PONDICHERRY UNIVERSITY

Bachelor of Technology

Civil Engineering (CE)

For Affiliated Colleges

REGULATIONS, CURRICULUM AND SYLLABUS

(For Affiliated Colleges)

(2024 - 25)

PONDICHERRY UNIVERSITY

BACHELOR OF TECHNOLOGY PROGRAMMES

(EIGHT SEMESTERS)

REGULATIONS 2024-25

1. Conditions for Admission:

(a) **Candidates for admission to the first semester of the 8 semester B.Tech. Degree programme should be required to have passed:**

The Higher Secondary Examination of the (10+2) curriculum (Academic Stream) prescribed by the different State Boards/ Central Boards or any other examination equivalent there to with minimum of 45% marks (40% marks in case of candidates belonging to reserved category) in aggregate of subjects – Mathematics, Physics and any one of the following optional subjects: Chemistry / Biotechnology/ Computer Science / IT and equivalent/ Electronics/ Biology (Botany & Zoology).

b) Candidates for admission through Lateral entry into second year (third semester) of the 8 semester B.Tech. Degree programme should be required to have passed:

Passed Minimum THREE years / TWO years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) in ANY branch of Engineering and Technology.

OR

Passed B.Sc. Degree from a recognized University as defined by UGC, with at least 45% marks (40% marks in case of candidates belonging to reserved category) and passed 10+2 examination with Mathematics as a subject.

2. Age Limit:

The candidate should not have completed 21 years of age as on 1st July of the academic year under consideration. For Lateral Entry admission to second year of degree programme, there is no age limit. For SC/ST candidates, the age limit is relaxable by 3 years.

3. Duration of Programme:

The Bachelor of Technology degree programme shall extend over a period of 8 semesters spread over 4 academic years – two semesters constituting one academic year. The duration of each semester shall normally be 15 weeks excluding examinations.

4. Program Structure

The medium of instruction is English.

A student admitted to the B.Tech. Programme in a particular branch of engineering will earn the degree in that branch by fulfilling all the requirements prescribed in the regulations during the course of study.

The student is also permitted to opt for earning an **Honors degree in the same discipline of Engineering or a Minor degree** in another discipline of engineering in addition to the degree in his own discipline of engineering. The student will be allowed to exercise this option at the end of first year based on his academic performance in the first year. The students admitted through lateral entry can exercise this option at the end of third semester, based on the GPA scored in the third semester examination.

The student opting for B.Tech. Degree with **Honors or B.Tech. Degree with Minor** is required to earn additional 20 credits starting from the third semester. The students admitted in the second year through lateral entry and opting for Honors / Minor degree will earn the additional 20 credits starting from the fourth semester.

5. Eligibility for the award of B.Tech Degree:

No candidate shall be eligible for the award of the degree of Bachelor of Technology, unless he/she has undergone the course for a period of 8 semesters (4 academic years) / 6 semesters (3 academic years for Lateral Entry candidates) in the Faculty of Engineering and has passed the prescribed examinations in all the semesters. Details regarding the possible exit for a B.Tech. Student – in line with one of the goals of the National Education Policy (NEP) 2020 are provided in section 13.

6. Branches of Study:

Branch I - Civil Engineering

Branch II – Mechanical Engineering

Branch III - Electronics & Communication Engineering

Branch IV - Computer Science & Engineering

Branch V – Electrical & Electronics Engineering

Branch VI – Chemical Engineering

Branch VII - Electronics & Instrumentation Engineering

Branch VIII – Information Technology

Branch IX - Instrumentation & Control Engineering

Branch X – Biomedical Engineering

Branch XI - Robotics and Automation

Branch XII – Food Technology

Branch XIII- CSE (Internet of Things & Cyber security including Block chain Technology)

Branch XIV – Artificial Intelligence and Machine Learning

Branch XV - Artificial Intelligence and Data Science

or any other branch of study as and when offered. The branch allocation shall be ordinarily done at the time of admission of the candidate to the first semester.

7. Course Structure and Subjects of Study:

Definition of Credit:

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

Range of Credits: The total credits of all the branches for the four-year B. Tech. degree Programme shall be in the range of 160 to 172 (Minor variation is allowed as per AICTE guidelines). "Minor Degree or Honors will cumulatively require additional 20 credits in the specified area in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline".

The subjects of study shall include theory, practical courses and project work/internships as given in the curriculum and shall be in accordance with the prescribed syllabus.

The curriculum of every programme will have courses that are categorized as follows:

(i) Humanities, Social Sciences and Management Courses (HSM)

(ii) Basic Science Courses (BSC)

(iii) Engineering Science Courses (ESC)

(iv) Professional Core Courses (PCC)

(v) Professional Elective Courses (PEC)

(vi) Open Elective Courses (OEC)

(vii) Professional Activity Courses (PAC)

(viii) Mandatory Non-Credit Courses (MCC)

Each course will have either one or more of three components namely Lecture (L), Tutorial (T) and Practice (P). Each course is assigned credits as detailed below:

(i) Theory courses will carry either 3 or 4 credits - 3 credits for courses with 3 lecture periods per week and 4 credits for courses with 3 lecture periods and 1 tutorial period per week.

(ii) All Elective courses including online courses will carry maximum 3 credits. The student can earn the credits towards the Open Elective Courses (OEC) by completing the online courses offered in NPTEL anytime between third and seventh semester on prior approval of the courses by the Academic Courses Committee of the Institute. Credits earned through the NPTEL courses will be confined to 2 or 3 credits and subject to a maximum of 9 credits during the entire programme of study.

(iii) Practical courses will normally carry either 1 or 1.5 credits – 1.5 credits for courses with 3 practice periods per week and 1 credit for courses with 2 practice periods per week.

(iv) Out of total credits required for successful completion of the degree, 14 to 22 credits can be assigned for Project work and/or Internship.

(v) Mandatory non-credit courses carry zero credit.

8. Examinations:

The theory and practical examinations shall comprise continuous internal assessment throughout the semester in all subjects as well as university examinations conducted by Pondicherry University at the end of the semester (November / December or April / May).

8.1. Evaluation Scheme

All Credit courses are evaluated for 100 marks comprising of internal assessment and end-semester exam.

For Theory Course, the weightage of internal assessment is 40% and end semester examination is 60%

For Practical course, the weightage of internal assessment is 60% and end semester examination is 40%

For Project, the weightage of internal assessment is 60% and end semester examination is 40%

8.2. Internal Assessment (Theory)

Total Internal Assessment mark for a theory course is 40 marks. The breakup is as follows:

Criteria	Maximum Marks
a) Internal Assessment Tests	30
b) Percentage of Attendance	5
c) Assignment(s)	5
Total	**40**

Marks for Attendance is as follows:

Below 75%	0
75% - 80%	1
81% - 85%	2
86% - 90%	3
91% - 95%	4
96% - 100%	5

The Principal of the College/Institute schedules the Internal Assessment tests for all courses. All faculty members are expected to conduct this Internal Assessment tests for 1.30 hours duration and evaluate and required to upload the marks to the Controller of Examinations of University. Colleges are also requested to preserve the answer sheets of Internal Assessment tests until declaration of results by the University.

8.3. Internal Assessment (Practical's)

Faculty in-charge of Lab courses shall evaluate the practical course for 60 marks. The break up is as follows:

Criteria	Maximum Marks
a) Laboratory exercises and Record	30
b) Mid Semester exam (Average of 2 exams)	15
c) Internal Viva voce	5
d) Percentage of Attendance	10
Total	**60**

Marks for Attendance is as follows:

Below 75%	0
75% - 80%	2
81% - 85%	4
86% - 90%	6
91% - 95%	8
96% - 100%	10

8.4. Internal Assessment (Project)

The Project work carried out in the eighth semester shall be assessed as follows:

Criteria	Marks
a) Continuous assessment (Guide)	25
b) Project Evaluation Committee	35
Total	**60**

8.5 Requirement for appearing for University Examination

The Controller of Examinations (COE) of Pondicherry University schedules the End-Semester exams for all theory and practical courses based on the University academic calendar.

A detailed Exam Time Table shall be circulated to all Colleges at least 15 days before the start of exams. Question Papers shall be set externally based on BOS approved syllabus.

A candidate shall be permitted to appear for university examinations at the end of any semester only if:

i) He / She secures not less than 75% overall attendance arrived at by taking into account the total number of periods in all subjects put together offered by the institution for the semester under consideration.

(*Candidates who secure overall attendance greater than 60% and less than 75% have to pay a condonation fee as prescribed by University along with a medical certificate obtained from a medical officer not below the rank of Assistant Director*)

ii) He / She earns a progress certificate from the Head of the institution for having satisfactorily completed the course of study in all the subjects pertaining to that semester

iii) His / Her conduct is found to be satisfactory as certified by the Head of the institution.

A candidate who has satisfied the requirement (i) to (iii) shall be deemed to have satisfied the course requirements for the semester.

8.6 End Semester Exam Evaluation Pattern

Course	Maximum marks
a) Theory course (Sec A, Sec B and Sec C) Questions from all units of syllabus	60 marks
b) Practical course (Based on Lab exercises/Record/ Practical's /Viva)	40 marks
c) Internship /Project Work (Based on Seminar/Project Work/Project report/Presentation and viva voce)	40 marks

8.7 Consolidation of Marks and Passing Minimum

The Controller of Examinations of the University consolidates the Internal Assessment marks uploaded by the Colleges and marks secured by students in the end-semester examination.
A student shall be declared to have passed the examination in a subject of study only if he/she secures not less than **40% marks individually both in internal assessment and end-semester examination or an aggregate of 40%.**

A candidate who has been declared "Fail" in a particular subject may reappear for that subject during the subsequent semesters and secure pass marks. However, there is a provision for revaluation of failed or passed subjects provided he/she fulfils the following norms for revaluation.

a) Applications for revaluation should be filed within 15 days from the date of declaration of results or 7 days from the date of receipt of grade sheet whichever is earlier.
b) The candidate should have attended all the internal assessments conducted by the college as well as all the end semester examinations conducted by the University.
c) If a candidate has failed in more than two papers in the end semester examinations, his/her representation for revaluation will not be considered.

d) The request for revaluation must be made in the prescribed format duly recommended by the Head of the Institution along with the revaluation fee prescribed by the University.

"A student shall be declared to have passed the examination in a subject of study only if he/she secures not less than **40% marks individually both in internal assessment and end-semester examination, or an aggregate of 40%.**

8.8. Arrear Exams

A student who failed to secure 40% marks in aggregate is declared as "Fail" and he is eligible to take up a supplementary examination by registering to the said course in the following semester. All other candidates who failed due to shortage of attendance and those seeking to improve the grade shall repeat the course.

8.9. Letter Grades and Calculation of CGPA

Total Marks Secured by a student in each course shall be converted into a letter grade. The following Table shows the seven letter grades and corresponding meaning and the grade points for the calculation of Cumulative Grade Point Average (CGPA).

Each course (Theory/Practical) is to be assigned 100 marks, irrespective of the number of credits, and the mapping of marks to grades may be done as per the following table:

Range of Marks	Assigned Grade
91-100	A+
81-90	A
71-80	B+
61-70	B
51-60	C+
46-50	C
40-45	D
<40	F
Not Applicable	FR (Fail due to shortage of attendance and therefore, to repeat the course)

Note: -F- denotes failure in the course; - FR - denotes absent / detained as per AICTE norms. After the results are declared, grade sheets will be issued to the students. The grade sheets will contain the following details:

a) The college in which the candidate has studied.

b) The list of courses enrolled during the semester and the grades scored.

c) The Grade Point Average (GPA) for the semester and the Cumulative Grade Point Average (CGPA) of all enrolled subjects from first semester onwards.

d) GPA is the ratio of sum of the products of the number of credits (C) of courses registered and the corresponding Grades Points (GP) scored in those courses, taken for all the courses and sum of the number of credits of all the courses.

$$\mathbf{GPA = \Sigma(C \times GP)/ \Sigma C}$$

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. FR grades are to be excluded for calculating GPA and CGPA.

e) The conversion of CGPA into percentage marks is as follows

$$\mathbf{\% \ Mark = (CGPA - 0.5) \times 10}$$

9. Procedure for completing the B.Tech. Degree:

A candidate can join/re-join the course of study of any semester only at the time of its normal commencement and only if he/she has satisfied the course requirements for the previous semester and further has registered for the university examinations of the previous semester in all the subjects as well as all arrear subjects if any.

However, the entire B.Tech. Degree should be completed within 7 years (14 semesters) and six years (12 semesters) for students admitted under lateral entry.

10. Award of Class and Rank in B.Tech. Degree:

i) A candidate who satisfies the course requirements for all semesters and who passes all the examinations prescribed for all the eight semesters (six semesters for lateral entry candidates) within a maximum period of 7 years (6 years for lateral entry candidates) reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of B.Tech. Degree.

ii) A candidate who qualifies for the award of the B.Tech. Degree passing in all subjects pertaining to the semesters 3 to 8 in his/her first appearance within 6 consecutive semesters (3 academic years) and in addition secures a CGPA of 8.50 and above for the semesters 3 to 8 shall be declared to have passed the examination in **FIRST CLASS** with **DISTINCTION**.

iii) A candidate who qualifies for the award of the B.Tech. degree by passing in all subjects relating to semesters 3 to 8 within a maximum period of eight semesters after his/her commencement of study in the third semester and in addition secures CGPA not less than 6.5 shall declared to have passed the examination in **FIRST CLASS**.

iv) All other candidates who qualify for the award of B.Tech. Degree shall be declared to have passed the examination in **SECOND CLASS**.

v) For the Award of University ranks and Gold Medal for each branch of study, the CGPA secured from the 1st to 8th semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from the1st to 8th semester in the first attempt. Rank certificates would be issued to the first ten candidates in each branch of study.

11. Provisions for Honors/Minor degree along with B.Tech. Degree:

1. B.Tech. With Honors Degree in the same Engineering discipline

a. The student shall be given an option to earn an Honors degree in the same discipline of engineering at the end of first year based on his academic performance in the first year.

b. A student is eligible to exercise this option if he has passed all the subjects offered in the first year in the first attempt itself and has earned a CGPA of not less than 7.5.

c. Honors degree in a particular discipline of engineering shall be offered for a batch of students if and only if a minimum of 5 eligible students opt for it.

d. The student is required to earn an additional 20 credits (over and above the prescribed maximum credits in the curriculum) starting from the third semester onwards to become eligible for the award of Honors degree. 20 credits shall be earned by the student by completing 5 additional courses of 4 credits each, one in each of the 5 semesters starting from the third to seventh semester. The syllabus of these 5 courses are framed so as to cover advanced topics in that discipline of engineering.

e. The students admitted in the second year through Lateral Entry Scheme will also be given a chance to opt for Honors degree. Eligibility to avail this option is CGPA of 7.5 and above with no arrears in the third Semester. The student will join the existing batch of students in the fourth semester and earn 16 credits by registering the prescribed courses offered up to the seventh semester. The respective BoS will decide on a suitable course in lieu of the course offered in the third semester to facilitate the student to earn the remaining 4 credits.

f. A student is eligible to get the Honors degree only on completing the programme in 'First Class with Distinction' class.

g. A student can exercise the option to withdraw from the Honors degree at any time after entry.

h. Details about the courses completed and credits earned for Honors degree will appear only in the 'Eighth Semester Grade Sheet' and 'Consolidated Grade Sheet'. These details will be listed under the heading 'Credits Earned for Honors degree'. In the case of students who have either withdrawn from Honors degree or become ineligible for Honors degree by not securing 'First Class with Distinction', the credits earned for the courses registered and successfully completed for Honors degree will be listed under the heading 'Additional Credits Earned'.

i. The CGPA will be calculated for all the courses credited by the students inclusive of major and honors courses

j. Nomenclature of Honors Degree is 'B.Tech.(Honors) in XXX ', where XXX is Discipline in which the student has enrolled.

