Evaluate the pavements based on the functional and structural characteristics. An ability to design various crossings and signals in Railway Projects.
3. Understand the construction of base, sub base and drains.

**UNIT-I**

Pavement management system: Components of PMS and their activities; Major steps in implementing PMS; Inputs; Design, Construction and Maintenance; Rehabilitation and Feedback systems; Examples of HDM and RTIM packages; Highway financing; Fund generation; Evaluating alternate strategies and Decision criteria ; Pavement Maintenance Management Components of Maintenance Management and Related Activities – Network and Project Level Analysis; Prioritization Techniques and Formulation of Maintenance Strategies.

**UNIT-II**

Pavement Inventories, Quality Control and Evaluation: Serviceability Concepts ;Visual Rating ;Pavement Serviceability Index; Roughness Measurements ;Distress Modes – Cracking Rutting Etc; Pavement Deflection – Different Methods and BBD, Skid Resistance, Roughness, Safety – Aspects; Inventory System. Causes of Deterioration, Traffic and Environmental Factors, Pavement Performance Modeling Approaches and Methods of Maintaining WBM, Bitumen and Cement Concrete Roads, Quality Assurance; Quality Control – ISO 9000, Sampling Techniques – Tolerances and Controls related to Profile and Compaction.

**UNIT-III**

Construction of Base, Subbase, Shoulders and Drain: Roadway and Drain Excavation, Excavation and Blasting, Embankment Construction, Construction of Gravel Base, Cement Stabilised Sub- Bases, WBM Bases, Wet Mix Construction; Crushed Cement Bases, Shoulder Construction; Drainage Surface, Turfing Sand Drains; Sand Wicks; Rope Drains, Geo- Textile Drainage; Preloading Techniques.

**UNIT-IV**

Bituminous Construction and Maintenance: Preparation and Laying of Tack Coat; Bituminous Macadam, Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-Dense Asphalt Concrete-Interface Treatments and Overlay Construction, IRC Specifications.



**UNIT-V**

Cement Concrete pavement Construction and Maintenance: Cement Concrete Pavement Analysis - Construction of Cement Roads, Manual and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement and Overlay Construction.

**REFERENCES:**

1. Haas and Hudson , W. R. Pavement management systems –McGraw Hill publications.
2. Sargious, M. A. – Pavements and surfacing for highways and airports – Applied Science Publishers ltd.
3. Bridge and Pavement maintenance- Transportation Research Record no.800, TRB.
4. Shahin M.Y, 1994- Pavement management for airports, roads and parking lots.
5. Bent Thagesan, 1996- Highway and Traffic engineering for developing countries.
6. MORTH - Specifications.

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**PAVEMENT ANALYSIS & DESIGN  
(PROFESSIONAL ELECTIVE-VI)**

**IV-B.TECH II-SEMESTER**

**Course code: A2CE918PE**

**L T P C  
3 0 0 3**

**COURSE OBJECTIVES**

1. The study factors affecting pavement design,
2. The study factors material characteristics, design of flexible,
3. The study factors rigid pavements and low volume roads
4. The study the Fundamental Design Concepts. Stresses In Rigid Pavements
5. The study CBR and Modulus of Sub grade Reaction of Soil, Mineral aggregates

**COURSE OUTCOMES**

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

1. Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes
2. Analyze flexible pavements
3. Analyze rigid pavements
4. Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods
5. Design a rigid pavement using IRC, and AASHTO methods

**UNIT-I INTRODUCTION**

Factors Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chasis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

**UNIT –II STRESSES IN PAVEMENTS**

Stress Inducing Factors in Flexible and Rigid pavements. Stresses In Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts. Stresses In Rigid Pavements: Westergaard’s Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

**UNIT -III MATERIALS**

CBR and Modulus of Sub grade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.

**UNIT –IV DESIGN OF FLEXIBLE PAVEMENTS**

Flexible Pavement Design Concepts, Asphalt Institute’s Methods with HMA and other Base Combinations, AASHTO, IRC Methods Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, and Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

**UNIT-V DESIGN OF LOW VOLUME ROADS**

Pavement design for low volume roads, rural road designs – code of practice. Design of Overlays: Types of Overlays, Suitability, Design of overlays

**TEXT BOOKS**

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc

**REFERENCE BOOKS**

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Principles of Pavement Design, Yoder.J. & Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes for Flexible and Rigid Pavements design

**CODE OF PROVISIONS**

1. Code of Provisions: Design Codes: IRC 37,IRC 58

**MOOCS COURSE**

1. <https://swayam.gov.in/>
2. <https://onlinecourses.nptel.ac.in/>

**ENERGY EFFICIENT BUILDINGS  
(OPEN ELECTIVE - III)**

**IV-B.TECH II-SEMESTER**

**Course code: A2CE805OE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**UNIT-I**

Overview of the significance of energy use and energy processes in building - Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macro aspect of energy use in dwellings and its implications.

**UNIT-II**

Indoor environmental requirement and management - Thermal comfort - Ventilation and air quality - Airconditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

**UNIT-III**

Climate, solar radiation and their influences - Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

**UNIT-IV**

End-use, energy utilization and requirements - Lighting and day lighting - End-use energy requirements - Status of energy use in buildings Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer.

**UNIT-V**

Energy management options - Energy audit and energy targeting - Technological options for energy management.