2. B.Tech. with Minor degree in another Engineering discipline

a) The student shall be given an option to earn a minor degree in another discipline of engineering of his choice at the end of first year based on his academic performance in the first year.

b) A student is eligible to exercise this option if he has passed all the subjects offered in the first year in the first attempt itself and has earned a CGPA of not less than 7.5.

c) Minor degree in a particular discipline of engineering shall be offered for a batch of students if and only if a minimum of 5 eligible students opt for it.

d) The student is required to earn an additional 20 credits (over and above the prescribed maximum credits in the curriculum) starting from the third semester onwards to become eligible

for the award of minor degree. 20 credits shall be earned by the student by completing 5 additional courses of 4 credits each, one in each of the 5 semesters starting from the third to seventh semester. The curricular content of these 5 courses are framed in such a way that that these courses will essentially cover the core minimum knowledge required to be fulfilled for award of degree in the discipline of engineering in which the student chooses to earn the minor degree.

e) The students admitted in the second year through Lateral Entry Scheme will also be given a chance to opt for Minor degree. Students with a CGPA of 7.5 and with no arrears in the third semester are eligible to avail this option. The student will join the existing batch of students in the fourth semester and earn 16 credits by registering for prescribed courses offered up to seventh semester. The respective BoS will decide on a suitable course in lieu of the course offered in the third semester to facilitate the student to earn the remaining 4 credits.

f) A student can exercise the option to withdraw from the Minor degree at any time after entry.

g) Details about the courses completed and credits earned for Minor degree will appear only in the 'Eighth Semester Grade Sheet' and 'Consolidated Grade Sheet'. These details will be listed under the heading 'Credits Earned for Minor degree'. In the case of students who have withdrawn from Minor degree, the credits earned for the courses registered and successfully completed for Minor degree will be listed under the heading 'Additional Credits Earned'.

h) Nomenclature of Minor Degree is 'B.Tech. in XXX with Minor in YYY', where XXX is Discipline in which the student is enrolled and YYY is Discipline which the student has opted as Minor.

i) The CGPA willbe calculated for all the courses credited by the students inclusive of major and minor courses.

12. Provision for withdrawal:

Based on the recommendation of the Head of the Institution, a candidate with valid reasons may be granted permission by the University to withdraw from writing the entire semester examination as one Unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire course. A candidate who has withdrawn is also eligible to be awarded DISTINCTION

provided he/she satisfies the other necessary conditions. But, they are not eligible to be awarded a rank.

13. Provisions for exit in B.Tech Course:

(For courses where AICTE specifies exit In the model curriculum)

The curriculum and the syllabus for all B.Tech programmes have been planned in compliance with the NEP guidelines proposed by AICTE. Accordingly, students joining B.Tech programmes shall have all benefits NEP offers in terms of exercising exit option during the course of study. Every B.Tech programme governed under this school board shall adopt the NEP guidelines, as and when proposed/amended by AICTE, and the following scheme will be applied for all such B.Tech programmes specified by AICTE.

NEP 2020 suggests that a student can exercise exits at multiple stages of the course of study. As per AICTE norms, a student can have two possible exits before the completion of the Full Engineering degree and may get a UG Diploma /Certificate or B.Sc. degree in the relevant discipline if he/she fulfils the following conditions:(Subject to change as per AICTE guidelines)

1. ***UG Diploma/Certificate in the relevant branch of study***

A student should be able to get a UG Diploma if he/she completes:

a. 50%of the credits for B.Tech.(80-85credits)
b. 50% of the program core courses
c. Students exiting the program after earning 50% credit requirements will be awarded a UG Diploma provided they secure an additional 6 credits through summer internships/apprenticeship of 2 months duration.
d. Students admitted through lateral entry cannot exercise the exit option as he will not be able to meet out the 50% Credits for B.Tech. degree.

2. ***B.Sc.in the relevant branch of study***

A student should be able to get a B.Sc. degree if he/she completes:

(i) 75% of the credits for B.Tech. (Minimum120 credits) and at least 3years in the program.

(ii) 100% of the core program courses.

(iii) Students exiting the program after earning 75% credit requirements will be awarded a B.Sc. provided they secure an additional 6 credits through 2 summer internships/apprenticeship for 2 months each.

(iv) With B.Sc. degree, the student is eligible for entry into programs which take B.Sc. degree as eligibility criteria.

2.1AwardofClassin B.Sc. Degree

A candidate who satisfies the course requirements for all semesters and who passes all the examinations within a maximum period of 6 years (5 years for lateral entry candidates) reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of B.Sc. degree in the relevant discipline.

i) A candidate who qualifies for the award of the B.Sc. degree passing in all subjects pertaining to semesters the 3 to 6 in his/her first appearance within 4consecutive semesters (2academic years) and in addition secures a CGPA of 8.50 and above for the semesters 3 to 6 shall be declared to have passed the examination in **FIRST CLASS** with **DISTINCTION**.

ii) A candidate who qualifies for the award of the B.Sc. degree bypassing in all subjects relating to semesters 3to6 within a maximum period of six semesters after his/her commencement of study in the third semester and in addition secures CGPA not less than 6.5 shall declared to have passed the examination in **FIRST CLASS.**

iii) All other candidates who qualify for the award of B.Sc. degree shall be declared to have passed the examination in **SECOND CLASS**.

3. *Re-entry to complete the program*

A student exiting with B.Sc. should be entitled to re-enrol in the programme of the same Engineering discipline. Only students admitted to the B.Tech. programme and exercised an exit option are eligible for readmission to the B.Tech. programme under the same discipline. It is suggested that all credits will be transferred, if the student enrols back within a limited period (3 years) of exiting. In case a student enrols after that, then the decision on

the transfer of credits should be based on the changes in the curriculum the student studied. A candidate after exit may rejoin the course only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees to the University. The total period of completion of the B.Tech. Course reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed 7 years, including of the period of discontinuance.

4. ***Completion Possibility in other Institutions***

A student can earn B.Sc. in one institution (Engineering) and complete the degree program in another institution (same Engineering discipline only).

(Note: If these exit options are accepted for multiple B.Tech. programs, it is suggested that AICTE actively communicate these to the industry and other bodies, so they recognize these and accept them as bona-fide credentials for the purposes of recruitment and/or eligibility for admission to programs, appearing in competitive examinations, etc.)

14. Revision of Regulations and Curriculum:

The University may from time-to time revise, amend or change the regulations of curriculum and syllabus as and when found necessary.

GENERAL COURSE STRUCTURE

&

CREDIT DISTRIBUTION

GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L)	1 Credit
1 Hr. Tutorial (T)	1 Credit
2 Hours Practical (P)	1 Credit

B. Range of Credits: In the light of the fact that a typical Model Four-year Under Graduate degree program in Civil Engineering has about 168 credits, the total number of credits proposed for the four- year B. Tech in Civil Engineering is kept as 168.

C. Structure of UG Program in CIVIL: The structure of UG program in Civil Engineering shall have essentially the following categories of courses with the breakup of credits as given:

S. No	Category	Credit Breakup	Percentage of Credit Breakup
1.	Humanities and Social Sciences including Management courses	9	5%
2.	Basic Science courses	28	17%
3.	Engineering Science courses including workshop, drawing, basics of electronics/ electrical/ mechanical/ computer etc.	18	11%
4.	Professional core courses	85	50%
5.	Professional Elective courses relevant to chosen specialization/branch	6	4%
6.	Open subjects – Electives from other technical and /or emerging subjects	3	2%
7.	Project work	19	11%
8.	Mandatory Courses – Audit Course [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)	–
Total		**168**	**100%**

D. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
C	Credits
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences Including Management Courses
PCC	Professional Core Courses
PEC	Processional Elective Courses
OEC	Open Elective Courses
MC	Mandatory Courses/Audit Course

□ **Course level coding scheme:** Three-digit number (odd numbers are for the odd semester courses and even numbers are for even semester courses) used as suffix with the Course Code for identifying the level of the course. Digit at hundred's place signifies the year in which course is offered. e.g.

101, 102 … etc. for first year.

201, 202 …. Etc. for second year.

301, 302 … for third year.

□ **Category-wise Courses**

HUMANITIES & SOCIAL SCIENCES COURSES [HS]

(i) Number of Humanities & Social Science Courses: 3

(ii) Credits: 9

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	HSMC-101	English	II	2	0	2	3
2.	HSMC-102	Universal Human Values	II	2	1	0	3
3.	HSMC-103	Humanities	V	3	0	0	3
Total Credits							**9**

BASIC SCIENCE COURSES [BSC]

(i) Number of Basic Science Courses: 7

(ii) Credits: 28

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	BSC-101	Physics	II	3	1	2	5
2.	BSC-102	Mathematics-I	I	3	1	0	4
3.	BSC-103	Chemistry	I	3	0	2	4
4.	BSC-104	Mathematics-II	II	3	1	0	4
5.	BSC-105	Biology for Engineers	I	2	0	2	3
6.	BSC-106	Engineering Mechanics	I	3	1	0	4
7.	BSC-107	Mathematics-III	III	3	1	0	4
Total Credits							**28**

ENGINEERING SCIENCE COURSES [ESC]

(i) Number of Engineering Science Courses: 6
(ii) Credits: 18

S. No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1	ESC-101	Basic Electrical Engineering	II	2	1	2	4
2	ESC-102	Engineering Graphics & Design	I	1	0	4	3

3	ESC-103	Design Thinking	I	0	0	2	1
4	ESC-104	Programming for Problem Solving	I	2	0	4	4
5	ESC-105	Digital Fabrication	II	0	0	4	2
6	ESC-106	Numerical Techniques	IV	3	1	0	4
						Total Credits	**18**

PROFESSIONAL CORE COURSES [PCC]

(i) Number of Professional Core Courses: 34
(ii) Credits: 85

S. No.	Course Code	Course Title	Preferred Semester	Hrs /Week L: T: P	Credits
1.	CET01	Engineering Geology	III	3:0:0	3
2.	CEP02	Engineering Geology Lab	III	0:0:2	1
3.	CET03	Building Technology	III	3:0:0	3
4.	CEP04	Building Planning and Drawing	III	0:0:2	1
5.	CET05	Surveying & Geomatics	III	3:0:0	3
6.	CEP06	Surveying Lab	III	0:0:2	1
7.	CET07	Basics of Solid Mechanics	III	3:1:0	4
8.	CET08	Concrete Technology	IV	3:0:0	3
9.	CEP09	Concrete& highway Engineering Lab	IV	0:0:2	1
10.	CET10	Fluid Mechanics and Machinery	IV	3:1:0	4
11.	CEP11	Fluid Mechanics and Machinery Lab	IV	0:0:2	1
12.	CEP12	Mechanics of Materials	IV	3:1:0	4
13.	CEP13	Materials Testing Lab	IV	0:0:2	1
14.	CET14	Water Supply Engineering	IV	3:0:0	3
15.	CET15	Structural Analysis	V	3:1:0	4
16.	CEP16	Computer Aided Design Lab	V	0:0:2	1
17.	CET17	Geotechnical Engineering	V	3:0:0	3
18.	CEP18	Geotechnical Engineering Lab	V	0:0:2	1
19.	CEP19	Highways Engineering	V	3:0:0	3
20.	CET20	Sewage Engineering	V	3:0:0	3
21.	CEP21	Environmental Engineering Lab	V	0:0:2	1
22.	CET22	Design of RCC structures	V	3:1:0	4
23.	CET23	Railways and Airport Engineering	VI	3:0:0	3
24.	CEP24	Transportation Engineering Lab	VI	0:0:2	1
25.	CEP25	Foundation Engineering	VI	3:1:0	4
26.	CET26	Municipal Solid Waste Management	VI	3:0:0	3

27.	CEP27	Estimation Costing and Valuation Engineering Lab	VI	2:0:2	3
28.	CEP28	Surveying Camp	VI	0:0:2	1
29.	CET29	Hydrology and Water Resources Engineering	VII	3:0:0	3
30.	CET30	Design of Steel Structures	VII	3:1:0	4
31.	CE31	Disaster Mitigation and Management	VII	3:0:0	3
32.	CEP32	Design and Drawing (RCC & steel)	VII	2:0:2	3
33.	CEP33	Internship	VII	0:0:2	1
34.	CET34	Construction Management	VIII	3:0:0	3
Total Credits					**85**

PROFESSIONAL ELECTIVE COURSES [PEC]
(i) Number of Professional Elective Courses: 2
(ii) Credits: 6

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	PEC01	Professional Elective-I	VII	3	0	0	3
2.	PEC02	Professional Elective-II	VIII	3	0	0	3
Total Credits							**6**

ELECTIVE COURSES

1. PROFESSIONAL ELECTIVE COURSES

LIST OF PROFESSIONAL ELECTIVES COURSES - PEC

CODE	TITLE
CEE01	DESIGN OF PRESTRESSED CONCRETE STRUCTURES
CEE02	COASTAL ENGINEERING
CEE03	SAFETY PRACTICES IN CONSTRUCTION
CEE04	CONSTRUCTION METHODS AND EQUIPMENT
CEE05	REMOTE SENSING AND GIS
CEE06	UNDER GROUND STRUCTURES
CEE07	AIR AND NOISE POLLUTION
CEE08	FAILURE ASSESSMENT AND REHABILITATION OF STRUCTURES
CEE09	BRIDGE ENGINEERING
CEE10	DESIGN AND CONSTRUCTION OF PREFABRICATED STRUCTURES
CEE11	EARTHQUAKE RESISTANT DESIGN OF STRUCTURES
CEE12	DESIGN OF INDUSTRIAL STRUCTURES
CEE13	FORMWORK FOR CONCRETE STRUCTURES
CEE14	IRRIGATION AND DRAINAGE ENGINEERING

2. LIST OF OPEN ELECTIVES COURSES - OEC

CODE	TITLE
CEO01	BUILDING LIGHTING AND VENTILATION ENGINEERING
CEO02	GREEN BUILDING DESIGN
CEO03	FINITE ELEMENT ANALYSIS
CEO04	SELECTION OF MATERIALS
CEO05	TESTING OF MATERIALS
CEO06	INDUSTRIAL EFFLUENT TREATMENTS

3. MINOR (MI)

Students who have registered for B.Tech. (Minor) in Construction Engineering and Management can opt to study Minimum 5 out of the courses listed below. Students from non-circuit branches alone can opt for this Minor Programme.

CODE	TITLE
CEM01	ENGINEERING GEOLOGY
CEM02	BUILDING TECHNOLOGY
CEM03	CONCRETE TECHNOLOGY
CEM04	WATER SUPPLY ENGINEERING
CEM05	HIGHWAYS ENGINEERING
CEM06	RAILWAYS AND AIRPORT ENGINEERING
CEM07	CONSTRUCTION METHODS AND EQUIPMENTS
CEM08	SAFETY PRACTICES IN CONSTRUCTION
CEM09	AIR AND NOISE POLLUTION
CEM10	IRRIGATION AND DRAINAGE ENGINEERING

4. ADVANCED LEVEL COURSES FOR B.Tech. (HONOURS)

Students who have registered for B.Tech. (Honours) in Construction Engineering and Management can opt to study Minimum 5 out of the courses listed below. Department Students alone can opt for this Honours Programme.

CODE	TITLE
CEH01	MECHANICS OF MATERIALS
CEH02	ADVANCED RCC STRUCTURES
CEH03	FINITE ELEMENT ANALYSIS
CEH04	REMOTE SENSING AND GIS
CEH05	GEOTECHNICAL PROCESSES AND APPLICATION
CEH06	DESIGN AND CONSTRUCTION OF PREFABRICATED STRUCTURES
CEH07	FORMWORK FOR CONCRETE STRUCTURES
CEH08	COASTAL ENGINEERING
CEH09	ADVANCED STRUCTURAL ANALYSIS
CEH10	ADVANCED STEEL DESIGN

OPEN ELECTIVE COURSES [OEC]

(i) Number of Open Elective Courses: 1
(ii) Credits: 3

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	OEC01	Open Elective-I	VI	3	0	0	3
						Total Credits	**3**

PROJECTS

(i) Number of Courses: 4
(ii) Credits: 19

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	PRJ CE101	Micro Project	IV	0	0	4	2
2.	PRJ CE102	Mini Project	VI	0	0	6	3
3.	PRJ CE103	Project Phase- I	VII	0	0	4	2
4.	PRJ CE104	Project Phase -II	VIII	0	0	24	12
						Total Credits	**19**

MANDATORY/AUDIT COURSES [MC]

(i) Number of Mandatory/Audit Courses: 5

(ii) Credits: 0

S.No	Code No.	Course Title	Semester	Hours per week			Total Credits
				Lecture	Tutorial	Practical	
1.	MC101	Sports and Yoga or NSS/NCC	II	2	0	0	0
2.	MC102	Life Skills/ Languages	III	2	0	0	0
3.	MC103	Environmental Science	III	3	0	0	0
4.	MC104	Management (Organizational Behavior / Finance & Accounting)	IV	1	0	0	0
5.	MC105	Professional Practice, Law and Ethics	VI	2	0	0	0
						Total Credits	**0**

SEMESTER WISE STRUCTURE

I Semester

S. No.	Subject Code	Subjects	Category	Periods			Credits	Marks		
				L	T	P		IA	UE	TM
Induction Program for 3Weeks (Including UHV-II)										
Theory										
01	T101	Mathematics– I	BSC	3	1	0	04	40	60	100
02	T102	Engineering Chemistry	BSC	3	0	2	04	40	60	100
03	T103	Biology for Engineers	BSC	3	0	0	03	40	60	100
04	T104	Engineering Mechanics	ESC	3	1	0	04	40	60	100
Practical										
05	P101	Design Thinking	ESC	0	0	2	01	60	40	100
06	P102	Engineering Graphics & Design	ESC	1	0	4	03	60	40	100
07	P103	Programming for Problem Solving	ESC	2	0	4	04	60	40	100
08	MCP104	Idea Lab Workshop	ESC	2	0	4	0	0	0	0
Total				**17**	**2**	**16**	**23**	**340**	**360**	**700**

II Semester

S. No.	Subject Code	Subjects	Category	Periods			Credits	Marks		
				L	T	P		IA	UE	TM
Theory										
01	T105	Mathematics–II	BSC	3	1	0	04	40	60	100
02	T106	Basic Electrical and Electronics Engineering	ESC	3	0	2	04	40	60	100
03	T107	Engineering Physics	BSC	3	1	2	05	40	60	100
04	T108	Communicative English	HSMC	3	0	0	03	40	60	100
05	T109	Universal HumanValues-2	HSMC	3	0	0	03	40	60	100
Practical										
06	P105	Digital Fabrication/Workshop/ Manufacturing Practices.	ESC	0	0	4	2	60	40	100
07	MCP 106	Sports and Yoga or NSS/NCC	MC	2	0	0	0	0	0	0
Total				**17**	**2**	**8**	**21**	**260**	**340**	**600**

III Semester

S. No.	Subject Code	Subjects	Category	Periods			Credits	Marks		
				L	T	P		IA	UE	TM
Theory										
01	MAT31	Mathematics-III	BSC	3	1	0	4	40	60	100
02	CET32	Engineering Geology	PCC	3	0	0	3	40	60	100
03	CET33	Building Technology	PCC	3	0	0	3	40	60	100
04	CET34	Basics of Solid Mechanics	PCC	3	1	0	4	40	60	100
05	CET35	Surveying & Geomatics	PCC	3	0	0	3	40	60	100
06	MCT201	Environmental Science	MC	3	0	0	0	0	0	0
Practical										
07	CEP31	Engineering Geology Lab	CEP	0	0	2	1	60	40	100
08	CEP32	Building Planning and Drawing	CEP	0	0	2	1	60	40	100
09	CEP33	Surveying Lab	CEP	0	0	2	1	60	40	100
Total				**18**	**2**	**6**	**20**	**380**	**420**	**800**

IV Semester

S.No.	Subject Code	Subjects	Category	Periods			Credits	Marks		
				L	T	P		IA	UE	TM
Theory										
01	MAT41	Numerical Techniques	BSC	3	1	0	4	40	60	100
02	CET42	Concrete Technology	PCC	3	0	0	3	40	60	100
03	CET43	Mechanics of Materials	PCC	3	1	0	4	40	60	100
04	CET44	Fluid Mechanics and Machinery	PCC	3	1	0	4	40	60	100
05	CET45	Water Supply Engineering	PCC	3	0	0	3	40	60	100
06	MCT202	Management (Organizational Behavior / Finance &Accounting)	MC	1	0	0	0	0	0	0
Practical										
07	CEP41	Concrete & Highway Engineering Lab	CEP	0	0	2	1	60	40	100
08	CEP42	Material Testing Lab	CEP	0	0	2	1	60	40	100
09	CEP43	Fluid Mechanics & Machineries Lab	CEP	0	0	2	1	60	40	100
10	CEPRJ44	Micro Project	PRJ	0	0	4	2	60	40	100
Total				**16**	**3**	**10**	**23**	**440**	**460**	**900**

V Semester

S.No.	Subject Code	Subjects	Category	Periods			Credits	Marks		
				L	T	P		IA	UE	TM
Theory										
01	CET51	Design of RCC Structures	PCC	3	1	0	4	40	60	100
02	CET52	Structural Analysis	PCC	3	1	0	4	40	60	100
03	CET53	Geotechnical Engineering	PCC	3	0	0	3	40	60	100
04	CET54	Highways Engineering	PCC	3	0	0	3	40	60	100
05	CET55	Sewage Engineering	PCC	3	0	0	3	40	60	100
06	HSMCT56	Total Quality Management	HSMC	3	0	0	3	40	60	100
Practical										
07	CEP51	Computer Aided Design Lab	CEP	0	0	2	1	60	40	100
08	CEP52	Geotechnical Engineering Lab	CEP	0	0	2	1	60	40	100
09	CEP53	Waste Water Analysis Lab	CEP	0	0	2	1	60	40	100
Total				**18**	**2**	**6**	**23**	**420**	**480**	**900**

VI Semester

S.No.	Subject Code	Subjects	Category	Periods			Credits	Marks		
				L	T	P		IA	UE	TM
Theory										
01	CET61	Foundation Engineering	PCC	3	1	0	4	40	60	100
02	CET62	Railways and Airport Engineering	PCC	3	0	0	3	40	60	100
03	CET63	Municipal Solid Waste Management	PCC	3	0	0	3	40	60	100
04	OET 64	Open Elective- II	OEC	3	0	0	3	40	60	100
05	MCT301	Professional Practice, Law and Ethics	MC	2	0	0	0	0	0	0
Practical										
06	CEP61	Transportation Engineering Lab	CEP	0	0	2	1	60	40	100
07	CEP62	Estimation Costing and Valuation Engineering Lab	CEP	2	0	2	3	60	40	100
08	CESP63	Surveying Camp *	SCC	0	0	2	1	100	-	100
09	CEPRJ64	Mini Project	MPC	0	0	6	3	100	-	100
Total				**16**	**1**	**12**	**21**	**480**	**320**	**800**

* The Survey camp will be conducted at the end of V semester winter vacation.

VII Semester

S. No.	Subject Code	Subjects	Category	Periods			Credits	Marks		
				L	T	P		IA	UE	TM
Theory										
01	CET71	Design of Steel Structures	PCC	3	1	0	4	40	60	100
02	CET72	Hydrology and Water Resources Engineering	PCC	3	0	0	3	40	60	100
03	CET73	Disaster Mitigation and Management	PCC	3	0	0	3	40	60	100
04	PET74	Professional Elective-I	PEC	3	0	0	3	40	60	100
Practical										
05	CEP71	Design and Drawing (RCC & Steel)	CEP	2	0	2	3	60	40	100
06	CEP72	Internship	CEP	0	0	2	1	100	-	100
07	CEPW73	Project Phase-I	CEPRO	0	0	4	2	100	-	100
Total				**14**	**1**	**8**	**19**	**420**	**280**	**700**

VIII Semester

S. No.	Subject Code	Subjects	Category	Periods			Credits	Marks		
				L	T	P		IA	UE	TM
Theory										
01	CET81	Construction management	PCC	3	0	0	3	40	60	100
02	PET82	Professional Elective-II	PEC	3	0	0	3	40	60	100
Practical										
03	CEPW81	Project Phase-II	CEPRO	0	0	24	12	60	40	100
Total				**6**	**0**	**24**	**18**	**140**	**160**	**300**

LIST OF PROFESSIONAL ELECTIVES COURSES-PEC (7th to 8th Semester)

CODE	TITLE
CEE01	DESIGN OF PRESTRESSED CONCRETE STRUCTURES
CEE02	COASTAL ENGINEERING
CEE03	SAFETY PRACTICES IN CONSTRUCTION
CEE04	CONSTRUCTION METHODS AND EQUIPMENT
CEE05	REMOTE SENSING AND GIS
CEE06	UNDER GROUND STRUCTURES
CEE07	AIR AND NOISE POLLUTION
CEE08	FAILURE ASSESSMENT AND REHABILITATION OF STRUCTURES
CEE09	BRIDGE ENGINEERING
CEE10	DESIGN AND CONSTRUCTION OF PREFABRICATED STRUCTURES
CEE11	EARTHQUAKE RESISTANT DESIGN OF STRUCTURES
CEE12	DESIGN OF INDUSTRIAL STRUCTURES
CEE13	FORMWORK FOR CONCRETE STRUCTURES
CEE14	IRRIGATION AND DRAINAGE ENGINEERING

LIST OF OPEN ELECTIVES COURSES-OEC (6th Semester)

CODE	TITLE
CEO01	BUILDING LIGHTING AND VENTILATION ENGINEERING
CEO02	GREEN BUILDING DESIGN
CEO03	FINITE ELEMENT ANALYSIS
CEO04	SELECTION OF MATERIALS
CEO05	TESTING OF MATERIALS
CEO06	INDUSTRIAL EFFLUENT TREATMENTS

SYLLABUS

SEMESTER–I

FIRST SEMESTER

Department : Civil Engineering		Programme : B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T101	**MATHEMATICS– I**	3	1	0	4	40	60	100

Objective (s)

- To comprehend the mathematical concepts of matrices, ordinary differential equations, multivariable calculus and problem-solving.
- To formulate and solve first-order and higher-order ordinary differential equations. They will be equipped with techniques for solving exact equations
- To proficient in partial differentiation of functions of multiple variables, including finding higher-order partial derivatives and solving implicit differentiation problems
- To gain the ability to perform double and triple integrations in Cartesian, polar, cylindrical, and spherical coordinates
- To apply vector calculus concepts, including gradient, divergence, curl, and directional derivatives, to analyse vector fields.

Module– I **Linear Algebra (Matrices)** Total Hours: 12

Rank of a matrix, Consistency of a system of linear equations, Characteristic equation of a matrix, Eigen values and Eigenvectors–Properties of Eigen values and Eigen vectors, Cayley-Hamilton theorem (excluding proof) verification– Application (Finding Inverse and Power of a matrix), Diagonalization of matrix by orthogonal and similarity transformation, Quadratic form–Nature of Quadratic Form–Orthogonal reduction of quadratic form to canonical form.

Module – II **Ordinary Differential Equations** Total Hours: 12

Differential Equations of First Order- Exact equations -Leibnitz's linear equations-Bernoulli's equation - Equations solvable for p - Clairaut's equation, Differential equations of Higher order - Linear differential equations of higher order with constant coefficients -Euler's linear equation of higher order with variable coefficients - Method of variation of parameters.

Module – III **Multi Variable Calculus (Differentiation)** Total Hours: 12

Partial differentiation–Partial derivatives of first order and higher order–Partial differentiation of implicit functions – Euler's theorem on homogeneous functions – Total derivative, Jacobian – Properties of Jacobian, Taylor's series for functions of two variables, Maxima and minima of functions of two variables.

Module -IV **Multi Variable calculus (Multiple Integrals)** Total Hours: 12

Double integration (Cartesian form and Polar form) – constant limits – variable limits – overtheregionR,changeofvariablesindoubleintegrals(Cartesiantopolar),Applicationofdoubleintegral - Area by double integration, Change of Order of Integration, Triple Integration(Cartesian – Spherical and Cylindrical) – constant limits – variable limits – over the region R, Application of triple integral-Volume by triple integration.

Module - V **Multi Variable Calculus (Vector Calculus)** Total Hours: 12

Vector Differential Operator, Gradient – Properties, Directional derivative, Divergence andcurl– Properties and relations, Solenoidal and Irrotational vector fields, Line integral and Surface integrals –Integral Theorems (excluding Proof) – Green's theorem–Stoke's theorem–Gauss divergence theorem

Lecture Periods: 45 **Tutorial Periods: 15** **Practical Periods:-** **Total Periods:60**

Course Outcome

1.To solve practical problems using Matrix algebra.
2.To solve various types of ordinary differential equations, including higher-order linear equation.
3.To compute partial derivatives, determine total derivatives, Jacobians, employ Taylor series, and find extremes of functions of two variables.

	4.To demonstrate proficiency in evaluating double integration and triple integration and using them to compute area and volume. 5.To apply Green's theorem, Stoke's theorem and Gauss divergence theorem

Text Books

1. Reena Garg, Mathematics-I (Calculus & Linear Algebra), Khanna Book Publishing Co., 2023
2. Reena Garg, Engineering Mathematics, Khanna Book Publishing Company, 2022.
3. Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2021

Reference Books

1. GrewalB.S., "HigherEngineering Mathematics", Khanna Publishers, NewDelhi, 43rdEdition, 2014.
2. RamanaB.V., "HigherEngineeringMathematics",TataMcGraw-Hill,NewDelhi,2010.
3. BaliN.PandManishGoyal., "ATextBookofEngineeringMathematics",LaxmiPublications(P)Ltd,2011.
4. ErwinKreyszig, AdvancedEngineeringMathematics(9thEd), JohnWiley&Sons, NewDelhi,2011

Department : Civil Engineering		Programme : B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T102	**ENGINEERING CHEMISTRY**	3	0	2	4	40	60	100

Objective (s)	• *Understand the unique properties and molecular structure of water.* • *Study the classification, synthesis, and applications of polymers.* • *Learn the fundamentals and applications of electrochemical cells.* • *Apply the phase rule to analyze multi-component systems.* • *Grasp the concepts and applications of vector differential operators.*

Module– I	**Water**	Total Hours: 15

Water-Hardness of water – units and calcium carbonate equivalent. Determination of hardness of water-EDTA method. Disadvantages of hardwater-boiler scale and sludge, caustic embrittlement, priming & foaming and boiler corrosion. Water softening method – internal & external conditioning– lime-soda process, zeolite process and ion exchange process. Desalination–reverse osmosis&electro dialysis.

Module – II	**Polymers**	Total Hours: 15

Polymers- Classification, types of polymerization reactions – mechanism of radical, ionic and Ziegler-Natta polymerizations. Polymer properties – Chemical resistance, crystallinity and effect of temperature, Mn and Mw. Thermoplastics and thermosets. Preparation, properties and uses of PVC, TEFLON, Nylons, Bakelite, Polyurethane, rubber–vulcanization, syntheticrubber, BuNa-S, BuNa-N, Silicone and butyl rubber.
Conducting Polymers- classification and applications. Polymercomposites– FRP– laminar composites. Moulding constituents of plastics, moulding techniques – compression, injection, transfer and extrusion moulding.

Module – III	**Electrochemical cells**	Total Hours: 15

Electrochemical cells- Galvanic cell, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes - hydrogen, calomel, Ag/AgCl & glass electrodes. Batteries - primary and secondary cells, Leclanché cell, Lead acid storage cell, Ni-Cd battery & alkaline battery. Fuel cells– H_2- O_2 fuel cell.

Module -IV	**Phase rule**	Total Hours: 15

Phase rule- Definition and derivation of phase rule. Application to one component system-water and sulphur systems. Thermalanalysis, condensed phase rule. Two component systems-Pb-Ag, Cu-Ni and Mg-Zn systems.