**REFERENCE BOOKS:**

1. J. Krieder and A. Rabl, Heating and Cooling of Buildings - Design for Efficiency, McGraw Hill, 1994.
2. S.M. Guinness and Reynolds, Mechanical and Electrical Equipment for Buildings, Wiley, 1989.
3. A. Shaw, Energy Design for Architects, AEE Energy Books, 1991.
4. ASHRAE, Handbook of Fundamentals, Atlanta, 1997.
5. Donald W. Abrams, Low Energy Cooling – A Guide to the Practical Application of Passive Cooling and Cooling Energy Conservation Measures, Van Nostrand Reinhold Co., New York, 1986.

## **MULTI CRITERION DECISION MAKING (OPEN ELECTIVE - III)**

### **IV-B.TECH II-SEMESTER**

**Course code: A2CE806OE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

1. To help in understanding the differences between traditional decision making and structured decision making methods of selection process.
2. To help in learning the theory of decision making and their applications in traditional and modern business firms.
3. To help in improving the skills of using the MCDM tools and techniques, in critical thinking especially in appropriate decision making in manufacturing systems.

### **COURSE REQUIREMENTS:**

Students are expected to attend all sessions and arrive for class promptly. Students are allowed maximum six absences during this course. Mini project and all case studies must be submitted by their due dates.

### **UNIT-I**

Introduction to Structured Decision Making. Estimation of Weights: Normalization methods; Rating methods; Entropy method;

### **UNIT-II**

Analytical Hierarchy Process. Case Study-1: Criticality analysis of spare parts using the analytic hierarchy process. Case Study-2: Application of analytical network process for the evaluation of sustainable business practices in an Indian relays manufacturing organization. Case Study-3: Evaluating petroleum supply chain performance-Application of analytical hierarchy process to balanced scorecard.

### **UNIT-III**

Compromise Programming. Methods of Classification: ELECTRETRI; Kohonen Neural Networks; Cluster validity indices. Distance based MCDM methods: TOPSIS; Composite Programming. Case Study-4: Multicriteria selection of project managers by applying grey criteria. Case Study-5: Evaluation of buyer-supplier relationships using an integrated mathematical approach of interpretive structural modeling (ISM) and graph theoretic matrix.

### **UNIT-VI**

Outranking based MCDM methods: PROMETHEE-2; ELECTRE-3; ELECTRE-4. Utility Based MCDM Method: Multi-Attribute Utility Theory. Data Envelopment Analysis. Multi Criterion Q-Analysis-2; EXPROM2; STOPROM-2. Fuzzy Logic-Based Discrete MCDM Fuzzy TOPSIS. Case Study-6: Application of fuzzy VIKOR for concept selection in an agile environment. Case Study-7: Assessment of sustainability using multi-grade fuzzy approach. Fuzzy Programming Methods in MCDM.

### **UNIT-V**

Correlation Coefficient and Group Decision Making; Case Study-8: Selecting the advanced manufacturing technology using fuzzy multiple attributes group decision making with multiple fuzzy information. Case Study-9: A hybrid approach using ISM and fuzzy TOPSIS for the selection of reverse logistics provider; Case Study-10: A fuzzy multi-criteria group decision making framework for evaluating health-care waste disposal alternatives.

### **TEXT BOOKS:**

1. Raju K.S ., Nagesh Kumar D.,(2014). Multicriterion Analysis in Engineering and Management, Prentice Hall of India (PHI) Learning Pvt. Ltd, New Delhi.

**REFERENCE BOOKS:**

1. Dursun, M, Karsak, E. E.,Karadayi, M.A., (2011). A fuzzy multi-criteria group decision making framework for evaluating health-care waste disposal alternatives, *Expert Systems with Applications*,38,11453–11462.
2. Gajpal.P.P., Ganesh, L.S.,Rajendran, C., (1994). Criticality analysis of spare parts using the analytic hierarchy process, *International Journal of Production Economics*, 35, 293-297.
3. Jong Chuu, S, (2009). Selecting the advanced manufacturing technology using fuzzy multipleattributes group decision making with multiple fuzzy information, *Computers & Industrial Engineering*, 57, 1033–1042.

**ENVIRONMENTAL POLLUTION  
(OPEN ELECTIVE - III)**

**IV-B.TECH II-SEMESTER**

**Course code: A2CE807OE**

**L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

1. Understand the Air pollution Concepts
2. Identify the source of air pollution
3. Know Air pollution Control devices
4. Distinguish the Air quality monitoring devices

**UNIT – I**

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water – Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

**UNIT – II**

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation 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 – theory of chlorination, chlorine demand – other disinfection practices–Design of distribution systems–pipe appurtenances.

**UNIT – III**

characteristics of sewage –waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self-purification of rivers.

**UNIT – IV**

Waste water treatment plant – Flow diagram – primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

**UNIT – V**

Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior –Control of particulates – Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

**TEXT BOOKS**

1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
3. Environmental Engineering, I and II by BC Punmia, Std. Publications
4. Environmental Engineering, I and II by SK Garg, Khanna Publications
5. Environmental Pollution and Control Engineering CS Rao,Wiley Publications

**REFERENCE BOOKS:**

1. Water and Waste Water Technology by Steel, Wiley
2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2000