Module - V	**Vector Differential Operator**	Total Hours: 15

Vector Differential Operator, Gradient – Properties, Directional derivative, Divergence andcurl– Properties and relations, Solenoidal and Irrotational vector fields, Line integral and Surface integrals –Integral Theorems (excluding Proof) – Green's theorem–Stoke's theorem–Gauss divergence theorem

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods: 30** **Total Periods:75**

Course Outcome	1. Explain water's role in chemical and biological processes. 2. Classify and describe the synthesis and uses of polymers. 3. Solve problems involving electrochemical cells and their potentials. 4. Use the phase rule to predict phase behavior in systems. 5. Apply vector differential operators in physics and engineering problems.

Text Books

1. P.C.Jainand Monika Jain, Engineering Chemistry, Dhanpat Rai and Sons,NewDelhi15th Ed,2010.

Reference Books

1. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 2016.
2. S.S. Dara and S.S Umare, A Textbook of Engineering Chemistry, S. Chand & Co., Ltd. New Delhi, 2013.
3. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S. Chand and Company Ltd, New Delhi, 2016
4. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, S. Chand and Company Ltd, New Delhi, 2011
5. S. S. Dara, A Textbook of Engineering Chemistry, 11th Ed, S. Chand & Co., Ltd. NewDelhi,2008.
6. B.K.Sharma, Engineering Chemistry,3rdeditionKrishnaPrakashanMedia(P)Ltd.,Meerut,2001.
7. P.KannanandA.RaviKrishnan"EngineeringChemistry"HiTechSriKrishnaPublications, Chennai,9th Ed,2009.
8. N.Krishnamurthy,P.Vallinayagam and D.Madhavan,EngineeringChemistry,2ndEd,PHILearningPVT.,LTD,NewDelhi,2008.

CHEMISTRY LAB (Lab-30hrs)

OBJECTIVES

- *To gain a practical knowledge of engineering chemistry in relevance to Industrial applications.*

LIST OF EXPERIMENTS (ANY 10 EXPERIMENTS)

1. Determination of dissolved oxygen in water.
2. Determination of total hardness of water by EDTA method.
3. Determination of carbonate and bicarbonate in water.
4. Estimation of chloride content in water.
5. Estimation of magnesium by EDTA.
6. Estimation of acetic acid in vinegar.
7. Estimation of ferrous by permanganometry.
8. Estimation of ferrous and ferric iron in a solution mixture by dichrometry.
9. Estimation of available chlorine in bleaching powder.
10. Estimation of copper in copper sulphate solution.
11. Estimation of calcium by permanganometry.
12. Estimation of iron by colorimetry.

DEMONSTRATION EXPERIMENTS (ANY TWO OF THE FOLLOWING)

1. Determination of COD of water sample.
2. Determination of lead by conductometry.
3. Percentage composition of sugar solution by viscometry.

Department : Civil Engineering		Programme : B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T103	**BIOLOGY FOR ENGINEERS**	3	0	0	3	40	60	100

Objective (s)	• *To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.* • *To convey that classification perse is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.* • *To convey that "Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment.* • *How to analyses biological processes at the reductionistic level.* • *The fundamental principles of energy transactions are the same in physical and biological world.*

Module– I	**Classification**	Total Hours: 9

(a) cellularity-Unicellular or multicellular (b) ultra-structure prokaryotes or eukaryotes (c)Energy and Carbon- utilisation-Autotrophs, heterotrophs, lithotropes (d)Ammonia excretion–aminotelic, uricoteliec, ureotelic (e)Habitats- acquatic or terrestrial (f)Molecular taxonomy three major kingdoms of life.

Module – II	**Genetics**	Total Hours: 9

Mendel's laws, Concept of segregation &independent assortment. Concept of allele. Recessiveness, and dominance. Single gene disorders in humans–Sickle cell disease, Phenylketonuria.

Module – III	**Biochemistry**	Total Hours: 9

Types, Structural & functional importance. Lipids: Classification - Simple, compound, & derived, Importance of lipid soluble vitamins. Amino acids – general structure, essential amino acids. Proteins-Levels of protein structure, structural & functional importance of proteins, Enzymes- Definition, Enzyme Activity & Units, Specific Activity, Specificity, Factors affecting enzyme activity. Nucleic acids: Types and importance.

Module -IV	**Food chain**	Total Hours: 9

Introduction: Food chain & energy low. Definitions Anabolism Catabolism. Photosynthesis: Reaction and importance. Glycolysis & TCA cycle. ATP–the energy currency of cells.

Module - V	**Microbiology**	Total Hours: 9

Concept of single celled organisms. Concept of species & strains. Identification & classification of microorganisms. Virus– Definition, types, examples.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods:45

Course Outcome	1. Recognize Biology as a core scientific discipline alongside Mathematics, Physics, and Chemistry 2. Understand biological classification through morphological, biochemical, and ecological criteria. 3. Grasp Mendelian genetics as foundational to Biology, akin to Newton's laws in Physical Sciences. 4. Analyze biological processes using reductionistic methods for deeper understanding. 5. Apply the principles of energy transactions consistently across physical and biological sciences.

Text Books/Reference Books

1. Biology:Aglobalapproach:Campbell,N.A.;Reece,J.B.;Urry,Lisa;Cain,M,L.;Wasserman,S.A.; Minorsky,P.V.;Jackson,R.B.PearsonEducationLtd
2. General Biology, Uma Devi Koduru, Khanna Book Publishing Company.
3. OutlinesofBiochemistry,Conn,E.E;Stumpf,P.K;Bruening,G;Doi,R.H.JohnWileyandSons
4. PrinciplesofBiochemistry(VEdition),ByNelson,D.L.;andCox,M.M.W.H.Freeman and Company
5. Molecular Genetics (Secondedition), Stent,G.S.;and Calender,R.W.H.Freemanand company,DistributedbySatishKumarJainforCBSPublisher.
6. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

Department : Civil Engineering		Programme: B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T104	**ENGINEERING MECHANICS**	3	1	0	4	40	60	100

Objective (s)

- *To understand the vector and scalar representation of forces and moments, static equilibrium of particles and rigid bodies in two dimensions.*
- *To comprehend the effect of friction on equilibrium*
- *To understand the laws of motion*
- *To understand the kinematics of motion and the interrelationship and to learn to write the dynamic equilibrium equation*
- *To emphasis the concepts through solved examples*

Module– I **FUNDAMENTAL OF MECHANICS** Total Hours: 12

Basic Concepts Force System and Equilibrium, Definition of force, Moment and Couple, Principle of Transmissibility, Varignon's theorem, Resultant of force system–Concurrent and non-concurrent coplanar forces, Condition of static equilibrium for coplanar force system, stability of equilibrium, applications in solving the problems on static equilibrium of bodies.

Module – II **PRACTICAL APPLICATION OF FORCE SYSTEM** Total Hours: 12

Structural member: Definition, degree of freedom, concept of free body diagrams, types of supports and reactions, types of loads, Analysis of trusses-method of joints, method of sections. Friction: Introduction, Static dry friction, simple contact friction problems, ladders, wedges.

Module – III **PROPERTIES OF SURFACES** Total Hours: 12

Properties of sections – area, centroids of lines, areas and volumes, moment of inertia first moment of inertia, second moment of inertia and product of moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.

Module -IV **KINEMATICS AND KINETICS OF PARTICLES** Total Hours: 12

Equations of motion – Rectilinear motion, curve linear motion, relative motion, D'Alembert's principle, work-Energy equation–conservative forces and principle of conservation of energy, Impulse –momentum, Impact– Direct central impact and oblique central impact.

Module - V **KINEMATICS AND KINETICS OF RIGID BODIES** Total Hours: 12

Plane motion, absolute motion, Relative motion, translating axes and rotating axes, work and energy, impulse and momentum.

Lecture Periods: 45 **Tutorial Periods: 15** **Practical Periods:-** **Total Periods:60**

Course Outcome

1. Demonstrate a strong understanding of the fundamental principles of mechanics.
2. Apply force systems to solve practical engineering problems.
3. Analyze and calculate the properties of surfaces, such as centroids and moments of inertia.
4. Solve kinematic and kinetic problems involving the motion of particles.
5. Apply kinematic and kinetic principles to analyze the motion of rigid bodies.

Text Books

1. Rajesekaran.S and SankaraSubramanian.,G., EngineeringMechanics, Vikas Publishing House Private Ltd., 2012.

Reference Books

1. Palanichamy, M.S.Nagan,S., Engineering Mechanics–Statics & Dynamics, TataMcGraw-Hill,2011.
2. Timoshenko, S., Young, D.H., Rao, J.V. and SukumarPati, Engineering Mechanics, Fifth edition, McGraw Hill Education (India) Pvt. Ltd., 2013.

3. Beer, F.P and Johnson Jr.E.R, Vector Mechanics for Engineers, Vol.1 Statics and Vol.2 Dynamics, McGraw–Hill International Edition, 1997.
4. Bhavikatti,S.S and K.G.Rajashekarappa, Engineering Mechanics, New Age International (p) Ltd, NewDelhi,2010.
5. Bhavikatti,S.S and Rajashekarappa,K.G., Engineering Mechanics, New Age International (P) Ltd, New Delhi, 2013.

Department : Civil Engineering		Programme: B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
P101	**DESIGN THINKING LAB**	0	0	2	1	60	40	100

Objective (s)	• *To provide the new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career.* • *Understanding the emotions.* • *Study the creative thinking* • *To understand the prototype* • *To study the customer challenges*

Module– I	**Process of Learning**	Total Hours: 6

An Insight to Learning- Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting.
Remembering Memory- Understanding the Memory process, Problems in retention, Memory enhancement techniques.

Module – II	**Emotions and Basics of Design Thinking**	Total Hours: 6

Emotions: Experience & Expression- Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers.
Basics of Design Thinking- Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test.

Module – III	**Creative thinking**	Total Hours: 6

Being Ingenious & Fixing Problem-Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving.
Process of Product Design-Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment– Engineering Product Design.

Module -IV	**Prototype**	Total Hours: 6

Prototyping & Testing- What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing.
Celebrating the Difference-Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences.

Module - V	**Customer challenges**	Total Hours: 6

Design Thinking & Customer Centricity-Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design.
Feedback, Re-Design & Re-Create- Feedback loop, Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – "Solving Practical Engineering Problem through Innovative Product Design & Creative Solution".

Lecture Periods:- **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome	1. Clearance in learning process 2. Dealing with the emotions 3. Thinking creatively for any situation 4. Analysis of prototypes 5. Thorough knowledge of dealing customer challenges.

Text Books/ Reference Books

1. E. Balaguruswamy(2022), Developing Thinking Skills (The way to Success), Khanna Book, PublishingCompany.

Department : Civil Engineering		Programme: B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
P102	**ENGINEERING GRAPHICS & DESIGN**	1	0	4	3	60	40	100

Objective(s)	▪ To convey the basics of engineering drawing ▪ To explain the importance of an engineering drawing ▪ To each different methods of making the drawing ▪ To explain the role of computer aided design AutoCAD ▪ To develop an intuitive understanding of underlying significance of using these drawings.

Module– I	**Introduction**	Total Hours: 15
Introduction to Standards for Engineering Drawing practice, Lettering, Linework and Dimensioning. Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and planes.		
Module – II	**Solids**	Total Hours: 15
Projection of Solids and Sections of solids.		
Module – III	**Types of Intersections**	Total Hours: 15
Development of surfaces –Intersection of surfaces (Cylinder-Cylinder, cylinder-cone)		
Module –IV	**Projections & Types**	Total Hours: 15
Isometric projections and Orthographic projections.		
Module - V	**Computer Aided Drafting**	Total Hours: 15
Introduction to Computer Graphics and Drafting, AutoCAD, 2-D diagrams of simple geometries using Auto-CAD script		

Lecture Periods: 15 **Tutorial Periods:-** **Practical Periods: 60** **Total Periods: 75**

Course Outcome	1. Draw orthographic projections of lines and plane surfaces. 2. Develop the visualize and to project isometric and perspective sections of simple solids. 3. Apply the knowledge of development of surface in manufacturing and Rapid Prototyping Methods. 4. Apply Orthographic projections of real time parts in the engineering Field. 5. To understanding of the purpose and importance of using these drawings.

Text Books

1. K.R.Gopalakrishna and Sudhir Gopalakrishna, Engineering Graphics, Inzinc Publishers, 2007.

Reference Books

1. N.D.Bhatt, Engineering Drawing, 49thedition, Chorotar PublishingHouse,2006.
2. K.Venugopal, Engineering Drawing and Graphics+ AutoCAD, 4thedition, New Age International Publication Ltd., 2004.
3. T. Jeyapoovan, Engineering Graphics using AUTOCAD, 7th edition, VIKAS Publishing House (P) Ltd., 2015.
4. M. B. Shah and B. C. Rana, Engineering Drawing, 2nd edition, Pearson Publications, 2018.
5. . N.D. Bhatt, Engineering Drawing, 49th edition, Charotar Publishing House, 2014.
6. DavidIcook and Robert N McDougal, Engineering Graphics and Design with computer applications, Holt–SoundersInt. Edn.1985.
7. JamesDBethuneandet.al., Modern Drafting,Prentice Hal lint. 1989.

Department : Civil Engineering		Programme: B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
P 103	**PROGRAMMING FOR PROBLEM SOLVING**	2	0	4	4	60	40	100

Objective (s)

- *To understand the problem-solving approaches.*
- *To learn the basic programming constructs in C program*
- *To articulate where computing strategies support in providing Python-based solutions to real world problems.*
- *To use C program data structures- lists, tuples, dictionaries.*
- *To do input/output with files Feel C & Python program*

PRACTICALS:

1. Familiarization with programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if-then-else structures
4. Iterative problems .g., sum of series
5. 1DArraymanipulation
6. Matrix problems, String operations
7. Simple functions
8. Programming for solving Numerical methods problems
9. Recursive functions
10. Pointers and structures
11. File operations

Lecture Periods: 30 Tutorial Periods:- Practical Periods: 60 Total Periods:90

Course Outcome

The student will learn following through Practical's:

1. To formulate the algorithms for simple problems.
2. To translate given algorithms to a working and correct program.
3. To be able to correct syntax errors as reported by the compilers.
4. To be able to identify and correct logical errors encountered at runtime.
5. To be able to write iterative as well as recursive programs.
6. To be able to represent data in arrays, strings and structures and manipulate them through a program.
7. To be able to declare pointers of different types and use them in defining self-referential structures.
8. To be able to create, read and write to and from simple text files.

Text Books/ Reference Books

1. AICTE'sPrescribedTextbook:ProgrammingforProblemSolving(ISBN:978-93-91505-219)
2. ByronGottfried,Schaum'sOutlineofProgrammingwithC,McGraw-Hill.
3. E.Balaguruswamy, Programming inANSIC,TataMcGraw-Hill.
4. Ashok N Kamthane, "Computer Programming", Pearson education, Second Edition, 2012.
5. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, Seventh Edition, 2017.
6. Byron Gottfried & Jitender Chhabra, "Programming with C", Schaum's Outlines Series, 2017.
7. BrianW.KernighanandDennisM.Ritchie,
8. TheCProgrammingLanguage,PrenticeHallofIndia.

AlternativeNPTEL/SWAYAMCourse:

S.No.	NPTELCourseName	Instructor	Host Institute
1	INTRODUCTIONTOPROGRAMMINGIN C	PROF.SATYADEV NANDAKUMAR	IITKANPUR
2	PROBLEM SOLVING THROUGHPROGRAMMING INC	PROF.ANUPAMBASU	IITKHARAGPUR

S. No.	ExperimentName	ExperimentLink(s)
1.	Simplecomputationalproblems usingarithmeticexpressions.	http://ps-iiith.vlabs.ac.in/exp7/Introduction.html?domain=Computer%20Science&lab=Problem%20Solving%20Lab
2.	Iterativeproblemse.g.,sumofseries.	http://ps-iiith.vlabs.ac.in/exp4/Introduction.html?domain=Computer%20Science&lab=Problem%20Solving%20Lab
3.	1DArraymanipulation.	http://cse02-iiith.vlabs.ac.in/exp4/index.html
4.	Matrixproblems,Stringoperations.	http://ps-iiith.vlabs.ac.in/exp5/Introduction.html?domain=Computer%20Science&lab=Problem%20Solving%20Lab
5.	Simplefunctions.	http://cse02-iiith.vlabs.ac.in/exp2/index.html
6.	Programmingforsolving Numericalmethods problems.	http://ps-iiith.vlabs.ac.in/exp1/Introduction.html?domain=Computer%20Science&lab=Problem%20Solving%20Lab
7.	Recursivefunctions.	http://ps-iiith.vlabs.ac.in/exp6/Introduction.html?domain=Computer%20Science&lab=Problem%20Solving%20Lab
8.	1DArraymanipulation.	http://cse02-iiith.vlabs.ac.in/exp4/index.html
9.	Matrixproblems,Stringoperations.	http://ps-iiith.vlabs.ac.in/exp5/Introduction.html?domain=Computer%20Science&lab=Problem%20Solving%20Lab
10.	Simplefunctions.	http://cse02-iiith.vlabs.ac.in/exp2/index.html
11.	Programmingforsolving Numericalmethods problems.	http://ps-iiith.vlabs.ac.in/exp1/Introduction.html?domain=Computer%20Science&lab=Problem%20Solving%20Lab
12.	Recursivefunctions.	http://ps-iiith.vlabs.ac.in/exp6/Introduction.html?domain=Computer%20Science&lab=Problem%20Solving%20Lab

Department : Civil Engineering		Programme : B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
P104	**IDEA Lab Workshop**	2	0	4	0	-	-	-
Objective (s)	• *To learn all the skills associated with the tools and inventory associated with the IDEA Lab.* • *Learn useful mechanical and electronic fabrication processes.* • *Learnnecessaryskillstobuildusefulandstandalonesystem/projectwithenclosures.* • *Learn necessary skills to create print and electronic documentation for the system/project* • *Develop practical skills and innovative thinking through hands-on projects and collaborative problem-solving in the IDEA Lab Workshop.*							

Course Contents:

Unit	Topics	
1.	Electroniccomponentfamiliarization,Understanding electronic system design flow.Schematic design and PCB layout and GerbercreationusingEagleCAD.Documentationusing Dioxygen,GoogleDocs,Overleaf. Version controltools - GIT andGitHub. Basic 2D and 3D designing using CAD toolssuchasFreeCAD,Sketchup,PrusaSlicer,FlatCAM,Inkspace,OpenBSPandVeriCUT.	Introduction to basic hand tools – Tapemeasure,combinationsquare,Vernier caliper, hammers, fasteners, wrenches,pliers,saws, tubecutter,chisels,viceandclamps,tappingandthreading.Adhesives. IntroductiontoPowertools:Powersaws, band saw, jigsaw, angle grinder,beltsander,benchgrinder,rotarytools. Varioustypesofdrillbits,
2.	Familiarization and use of basic measurementinstruments-DSOincludingvarioustriggeringmodes,DSOprobes,DMM,LCRbridge,Signal and function generator. Logic analyzerand MSO. Bench power supply (with 4-wireoutput) Circuit prototyping using (a) breadboard, (b)ZeroPCB(c)'Manhattan'styleand(d)custom PCB.Single,doubleandmultilayerPCBs.Singleanddouble-sidedPCBprototypefabricationinthelab.Solderingusingsolderingiron/station.Solderingusingatemperaturecontrolledreflowoven. Automatedcircuitassemblyandsoldering Usingpickandplace machines.	Mechanical cutting processes - 3-axis CNC routing, basic turning,milling,drillingandgrindingoperations,Lasercutting,Lasengravingetc. Basicweldingandbrazingandotherjoiningtechniquesforassembly. Concept ofLababoarda Box.

3.	Electronic circuit building blocks includingcommonsensors. ArduinoandRaspberryPiprogramming and use. Digital Input andoutput. Measuring time and events. PWM.Serialcommunication.Analoginput. Interrupts programming. Power Supplydesign (Linear and Switching types),Wirelesspowersupply,USBPD,S olarpanels,Batterytypesandcharging	3Dprintingandprototypingtechnology – 3D printing using FDM, SLS and SLA. Basics of 3D scanning,point cloud data generation for reverseengineering. Prototyping using subtractive cuttingprocesses. 2D and 3D Structures forprototypebuildingusingLasercutte randCNC routers. BasicsofIPRand patents;Accessing Andutilizingpatent informationinIDEALab
4.	Discussionandimplementationofaminiproject	
5.	Documentation of theminiproject(Reportandvideo).	

LaboratoryActivities:

S.No.	List ofLabactivitiesandexperiments
1.	SchematicandPCBlayoutdesignofasuitablecircuit, fabricationandtestingofthecircuit.
2.	Machining of3Dgeometryonsoftmaterialsuchassoftwoodormodelling wax.
3.	3Dscanning ofcomputermousegeometrysurface.3Dprinting ofscanned geometryusingFDMorSLAprinter.
4.	2Dprofilecuttingofpress fitbox/casingin an acrylic (3or 6mmthickness)/cardboard, MDF (2mm) board usinglasercutter&engraver.
5.	2Dprofilecuttingonplywood/MDF (6-12mm) for pressfitdesigns.
6.	Familiarityand use ofweldingequipment.
7.	Familiarityanduseofnormaland wood lathe.
8.	Embeddedprogrammingusing Arduinoand/orRaspberryPi.
9.	Designandimplementationofacapstoneprojectinvolvingembeddedhardware,softwareandma chinedor 3D printed enclosure.
Lecture Periods: 30	**Tutorial Periods:** **Practical Periods: 60** **Total Periods: 90**

Reference Books:

S.No.	Title
1.	**AICTE'sPrescribedTextbook:Workshop/ManufacturingPractices(withLabManual),ISBN:978-9391505332**
2.	All-in-One Electronics Simplified, A.K. Maini; 2021. ISBN-13: 978-9386173393, Khanna Book PublishingCompany,NewDelhi.
3.	SimplifiedQ&A - DataSciencewithArtificialIntelligence,MachineLearningandDeepLearning,RajivChopra,ISBN:978-9355380821,KhannaBookPublishing Company,NewDelhi.
4.	3DPrinting&Design, Dr.Sabrie Soloman, ISBN: 978-9386173768, Khanna Book Publishing Company, New Delhi.
5.	TheBigBookofMakerSkills:Tools&TechniquesforBuildingGreatTechProjects.Chris Hackett.WeldonOwen; 2018.ISBN-13:978-1681884325.
6.	TheTotalInventorsManual(PopularScience):TransformYourIdeaintoaTop-SellingProduct.SeanMichaelRagan(Author).WeldonOwen;2017.ISBN-13: 978-1681881584.
7.	Make:Tools:HowTheyWorkandHowtoUseThem.Platt,Charles.Shroff/MakerMedia.2018.ISBN-13:978-9352137374
8.	TheArtofElectronics.3rdedition.PaulHorowitzandWinfieldHill.Cambridge UniversityPress.ISBN:9780521809269
9.	PracticalElectronicsforInventors.4thedition.PaulSherzandSimonMonk.McGraw Hill.ISBN-13:978-1259587542
10.	EncyclopediaofElectronic Components (Volume1, 2and3).CharlesPlatt.Shroff Publishers. ISBN-13: 978-9352131945, 978-9352131952, 978-9352133703
11.	Building Scientific Apparatus. 4th edition. John H. Moore, Christopher C. Davis,MichaelA.CoplanandSandraC.Greer.CambridgeUniversityPress.ISBN-13:978-0521878586
12.	ProgrammingArduino:GettingStartedwithSketches.2ndedition.SimonMonk.McGrawHill.ISBN-13:978-1259641633
13.	MakeYourOwnPCBswithEAGLE:FromSchematicDesignstoFinishedBoards. SimonMonkandDuncanAmos.McGrawHillEducation.ISBN-13:978-1260019193.

14.	ProGIT.2nd edition.ScottChaconandBenStraub.Apress.ISBN-13:978-1484200773
15.	Venuvinod,PK.,MA.W.,RapidPrototyping– LaserBasedandOtherTechnologies,Kluwer,2004.
16	Ian Gibson, David W Rosen, Brent Stucker., "Additive ManufacturingTechnologies:RapidPrototypingtoDirectDigitalManufacturing",Springer,2010
17.	ChapmanW.A.J,"WorkshopTechnology", Volume I,II,III,CBSPublishers anddistributors,5th Edition,2002.

Course Outcome

1. Master the use of tools and inventory in the IDEA Lab.
2. Apply mechanical and electronic fabrication techniques effectively.
3. Build functional and standalone systems/projects with proper enclosures.
4. Create detailed print and electronic documentation for projects.
5. Demonstrate innovative problem-solving through hands-on project development.

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SEMESTER–II

Department : Civil Engineering		Programme : B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T105	**MATHEMATICS-II**	3	1	0	4	40	60	100

Objective (s)

- To formulate and solve PDE, Laplace, Fourier transforms within the Engineering domain.
- To Learn the conditions for the existence of Laplace transforms and compute transforms for elementary functions
- To Explore the properties of inverse Laplace transforms and the convolution theorem
- To Gain an understanding of the Fourier integral theorem, Fourier transforms, and their inverses
- To Learn Dirichlet's conditions and apply them to expand periodic functions into Fourier series. Study techniques for changing the interval of expansion

Module– I **PARTIAL DIFFERENTIAL EQUATIONS:** Total Hours: 12

Formation of partial differential equations, Solutions of standard types of first order partial differential equations, Lagrange's linear equation, Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

Module – II **LAPLACE TRANSFORM:** Total Hours: 12

Existence conditions, Transforms of elementary functions, Properties, Transform of unit step function and unit impulse function, Transforms of derivatives and integrals, Transforms of Periodic Functions, Initial and final value theorems.

Module – III **INVERSE LAPLACE TRANSFORM:** Total Hours: 12

Inverse Laplace Transforms–Properties, Convolution theorem, Application-Solution of ordinary differential equations with constant coefficients- Solution of simultaneous ordinary differential equations

Module -IV **FOURIER TRANSFORM:** Total Hours: 12

Fourier Integral theorem (statement only), Fourier transform and its inverse–Properties, Fourier sine and cosine transform- Properties, Convolution and Parseval's identity.

Module - V **FOURIER SERIES:** Total Hours: 12

Dirichlet's conditions; Expansion of periodic functions into Fourier series- Change of interval, Half-range Fourier series, Complex form of Fourier series, Root mean square value-Parseval's theorem on Fourier coefficients, Harmonic analysis.

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods:60

Course Outcomes

1. To formulate and solve various types of partial differential equations.
2. To understand the Laplace transform and its properties.
3. To apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations.
4. To understand and apply Fourier transform techniques, including Fourier integral theorem, properties of Fourier transforms, convolution, and Parseval's identity.
5. To apply Fourier series and harmonic analysis, enabling them to analyze and synthesize periodic signals and functions in various engineering and mathematical applications.

Text Books

1.VeerarajanT.,"TPDE",TataMcGraw-Hill,New Delhi,2012.
2. Veerarajan T., Engineering Mathematics II , McGraw-Hill Education(India) Private Limited, 2018
3. Veerarajan T., Transforms and Partial Differential Equations , McGraw-Hill Education(India) Private Limited, 2016

Reference Books

1. GrewalB.S., "HigherEngineeringMathematics",KhannaPublishers,NewDelhi,43rd Edition,2015.
2. Ramana B.V.,"Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi,2010.

3. Bali N.P and Manish Goyal.,"A TextBook of Engineering Mathematics", LaxmiPublications(P)Ltd, 2011.
4. Erwin Kreyszig, Advanced Engineering Mathematics (Ninth Edition), John Wiley & Sons, New Delhi, 2011

Department : Civil Engineering		Programme : B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T106	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	3	0	2	4	40	60	100

Objective (s)

- *To understand and gain basic knowledge about magnetic and electrical circuits*
- *To understand and gain basic knowledge about AC circuits*
- *To understand and gain basic knowledge about single phase and three phase power measurement*
- *To understand the basic operation, functions and applications of PN junction diode, transistor, logic gates and flip flops.*
- *To gain knowledge on various communication systems and network models and the use of ISDN*

Module– I **DC Circuits** Total Hours: 15

DC Circuits: Definition of Voltage, Current, Power & Energy, circuit parameters, Ohm's law, Kirchoff's law & its applications – Simple Problems - Series & parallel connected circuits -star/delta conversion –Node and mesh methods of analysis of DC circuits.

DC Machines covering, working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, DC motor working principle; Back EMF and its significance, Types of D.C. motors, characteristics and applications; Necessity of a starter for DC motor.

Module – II **AC Circuits** Total Hours: 15

AC Circuits: Concepts of AC circuits – rms value, average value, form and peak factors–Simple RL, RC, RLC series circuits and Problems– Concept of real and reactive power–Power factor-Introduction to three phase system-Power measurement by two watt meter method.

Module – III **Single Phase Transformers** Total Hours: 15

Transformers covering, Principle of operation and construction of single phase transformers (core and shell types). EMF equation, losses, efficiency and voltage regulation; Synchronous Generators covering, Principle of operation; Types and constructional features; EMF equation; Three Phase Induction Motors covering; Concept of rotating magnetic field; Principle of operation, types and constructional features.

Module -IV **Electronic Circuits** Total Hours: 15

Electronic Circuits: Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type -V-I Characteristics of diode - Half-wave rectifier and Full-wave rectifier – with and without capacitor filter - Transistor –Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics - Transistor as an Amplifier - Principle and working of Hartley oscillator and RC phase shift oscillator-Construction and working of JFET & MOSFET.

Module - V **Digital Electronics & Fundamentals of Communication** Total Hours: 15

Digital Electronics & Fundamentals Of Communication Theory: Boolean algebra – Reduction of Boolean expressions - De-Morgan's theorem – Logic gates -Implementation of Boolean expressions - Flip flops - RS, JK, T and D. Combinational logic - Half adder, Full adder and Subtractors, Sequential logic-Ripple counters and shift registers.Model.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:30 Total Periods:75

Course Outcomes:	1. Understand and analyze magnetic and electrical circuits. 2. Analyze and solve problems related to AC circuits. 3. Measure and interpret single-phase and three-phase power systems. 4. Explain the operation and applications of PN junction diodes, transistors, logic gates, and flip-flops. 5. Demonstrate knowledge of communication systems, network models, and the use of ISDN.

Text Books

1. KothariDPandNagrathIJ,BasicElectricalEngineering,TataMcGrawHill,2009.(ForUnits ItoIII)
2. D. P. Kothari and L. J. Nagrath, "Basic Electrical Engineering", 3rd Edition, Tata McGraw Hill, 2017.
3. RajendraPrasad,"FundamentalsofElectronicEngineering",Cengagelearning, NewDelhi,firstEdition,2011(ForUnitIV)
4. MorrisMano,"DigitalDesign",PHIlearning,FourthEdition,2008(ForUnitV)
5. Wayne Tomasi, "Electronic Communication Systems-Fundamentals TheoryAdvanced",SixthEdition,PearsonEducation,2004.(ForUnitVI)

Reference Books

1. R.MuthusubramaniamS.SalivahananandK.A.MureleedharanBasicElectricalElectronicsandComputerEngineering,TataMcGrawHill,2004.
2. J.B.Gupta,ACourseinElectricalPower,KatsonPublishing House,NewDelhi,1993.
3. David.A Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, IndiaFourthEdition,2008.
4. Rajendra Prasad, "Fundamentals of Electrical Engineering", 3rd Edition, PHI Learning Private Limited, 2014.
5. DonaldPLeach,AlbertPaul MalvinoandGoutam Saha,"digital PrinciplesandApplications" 6th edition, Tata McGraw Hill Publishing Company Ltd., New Delhi,2008.
6. S.K. Sahdev, Fundamentals of Electrical Engineering and Electronics, Dhanpat Rai &Co,2013.
7. JacobMillmanandChristosC.Halkias,"ElectronicDevicesandCircuits"TataMcGraw Hill,2008.
8. R.L.BoylestadandL.Nashelsky,"ElectronicDevicesandCircuitTheory",PHILearningPrivateLimited,Ninthedition,2008.
9. M.S.SukhijaandT.K.Nagsarkar,"BasicElectricalandElectronicsEngineering",OxfordUniversityPress,2012.

Department : Civil Engineering		Programme : B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T107	**ENGINEERING PHYSICS**	3	1	2	5	40	60	100

Objective (s)

- *To understand the concepts of physics and its significant contributions in the advancement of technology and invention of new products that dramatically transformed modern-day society.*
- *To expose the students to different areas of physics which have direct relevance and applications to different Engineering disciplines.*
- *To understand the concepts and applications of Ultrasonic, optics and some optical devices.*
- *To understand the concepts and applications Laser and Fiber optics*
- *To understand the concepts and applications Nuclear energy sources and wave mechanics.*

Module– I **Acoustics & NDT** Total Hours: 12

Acoustics & NDT- Ultrasonics –Ultrasonic Waves productions (piezoelectric &Magnetostriction method) – Detections (Acoustic Grating) NDT applications–Ultrasonic pulse echo Method-liquid penetrant Method.

Acoustics-Factors affecting Acoustic of buildings (Reverberation, Loudness, Focusing, Echo, Echelon Effect and Resonance) and their Remedies–Sabine's formula for Reverberation Time-Doppler effect and its applications to Radars. (elementary ideas)

Module – II **Optics** Total Hours: 12

Interference- Airwedge– Michelson's Interferometer- wavelength determination-Interference Filter – Antireflection Coatings Diffraction- Diffraction Grating–Dispersive power of grating–Resolving power of grating & Prism Polarization- Basic concepts of double refraction–Huygens Theory of Double Refraction–Quarter and Half Wave Plates– Specific Rotary Power–Laurent Half Shade Polarimeter.

Module – III **Lasers & Fiber Optics** Total Hours: 12

Lasers-Principles of Laser –Spontaneous and Stimulated Emissions–Einstein's Coefficients-Population Inversion and Laser Action – types of Optical resonators (qualitative ideas) –Types of Lasers-NdYAG, CO_2 laser, Gas Laser- applications of lasers

Fiber Optics- Principle and Propagation of light in optical fiber–Numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode) – applications to sensors and FiberOptics Communication.

Module -IV **Wave Mechanics** Total Hours: 12

Wave Mechanics- Matter Waves– deBroglie Wavelength– Uncertainty Principle–Schrodinger Wave Equation – Time Dependent – Time Independent – Application to Particleina One Dimensional Potential Box–Quantum Mechanical Tunneling–TunnelDiode.

Module - V **Nuclear Energy Source** Total Hours: 12

Nuclear Energy Source- General Properties of Nucleus (Size, Mass, Density, Charge) – Mass Defect – Binding Energy - Disintegration in fission – *Nuclear Reactor:* Materials Used in Nuclear Reactors. – PWR –BWR – FBTR. Nuclear fusion reactions for fusion reactors - D-D and D- T reactions, Basic principles of Nuclear fusion reactors.

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods: 30 Total Periods:90

Course Outcomes

1. Apply acoustics and NDT techniques in material testing and quality control.
2. Analyze optical phenomena and solve problems related to light behavior.
3. Utilize lasers and fiber optics in communication and industrial applications.
4. Solve problems involving wave mechanics in various physical contexts.

	5. Understand and discuss the principles and applications of nuclear energy.

Text Books

1. VRajendran, EngineeringPhysics,2nd EditionTMH,NewDelhi2011(For Units I to IV only)
2. V. Rajendran, Engineering Physics, 2nd Edition, TMH, New Delhi 2011
3. ArthurBeiser,ConceptsofModernPhysics,6th Edition,TMH, NewDelhireprinted2008.(ForUnitVonly)

Reference Books

1. AjayGhatak,Optics,5th EditionTMH,NewDelhi,2012.
2. K.ThyagarajanandAjoyGhatak,LaserFundamentalsandApplications,2nd Edition,Springer2010 .
3. David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, Wiley publications, 2013
4. D. J. Griffiths, "Quantum mechanics", Pearson Education, 2014.
5. R.Murugesan,ModernPhysics,S. Chand&Co,NewDelhi2006.
6. K.R.Nambiar,Laser,NewAgeInternational,NewDelhi,2008.
7. ScienceofEngineeringMaterials, 2ndEdition,C.M.Srivastava andC.Srinivasan,New AgeInt.(P)Ltd,New Delhi,1997.
8. AvadhanuluMN, EngineeringPhysics,Vol-1,S.Chand &Co,2009.

PHYSICS LABORATORY (30 HOURS)

List of Experiments (ANY 10 EXPERIMENTS)

1. Thermal conductivity–Lee's DISC
2. Thermal conductivity– radial flow
3. Spectrometer–Prism or Hollow prism
4. Spectrometer –Transmission grating
5. Spectrometer– Ordinary & Extraordinary rays
6. Newton's rings
7. Air– wedge
8. Half shade polarimeter – determination of specific rotator power
9. Jolly's experiment– determination of α
10. Magnetism: i-h curve
11. Field along the axis of coil carrying current
12. Vibration magnetometer–calculation of magnetic moment & pole strength
13. Laser experiment: wavelength determination using transmission grating, reflection grating (vernier calipers) & particle size determination
14. Determination of optical absorption coefficient of materials using laser
15. Determination of numerical aperture of an optical fiber
16. Electrical conductivity of semiconductor–two probe/four probe method
17. Hall effect in semiconductor

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T108	**COMMUNICATIVE ENGLISH**	3	0	0	3	40	60	100

Objective (s)

- *To provide learning environment to practice listening, speaking, reading and writing skills.*
- *To assist the students to carry on the tasks and activities through guided instructions and materials.*
- *To effectively integrate English language learning with employability skills and training.*
- *To provide hands-on experience through case-studies, mini projects, group and individual presentations.*
- *To understand the writing and listening skills.*

Module– I **Basic Communication Theory** Total Hours: 9

Vocabulary Building- The concept of Word Formation- Root words from foreign languages and their use in English- Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.- Synonyms, antonyms and standard abbreviations.

Module – II **Comprehension And Analysis** Total Hours: 9

Basic Writing Skills-Sentence Structures-Use of phrases and clauses in sentences-Importance of proper punctuation.
Creating coherence- Organizing principles of paragraphs in documents-Techniques for writing precisely

Module – III **Writing** Total Hours: 9

Identifying Common Errors in Writing-Subject-verb agreement-Noun-pronoun agreement-Misplacedmodifiers-Articles-Prepositions-Redundancies-Clichés

Module -IV **Business Writing / Correspondence** Total Hours: 9

Nature and Style of sensible Writing-Describing Defining-Classifying, Providing examples or evidence- Writing introduction and conclusion.

Module - V **Oral Communication** Total Hours: 9

Writing Practices- Comprehension- Précis Writing- Essay Writing- Oral Communication.

Lecture Periods: 45 Tutorial Periods: - Practical Periods:- Total Periods: 45

Course Outcomes

1. Communicate and share a broad range of information.
2. Develop reading and speaking skills.
3. Understand the functions of essays and development of the vocabularies.
4. Write personal letter, official letter, email and articles
5. Participate in the conversation in order to acquire oral & listening skills.

Text Books

1. AICTE's Prescribed Textbook: English (with Lab Manual)ISBN: 978-93-91505-097
2. Effective Communication Skills. KulBhushan Kumar, Khanna Book Publishing, 2022.

Reference Books

1. PracticalEnglishUsage.MichaelSwan.OUP.1995.
2. RemedialEnglishGrammar.F.T.Wood.Macmillan.2007
3. OnWritingWell.WilliamZinsser.HarperResourceBook.2001
4. StudyWriting.LizHamp-LyonsandBenHeasly.CambridgeUniversityPress.2006.
5. CommunicationSkills.SanjayKumarandPushpLata.OxfordUniversityPress.2011.
6. Exercises in Spoken English.Parts.I-III. CIEFL, Hyderabad. Oxford University Press.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
T109	**UNIVERSAL HUMAN VALUES-2**	3	0	0	3	40	60	100

Objective (s)

- *To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS'*
- *To ensure sustained happiness and prosperity which are the core aspirations of all human beings.*
- *To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence.*
- *To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct.*
- *To gain knowledge about trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.*

Module– I **Introduction to Value Education** Total Hours: 9

Right Understanding, Relationship and Physical Facility(Holistic Development and the Role of Education)-Understanding Value Education-Sharing about Oneself-Self-exploration as the Process for Value Education-Continuous Happiness and Prosperity – the Basic Human Aspirations-Exploring Human Consciousness-Happiness and Prosperity –CurrentScenario-MethodtoFulfilltheBasicHumanAspirations-ExploringNaturalAcceptance

Module – II **Harmony in the Human Being** Total Hours: 9

Understanding Human being as the Co-existence of the Self and the Body-Distinguishing between the Needs of the Self and the Body-Exploring the difference of Needs of Self and Body-The Body as an Instrument of the Self-Understanding Harmony in the Self-Exploring Sources of Imagination in the Self-Harmony of the Self with the Body- Programme to ensure self-regulation and Health-Exploring Harmony of Self with the Body.

Module – III **Harmony in the Family and Society** Total Hours: 9

Harmony in the Family – the Basic Unit of Human Interaction-'Trust' – the Foundational Value in Relationship-Exploring the Feeling of Trust-'Respect'–as the Right Evaluation- Exploring the Feeling of Respect- Other Feelings, Justice in Human-to-Human Relationship- Understanding Harmony in the Society-Vision for the Universal Human Order- Exploring Systems to fulfil Human Goal.

Module -IV **Harmony in the Nature/Existence** Total Hours: 9

Understanding Harmony in the Nature- Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature- Exploring the Four Orders of Nature-Realizing Existence as Co-existence at All Levels-The Holistic Perception of Harmony in Existence- Exploring Co-existence in Existence.

Module - V **Implications of the Holistic Understanding–a Look at Professional Ethics** Total Hours: 9

Natural Acceptance of Human Values-Definitiveness of (Ethical) Human Conduct-Exploring Ethical Human Conduct-A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order- Competence in Professional Ethics- Exploring Humanistic Models in Education-Holistic Technologies, Production Systems and Management Models-Typical Case Studies-Strategies for Transition towards Value- based Life and Profession-Exploring Steps of Transition towards Universal Human Order.

Lecture Periods: 45 Tutorial Periods: - Practical Periods:- Total Periods: 45

Course Outcome	1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society 2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Coexistence of Self and Body. 3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society 4. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature. 5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Text Books

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana,GPBagaria,2ndRevisedEdition,ExcelBooks,NewDelhi,2019.ISBN978-93-87034-47-1
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics,RRGaur,RAsthana,GPBagaria,2ndRevisedEdition,ExcelBooks,NewDelhi,2019.ISBN 978-93-87034-53
3. Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.

Reference Books

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana,GPBagaria,2ndRevisedEdition,ExcelBooks,NewDelhi,2019.ISBN978-93-87034-47-1 2019.
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan,Amarkantak, 1999.
3. Human Values, A.N.Tripathi,New Age Intl.Publishers,NewDelhi,2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth- by Mohandas Karam chand Gandhi
6. Small is Beautiful-E.F Schumacher.
7. Slow is Beautiful- Cecile Andrews
8. Economy of Permanence-JCK umarappa
9. Bharat Mein Angreji Raj–Pandit Sunderlal
10. Redis covering India-by Dharampal
11. Hind Swarajor Indian Home Rule-by Mohandas K.Gandhi
12. India Wins Freedom-Maulana Abdul Kalam Azad
13. Vivekananda-Romain Rolland (English)
14. Gandhi-Romain Rolland(English)

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
P105	**DIGITAL FABRICATION/WORKSHOP/ MANUFACTURING PRACTICES**	0	0	3	2	60	40	100

Objective (s)

- *To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.*
- *To have a study and hands-on-exercise on plumbing and carpentry components.*
- *To have a practice on gas welding, foundry operations and fitting*
- *To have a study on measurement of electrical quantities, energy and resistance to earth.*
- *To have a practice on soldering.*

Module I: Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods.

Module II: CNC machining, Additive manufacturing.

Module III: Fitting operations & power tools.

Module IV: Electrical & Electronics.

Module V: Carpentry.

Module VI: Plastic moulding, glass cutting.

Module VII: Metal casting.

Module VIII: Welding (arc welding & gas welding), brazing.

Practicals:

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop (Arc welding + Gas welding)
6. Casting
7. Smithy
8. Plastic moulding & Glass Cutting

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Lecture Periods: - Tutorial Periods: - Practical Periods:45 Total Periods: 45

Text/Reference Books:

1. AICTE'sPrescribedTextbook:Workshop/ManufacturingPractices(withLabManual)ISBN:978-93-91505-332
2. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology",Vol.I 2008 and Vol.II 2010, Media promoters and publishers private limited, Mumbai**.**
3. KalpakjianS.AndStevenS.Schmid, "ManufacturingEngineeringandTechnology",4th edition, Pearson Education India Edition,2002.
4. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" PearsonEducation,2008.
5. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice HallIndia,1998.
6. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

EXPERIMENTS THAT MAY BE PERFORMED THROUGH VIRTUAL LABS:

S.No.	Experiment Name	Experiment Link(s)
1	Welding shop (Arc welding + Gas welding).	http://mm-coep.vlabs.ac.in/LaserSpotWelding/Theory.html?domain=Mechanical%20Engineering&lab=Welcome%20to%20Micromachining%20laboratory
2	Casting	http://fab-coep.vlabs.ac.in/exp7/Theory.html?domain=Mechanical%20Engineering & lab=Welcome %20to%20FAB%20laboratory

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
P106	**SPORTS AND YOGA**	2	0	0	0	-	-	-
Objective (s)	• *To make the students understand the importance of sound health and fitness principles as they relate to better health.* • *To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.* • *To create a safe, progressive, methodical and efficient activity basedplan.* • *To enhance improvement and minimize risk of injury.* • *To develop among students an appreciation of physical activity as a life time pursuit and a means to better health.*							

Objectives:

ModuleI: IntroductiontoPhysicalEducation

- Meaning &definitionofPhysical Education
- Aims&ObjectivesofPhysicalEducation
- ChangingtrendsinPhysicalEducation

ModuleII*:OlympicMovement*

- Ancient&ModernOlympics(Summer&Winter)
- OlympicSymbols,Ideals,Objectives&Values
- AwardsandHonoursinthefieldofSportsinIndia(DronacharyaAward,ArjunaAward,DhayanchandAward,RajivGandhiKhelRatna Awardetc.)

ModuleIII:*PhysicalFitness,Wellness&Lifestyle*

- Meaning&ImportanceofPhysicalFitness &Wellness
- ComponentsofPhysicalfitness
- ComponentsofHealth-relatedfitness
- Componentsofwellness
- PreventingHealthThreatsthroughLifestyleChange
- ConceptofPositiveLifestyle

ModuleIV: *FundamentalsofAnatomy&PhysiologyinPhysical Education,SportsandYoga*

- DefineAnatomy, Physiology&Its Importance
- EffectofexerciseonthefunctioningofVariousBodySystems.(CirculatorySystem,RespiratorySystem,Neuro-MuscularSystemetc.)

ModuleV:*Kinesiology, Biomechanics&Sports*

- Meaning&ImportanceofKinesiology &BiomechanicsinPhysicalEdu.&Sports
- Newton'sLaw ofMotion&itsapplicationinsports.
- FrictionanditseffectsinSports.

ModuleVI*:Postures*

- Meaning and Concept ofPostures.
- CausesofBadPosture.
- Advantages&disadvantagesofweight training.
- Concept&advantagesofCorrect Posture.
- CommonPosturalDeformities – KnockKnee;FlatFoot;RoundShoulders;Lordosis,Kyphosis,BowLegsandScoliosis.
- CorrectiveMeasuresforPosturalDeformities

ModuleVII*:Yoga*

- Meaning&ImportanceofYoga

- ElementsofYoga
- Introduction-Asanas,Pranayama,Meditation&YogicKriyas
- Yogaforconcentration&relatedAsanas(Sukhasana;Tadasana;Padmasana&S hashankasana)
- RelaxationTechniquesforimprovingconcentration-Yog-nidra

ModuleVIII:*Yoga&Lifestyle*

- Asanasaspreventivemeasures.
- Hypertension:Tadasana,Vajrasana,PavanMuktasana,ArdhaChakras ana,Bhujangasana,Sharasana.
- Obesity: Procedure, Benefits & contraindications for Vajrasana,Hastasana,Trikonasana,ArdhMatsyendrasana.
- BackPain:Tadasana,ArdhMatsyendrasana,Vakrasana,Shalabhasana,Bhujangasana.
- Diabetes: Procedure, Benefit s&contraindicationsforBhujangasana, Paschimottasana, PavanMuktasana,ArdhMatsyendrasana.
- Asthema: Procedure,Benefits & contraindicationsforSukhasana,Chakrasana,Gomukhasana,Parvatasana, Bhujangasana,Paschimottasana,Matsyasana.

ModuleIX:*TrainingandPlanninginSports*

- MeaningofTraining
- Warmingupandlimberingdown
- Skill,Technique&Style
- MeaningandObjectivesofPlanning.
- Tournament–Knock-Out,League/RoundRobin&Combination.

ModuleX*: Psychology&Sports*

- Definition &Importance ofPsychologyinPhysicalEdu.&Sports
- Define&DifferentiateBetweenGrowth&Development
- AdolescentProblems&TheirManagement
- Emotion:Concept,Type&Controllingofemotions
- Meaning, Concept&TypesofAggressionsinSports.
- Psychologicalbenefitsofexercise.
- Anxiety& Fear anditseffectsonSportsPerformance.
- Motivation,itstype&techniques.
- UnderstandingStress&CopingStrategies.

ModuleXI:*Doping*

- MeaningandConceptofDoping
- ProhibitedSubstances&Methods
- SideEffectsofProhibited Substances

ModuleXII*:SportsMedicine*

- First Aid–Definition,Aims&Objectives.
- Sportsinjuries:Classification,Causes&Prevention.
- ManagementofInjuries:SoftTissueInjuriesandBone&JointInjuries

ModuleXIII*:Sports/Games*

Following subtopicsrelated to anyoneGame/Sportofchoice of student out of:

Athletics,Badminton,Basketball,Chess,Cricket,Kabaddi,LawnTennis,Swimming,TableTe nnis,Volleyball,Yogaetc.

- HistoryoftheGame/Sport.
- LatestGeneralRules ofthe Game/Sport.

- SpecificationsofPlayFieldsand RelatedSportsEquipment.
- ImportantTournamentsandVenues.
- SportsPersonalities.
- ProperSportsGearanditsImportance.

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods:-**	**Total Periods: 30**

Course Outcomes:

1.Enhance physical fitness and mental well-being through a combination of sports and yoga.
2.Improve flexibility, strength, and coordination with regular yoga and sports practice.
3.Develop better stress management and relaxation techniques through yoga.
4.Foster teamwork, discipline, and competitive skills via sports activities.
5.Achieve a balanced lifestyle by integrating sports and yoga into daily routines.

TextBooks/References:

1. ModernTrendsandPhysicalEducationbyProf.AjmerSingh.
2. Light on YogabyB.K.S.Iyengar.
3. Healthand PhysicalEducation–NCERT(11thand 12thClass)

SEMESTER–III

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
MAT31	**MATHEMATICS – III**	3	1	0	4	40	60	100

Objective (s)

- *To understand analytic functions, properties, harmonic conjugates, analytic function construction, standard conformal mapping, and bilinear transformations.*
- *To apply Cauchy's theorem, integral formulas, Taylor& Laurent series.*
- *To solve one dimensional wave equations and one-dimensional heat flow equations using fourier series solutions.*
- *To solve two dimensional steady-state heat flow equations using Fourier series solutions.*
- *To develop Z- transform techniques which will perform the analysis for discrete time systems.*

Module– I **Analytic Functions** Total Hours: 12

Analytic Functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties of Analytic Functions– Harmonic conjugates – Construction of analytic function – Standard Conformal mapping –Bilinear transformation.

Module – II **Complex Integration** Total Hours: 12

Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

Module – III **Applications of PDEs (Wave Equation)** Total Hours: 12

Solution of PDE by Method of separation of variables – Classification of PDE – Fourier Series Solutions of one-dimensional wave equation.

Module -IV **Applications of PDEs – II (Heat Equation)** Total Hours: 12

Fourier Series Solutions of one-dimensional equation of heat flow equation – Steady state solution of two-dimensional equation of heat flow equation. (Cartesian and Polar)

Module - V **Z – Transform** Total Hours: 12

Z-transforms; Elementary properties; Convolution theorem; Inverse Z - transform (using partial fraction, convolution theorem and residues); Discrete time systems and Difference equations; Solution of difference equations using Z – transform.

Lecture Periods: 45 **Tutorial Periods: 15** **Practical Periods:-** **Total Periods: 60**

Course Outcomes:

1. Students will be able to determine whether a function is analytic by applying necessary and sufficient conditions in both Cartesian and polar coordinates
2. Students will master techniques for evaluating line integrals and apply Cauchy's integral theorem and formula to solve problems in complex analysis
3. Students will use the method of separation of variables to solve partial differential equations (PDEs), specifically for the one-dimensional wave equation
4. Students will be proficient in solving the one-dimensional heat flow equation using Fourier series and in determining steady-state solutions for the two-dimensional heat flow equation
5. Students will be adept at using Z-transforms to analyze discrete-time systems and solve difference equations

Text Books

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Veerarajan T., "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

Reference Books

1. Bali N.P and Manish Goyal., “A Text Book of Engineering Mathematics”, Laxmi Publications(P) LTD-2011.
2. Dr. M.K. Venkataraman, “Engineering Mathematics – Volume I and Volume II”, The National Publishing Company, Madras 2001.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET32	**ENGINEERING GEOLOGY**	3	0	0	3	40	60	100

Objective (s)	• *To familiarize the students to interior of the earth, plate tectonics, geomorphological processes and their significance in civil Engineering.* • *To provide an insight on minerals, rocks and their geological characteristics.* • *To understand their effects and significance in various areas of civil Engineering.* • *Facilitate the students to understand various defects associate with geological formations.* • *To emphasize their significance in the selection of site for various structures.*

Module – I	**General Geology**	Total Hours : 9

Scope of geology in Civil Engineering – interior of the earth- Fundamentals of plate tectonics - geomorphological (surface) processes –weathering – types , weathered products, assessment of degree of weathering , Fluvial processes, glaciations , wind action, their land forms and their significance in Civil Engineering – earthquake, its causes, classification, earthquake zones of India, - Landslides, its causes, classification and remediation.

Module – II	**Mineralogy**	Total Hours : 9

Physical properties of minerals – classification - study of important rock forming minerals –Quartz family, feldspar family, Augite, Hornblend, Mica family, calcite, Iron oxide minerals, Augite, Hornblend, and Clay minerals - effect of minerals on the performance of soils and rocks.

Module – III	**Petrology**	Total Hours : 9

Classification of rocks - mode of formation – Texture, structure and forms of igneous, sedimentary and metamorphic rocks - Physical properties, Mechanical properties of rocks-. Study of important rocks - granite, syenite, diorite, gabbro, pegmatite, dolerite, basalt, sand stone, limestone, shale, breccia , conglomerate, gneiss, quartzite, marble, slate, schist, phyllite and conglomerate - role of petrology in the field of construction.

Module – IV	**Structural geology and Geophysical methods**	Total Hours : 9

Attitude of beds - out crops, study of structural features such as folds, faults, joints, unconformities ,their brief classification and their bearing on engineering construction – principles of geophysical methods, electrical resistivity method , seismic method and its applications in civil engineering

Module – V	**Geological applications**	Total Hours : 9

Role of geology in site investigation, Geotechnical classification of rock, geological considerations in tunnels and dam site, reservoir site, buildings, road cuttings, study of air photographs and satellite images and interpretation for civil engineering projects, groundwater- types of aquifers , properties of geological formations affecting groundwater and its significance in construction.

Lecture Periods: 45 **Tutorial Periods: -** **Practical Periods:-** **Total Periods: 45**

Course Outcome	**1.** To familiarize the students to interior of the earth, plate tectonics, geomorphological processes and their significance in civil Engineering. 2. To provide an insight on minerals, rocks and their geological characteristics to understand their effects and significance in various areas of civil Engineering. 3. To Facilitate the students to understand various defects associate withgeological formations and to emphasizetheir significance in the selection of site for various structures. 4. To understand the structural geology and its features 5. To familarize the Students in geological applications and also petrology

Text Books

1.Chenna Kesavulu.N, "Engineering Geology ", Macmillan Publishers Pvt. Ltd., 2009

2. Varghese, P.C," Engineering Geology for Civil Engineers", Prentice-hall of India Pvt.Ltd., 2012.

Reference Books

1. Leggot, R.F.," Geology and Engineers ", McGraw Hill , New York.2002
2. Blyth, F.G.M., "A Geology for Engineers", Arnold, London, 2003.
3. Bell.F.G, "Fundamentals of Engineering Geology" Butterworth-Heinemann, 1983.
4. Bell. F.G. " Engineering Geology" Elsevier publications, 2007

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET33	**BUILDING TECHNOLOGY**	3	0	0	3	40	60	100

Objective (s)	• *Understand the properties and applications of various building materials.* • *Learn about finishing and protective materials used in construction.* • *Explore the components of buildings and their treatment methods.* • *Study plumbing systems and temporary structures in construction.* • *Familiarize with modern techniques and innovations in building construction.*

Module –I	**Building Materials**	TotalHours:9
Lime, Timber and its Products, Floor and Wall Tiles, Pozzolanas, Ferrous metals, Thermal Insulation		
Module – II	**Finishing and Perfective materials**	TotalHours:9
Finishing Materials: Glass, Aluminium, Plastics, Paints, Varnishes, Distemper, Waterproofing and Damp Proofing Materials, Ferro cement and its application.		
Module –III	**Components of building and Treatment**	TotalHours:9
Partition wall and Cavity wall, Composite Masonry, Doors, Windows, Ventilators, Stairs, Lift, Ramps, Escalators, Anti Termite Treatment		
Module –IV	**Plumbing and Temporary Structures**	TotalHours:9
Materials for Plumbing and Sanitation, Fire Protection, Temporary Structures, Introduction to Building Maintenance.		
Module –V	**Modern Techniques**	TotalHours:9
Principles of Energy Efficient Buildings, Disasters Resistant Buildings (as per IS), Ventilation and Air Conditioning, Cost - effective Construction Techniques		

Lecture Periods: 45 **Tutorial Periods: -** **Practical Periods:-** **Total Periods: 45**

Course Outcome	1. To learn the various types of building materials and its engineering application like lime, timber, floor and wall tiles, pozzolanas, ferrous metal etc 2. To understand finishing and perfective materials like glass, paints, varnishes 3. To Study about the components of building like wall, doors, window, ventilators, and vertical transportation 4. To gain knowledge about the various plumbing accessories and temporary structures in the construction practices in the field 5. To understand the Apply geological principles for mitigation of natural hazards and select sites for constructions and gain knowledge in modern equipments and the recent techniques to be used

TextBooks

1. Bhavikatti.S.S., Building Materials, Vikas Publishing House.Pvt. Ltd., New Delhi, 2012.
2. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publishing (P).Ltd., New Delhi-2, 2012.

ReferenceBooks

1. Rajput, R.K., Engineering Material, S.Chand &Co. Ltd., New Delhi, 2008.
2. Bhavikatti.S.S.,Building Technology, Vikas Publishing House. Pvt. Ltd., New Delhi, 2013.
3. Shrivastava.U.K, Building Materials Technology, Galgotia Publications Pvt., Ltd., 2012.
4. Varghese, P.C, Building Materials, Prentice-hall of India Pvt.Ltd., 2013.
5. SP 21 : 2005 First Published March 1985 First Revision November 2009 © BIS
6. IS SP 7-NBC: National Building Code of India 2016.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET34	**BASICS OF SOLID MECHANICS**	3	1	0	4	40	60	100

Objective (s)	• *To develop an understanding of the relationship between external loads applied to a deformable body.* • *To understand of the internal stress, strain and deformation induced in the body.* • *To show proficiency in mathematics and basic sciences required* • *To develop the knowledge about solve structural engineering and mechanics problem.* • *To develop analytical and graphical problem solving skills.*

Module – I	**Stresses & Strains**	TotalHours:12

Simple Stresses and Strains – Tension, compression and shear stresses - Hooke's law - compound stresses - thermal stresses – Compound bars.

Module – II	**Bending Stresses**	TotalHours:12

Shear force and bending moment diagrams for beams - Theory of simple bending –Bending stress distribution at sections. Beams of uniform strength.

Module –III	**Shear stress**	TotalHours:12

Shear stress distribution due to bending – Shear Centre. Springs – Stiffness – parallel, series - Problems Complex stresses – Principal planes and stresses-Mohr's circle.

Module –IV	**Torsion**	TotalHours:12

Theory of simple Torsion – Torsional rigidity – Torsion of non-circular sections – Composite shafts in series and parallel. Thin cylinders and shells – Thick cylinders.

Module –V	**Columns**	TotalHours:12

Columns – Euler's theory – Rankine – Jordon formula – Columns with initial curvature and eccentric loads– Long columns- Laterally loaded columns, Stability Check for masonry dams and retaining walls

Lecture Periods: 45 **Tutorial Periods: 15** **Practical Periods:-** **Total Periods: 60**

Course Outcome	1. To understand the concept of stress and strain 2.To calculate, describe and draw the shear force and bending moment under external,loadings and to understand the concept of bending stress in beams. 3. To calculate the shear stress in beams and to calculate internal stresses and strain through the application of stress transformation equations and Mohr's circle 4. To estimate the torsional effect in shafts and to understand the stresses and strain in a cylinders subjected to internal pressure 5. To understand stability and buckling phenomena for a slender member under an axial load, compressive force.

Text Books

1 Bhavikatti. S.S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi, SecondEdition, 2012.
2 Bansal.R.K., A Text book of Strength of Materials, Laxmi Publications (P) Ltd, New Delhi, 2012.

Reference Books

1 Shah.H.J. and Junnarkar.S.B., Mechanics of structures- Vol.I, Charotar Publishing house, Ltd,, 2012.
2 Surendra Singh, Strength of Materials, Vikas Publishing House, 2013
3 Rattan, S.S., Strength of Materials, Tata McGraw-Hill, 2011.
4 Ramasamy.V, Purushothama Raj.P, Strength of Materials, Pearson Education Ltd., 2012

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET36	**SURVEYING AND GEOMATICS**	3	1	0	4	40	60	100

Objective (s)

- *Understand the basics of Surveying and its related field application*
- *Utilize their knowledge to solve field associated problems*
- *Carry out preliminary surveying in the field of civil engineering applications such as structural, highway engineering and geotechnical engineering*
- *plan a survey, taking accurate measurements, field booking, plotting and adjustment of traverse use various conventional instruments involved in surveying with respect to utility and precision plan a survey for applications such as road alignment and height of the building undertake measurement and plotting in civil engineering.*
- *Familiarize with the latest surveying techniques using GPS and GIS*

UNIT – I **Fundamentals Of Surveying And Levelling** Total Hours : 9

Classification and basic principles of surveying: Chain: Chaining and accessories for ranging methods of ranging – Compass: Terminology – Types of compass – Types of bearing- Levelling: Principle of Levelling – Temporary and Permanent Adjustments – sources of errors in Levelling – curvature and refraction - Methods of levelling – Booking.

UNIT – II **Theodolite And Tachometric Surveying Contouring** Total Hours : 9

Theodolite: Horizontal and vertical angle measurements – temporary and permanent adjustments – heights and distances – Tacheometers: stadia constants - Analytic lens – Tangential and stadia Tacheometry surveying. Contour – Characteristics of contours – methods of contouring – Tachometric contouring – Contour gradient – uses of contour plan and map.

UNIT – III **Control Surveying And Adjustments** Total Hours : 9

Triangulation – baseline measurement – horizontal and vertical control – satellite stations – reduction to centre – single and reciprocal observations- traversing – adjustment of sample triangulation networks.

UNIT – IV **Errors And Adjustments** Total Hours : 9

Errors sources: precautions and corrections classification of errors – true and most probable values weighed observations - method of equal shifts – principle of least squares – normal equation – correlates – level nets.

UNIT – V **Modern Surveying And Equipment** Total Hours : 9

GPS surveying: different segments – space, control and user segments – satellite configuration – signal structure – orbit determination and representation – hand held and geodetic receivers – data processing. GIS: remote sensing and different platforms – sources of EMD – application of GIS in different fields. Modern equipment: total station – advantages – fundamental and working principle – parts and accessories - on board calculation – field procedure - errors and correction.

Total Contact Hours : 45	Total Tutorials : 15	Total Practical Class : 0	Total Hours : 60

Course Outcome

1. To understand the concept of linear and angular moment measurement.
2. To study the various method of taking levels and reducing levels.
3. To learn about the angular measurement using theodolite instrument.
4. To extract the knowledge of the area calculation and volume calculation.
5. To understand the stadia constant and tachometric surveying**.**

Text Books

1. Punmia .B.C . , et .al..” Surveying “, Vols, I, Laxmi Publications, 2012
2. Kanetkar, T.P. ,Surveying and leveling, Vols. I & II, United book corporation, Pune 2012

Reference Books

1. Kanetkar, T.P., and Kulkarni,S.V., Surveying and Levelling, Part I, United book Corporation, Pune. 2012.
2. Shahani, P.B., Text book of Surveying, Vol.I, Oxford &IBH Publications, 2012.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET36	**ENVIRONMENTAL SCIENCE** (Audit course – No credit)	3	-	-	-	-	-	100

Objective (s)	• *To study about environment and ecosystems* • *To study about different types of natural resource.* • *Knowledge and concept of biodiversity and its conservation.* • *Basic knowledge and concept of causes, effect and control of different type of environmental pollution.* • *To study population growth and its impact on environment*

UNIT – I	**Water Resources**	Total Hours : 9

Water resources- Water Cycle, Distribution, Groundwater flow, Demand for water, Water pollution- causes CO1 and effects, Water Act (1974), Rainwater Harvesting-Methodology, components, design of rainwater harvesting system for a single house (as per IS:15797-2008) Domestic waste water- Definition, Characteristics, Recycling and Reuse of domestic waste water.

UNIT – II	**Air Pollution and Solid Waste management**	Total Hours : 9

Air Pollution- definition, classification, causes, Sources, effects and control measures, Air Act(1981) Solid Waste management – Causes- effects and control measures of Urban and industrial waste, Waste management initiatives in India for human well-being.

UNIT – III	**Renewable and non-renewable energy resources**	Total Hours : 9

Renewable and non-renewable energy resources- use of alternating energy sources – Energy management. Green Buildings- Definition, Importance, building envelope, Problems in existing buildings, Energy use in Buildings, Greenhouse gas emissions and indoor air pollution, green construction materials, Green building assessment system, Case study.

UNIT – IV	**Environmental Management Systems**	Total Hours : 9

Environmental Management Systems; ISO14000 series; Environmental auditing: Environmental Impact Assessment; Life cycle assessment; Human health risk assessment.

UNIT – V	**Environmental Law and Policy**	Total Hours : 9

Environmental Law and Policy – Objectives; Polluter pays principle, Precautionary principle; The Water and Air Acts with amendments; The Environment (Protection) Act (EPA) 1986; National Green Tribunal Act, 2010; National Environment Policy; Principles of International Law and International treaties.

Total Contact Hours : 45	Total Tutorials : 15	Total Practical Class : 0	Total Hours : 60

Course Outcome	1. Gain knowledge about environment and ecosystem. 2. Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource. 3. Gain knowledge about the conservation of biodiversity and its importance. 4. Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures. 5. Students will learn about increase in population growth and its impact on environment

Text Books

1. P.Yugananth, R.Kumaravelan, Environmental Science and Engineering, Scitech Publications (Inida) P.Ltd., Delhi, 2017.

2. John Pichtel, Waste Management Practices: Municipal, Hazardous and Industrial, CRCPress,2014.
3. V.S.K.V.Harish, Arunkumar, Green Building Energy Simulation and Modeling, Elsevier Science & Technology,2018

Reference Books

1. Anubha Kaushik and C.P.Kaushik, Environmental Science and Engineering, New AgeInternational (P) Ltd., New Delhi, 2010.
2. S.S.Dara, A text book of Environmental Chemistry and Pollution Control, S.Chand andCompany Ltd., New Delhi, 2014.
3. IS:15797:2008, Roof Top Rainwater Harvesting-Guidelines, BIS, New Delhi
4. Energy Conservation Building Code, 2017, Bureau of Energy Efficiency, Ministry ofPower, Government of India.
5. G.D RAI Renewable energy sources

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP31	**ENGINEERING GEOLOGY LAB**	0	0	2	1	60	40	100

Objective (s)	• *To familiarize the various types of minerals and rocks, their geological characteristics to understand their behavior/performance.* • *To impart hands on training in determination of properties of rocks.* • *To provide the knowledge on interpretation of data to arrive the solution.* • *Perform tests to evaluate soil stability and rock strength.* • *Apply geological data to solve engineering and construction challenges.*

1. Megascopic study of important rock forming/silicate minerals.
2. Megascopic study of important non-silicate minerals.
3. Megascopic study of important igneous rocks.
4. Megascopic study of important sedimentary rocks
5. Megascopic study of important metamorphic rocks
6. Elementary problems of true dip, apparent dip and strike of geological formations.
7. Establishing thickness, depth and structure of geological formations
8. Construction of topographic profile , geological sections and their interpretation
9. Electrical resistivity method (Study).
10. Determination of soundness of rocks (Study)
11. Determination of weathering of rock
12. Determination of durability of rock

Lecture Periods:- Tutorial Periods:- Practical Periods: 30 Total Periods: 30

Course Outcome	1. Students can identify minerals/rocks, their characteristics and their bearing on the construction 2. To familiarize with attitude of formations in geological 3. To learn to prepare the geological sections to address the problems 4. To provide the knowledge on interpretation of data. 5. To make hands on training to the determination of properties of rocks.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP32	**BUILDING PLANNING AND DRAWING**	0	0	2	1	60	40	100

Objective (s)	• *To understand the Functional Planning and architectural design of buildings* • *To develop skills in manual and Autocad drafting of building plans, elevation and sections* • *Develop skills in designing functional and aesthetically pleasing layouts.* • *Use drawing software and tools for effective building design and visualization.* • *Analyze and interpret building plans for practical construction applications.*

Theory

1. Functional planning – Introduction to anthropometrics and ergonomics – Occupancy classification of Buildings –Essentials of National Building Code – Essentials of Building and development rules – Introduction to green building.
2. Building Physics : Sun's movement and building: Sun control devices –Exposed walls and Openings
3. Lighting and acoustics
4. Introduction to AutoCAD – Draw and modify tools- Dimensioning-Layers- Blocks-Printing- Two dimensional drawing *3D commands* .

Plates to be submitted in CAD

1. Door, Windows, Ventilators.
2. Foundation, Staircase
3. Residential buildings – Plan, Section, Elevations (Using Mini Drafter and Cad)
4. Public buildings like office, dispensary, post office, bank etc.
5. Industrial buildings

Lecture Periods: 5 Tutorial Periods:- Practical Periods:25 Total Periods: 30

Course Outcome	1. The student can able to develop a concept drawing based on the requirements 2. To able to draft an Approval Drawing in CAD**.** 3. To understand the Functional Planning and design of buildings 4. To develop skills in manual and Cad drawing 5. To create a knowledge on building plans, elevation and sections

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP33	**SURVEYING LABORATORY**	0	0	2	1	60	40	100

Objective (s)	• *To train the students handling instruments used for surveying.* • *To make the students to understand various problems in linear and angular measurement associated with field application* • *Understand and apply various surveying methods for different terrains and purposes.* • *Analyze and interpret survey data to create precise maps and plans.* • *Gain practical experience in fieldwork and data collection for surveying projects.*

List of Experiments

1. Chain Traversing.
2. Compass Traversing.
3. Fly levelling using Dumpy level.
4. Check levelling.
5. LS and CS.
6. Contouring.
7. Measurement of horizontal angles by Reiteration method and Repetition method
8. Measurement of vertical angles
9. Tachometry - Stadia system.
10. Tachometry - Tangential system.
11. Setting out works - Foundation marking.
12. Study of Total Station.
    Setting out works - Simple curve

Lecture Periods:- Tutorial Periods:- Practical Periods: 30 Total Periods: 30

Course Outcome	1. Toprovideexerciseandmakethestudentstolearntheconceptofdetermining the measurements of horizontal as well as vertical control. 2. To train the students in handling angular measuring instruments 3. To make the students in determining the vertical cross sections of roads 4. The Students learn to take measurements from total station 5. The Students learn the procedure of survey.

SEMESTER–IV

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
MAT41	**NUMERICAL TECHNIQUES**	3	1	0	4	40	60	100

Objective (s)	• *To understand and apply concepts related to discrete and continuous random variables, including important distributions.* • *To apply large sample tests, conduct chi-square tests for goodness of fit and independence of attributes, and perform one-way and two-way classifications.* • *To solve linear systems using iterative and direct methods, and apply the power method to find dominant Eigenvalues and Eigenvectors.* • *To utilize numerical methods for solving ordinary differential equations.* • *To apply numerical techniques for solving partial differential equations.*

Module-I	**Probability and Random Variables**	Total hours :12

Probability – The axioms of probability – Conditional probability – Baye's theorem -Discrete and continuous random variables– Moment generating functions – Binomial distribution–Poisson distribution–Geometric distribution–Uniform distribution–Exponential distribution–Normal distribution.

Module-II	**Testing of Hypothesis an Design of Experiments**	Total hours : 12

Large sample test for single proportion **–** difference of proportions **–** Tests for single mean **–**difference of means **–** difference of standard deviations **–** Test for ratio of variances –Chi – squaretestforgoodnessoffitandindependenceofattributes,oneway and twowayclassifications.

Module-III	**Solution of Linear System and Numerical Integration**	Total hours : 12

Gaussian elimination and Gauss – Jordan methods – LU – decomposition methods – Crout'smethod– JacobiandGauss–Seideliterativemethods–sufficientconditionsforconvergence – PowermethodtofindthedominanteigenvalueandeigenvectorandIntegrationByTrapezoidalandSimpson 'sRules.

Module-IV	**Numerical Solution of Ordinary Differential Equations**	Total hours : 12

Euler's method – Euler's modified method – Taylor's method and Runge – Kutta method for simultaneous equations and 2nd order equations – Stability analysis of single step methods –Multistep methods–Milne's and Adams'methods.

Module-V	**Numerical Solution of Partial Differential Equations**	Total hours : 12

Numerical solution of Laplace equation and Poisson equation by Liebmann's method–solution of one dimensional heat flow equation –Bender–Schmidt recurrence relation–Crank–Nicolson method– Solution of one –dimensional wave equation.

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods: - Total Periods: 60

Course Outcome	1. Students will demonstrate a thorough understanding of probability theory, including axioms, conditional probability, and Bayes' theorem 2. Students will be able to conduct and interpret hypothesis tests for large samples, including tests for single proportions, differences in proportions, means, standard deviations, and variances. 3. Students will be proficient in solving linear systems using methods such as Gaussian elimination, Gauss-Jordan elimination, LU decomposition, and iterative methods like Jacobi and Gauss-Seidel 4. Students will have the capability to solve ordinary differential equations (ODEs) using numerical methods including Euler's method, modified Euler's method, Taylor's method, and Runge-Kutta methods. 5. Students will be skilled in solving partial differential equations (PDEs) using numerical methods.

Text Books:

1.Johnson,R.A.,Miller,IandFreundJ.,“MillerandFreund’sProbabilityandStatisticsforEngineers",PearsonEducation,Asia,8th Edition,2015.

2.Devore.J.L.,"ProbabilityandStatisticsforEngineeringandtheSciences”,CengageLearning,NewDelhi, 8th Edition,2014.

3.Spiegel.M.R.,Schiller.J.andSrinivasan.R.A.,"Schaum’sOutlinesonProbabilityandStatistics",Tata McGrawHillEdition,2004.

4.Walpole.R.E.,Myers.R.H.,Myers.S.L.andYe.K.,“ProbabilityandStatisticsforEngineersandScientists",8th Edition,PearsonEducation,Asia,2007.

Reference Books:

1.DavidKincaidandWardCheney,“NumericalAnalysis”,3rd edition,AmericanMathematicsSociety,(IndianEdition)–2010.

2.GeraldC.F.,andWheatleyP.O.,“AppliedNumericalAnalysis”,Addison-WesleyPublishingCompany,1994.

3.Jain,M.K.,Iyengar,S.R.andJain,R.K.,“NumericalMethodsforScientificandEngineeringComputation”,NewAgeinternational,2003.

4.Grewal. B.S. andGrewal.J.S., “NumericalMethodsinEngineeringandScience",10th Edition,KhannaPublishers,NewDelhi,2015.

5.Burden,R.LandFaires,J.D,"NumericalAnalysis”,9th Edition,CengageLearning,2016.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE T42	**CONCRETE TECHNOLOGY**	3	0	0	3	40	60	100

Objective (s)	• *Should be able to understand the Engineering properties of materials, Cement, Aggregates, Admixtures* • *Understand the hydration mechanism of Cement & properties of fresh and Hardened concrete* • *Explore the methods for improving concrete durability and strength.* • *To understand about durability of concrete* • *To design concrete mixes.*

Module – I	**Cement**	Total Hours : 9

Portland cement- chemical composition- hydration of Portland cement- heat of hydration- Test on Cement - hardening of cement paste- Types of Portland cement- special hydraulics cements.

Module – II	**Aggregates & Fresh Concrete**	Total Hours : 9

Aggregates- natural and mineral aggregates- characteristics of aggregate and their significant- testing of aggregates- admixture for concrete- concrete at early ages- Workability of concrete- early Volume changes- setting time.

Module – III	**Hardened Concrete**	Total Hours : 9

Concrete- introduction- components of concrete- types- properties of hardened concrete and their significance, structure of the hardened concrete- Compressive strength of concrete and factors affecting it- elastic behaviour of concrete- drying shrinkage and creep.

Module – IV	**Durability Properties**	Total Hours : 9

Durability of concrete- significant- causes of concrete deterioration- alkali-aggregate reaction- deterioration by chemical actions- concrete in marine environment.

Module – V	**Mix Design**	Total Hours : 9

Concept of proportioning concrete mixes- mix design- IS code method- ACI method. Testing evaluation and control of concrete quality.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome	1. To understand the various properties of cement, and types its applications. 2. Students should be able to understand the various properties of aggregates and fresh concrete and its workability. 3. To study about the Properties of hardened concrete with factors effecting on it. 4. To Study about the durability of concrete and chemical action of aggregate 5. Students should be able to understand the Mix design as per IS codes and ACI standards

Text Books

1. M.L. Gambhir, Concrete Technology, McGraw Hill Book Company, Fifth Edition, 2017. (ISBN-1259062554, 978-1259062551).
2. M.S. Shetty, Concrete Technology, Theory and Practice, S. Chand Publication, Sixth Edition, 2018. (ISBN-9788121900034,978-8121900034)
3. Santhakumar.Ar, Concrete Technology, Oxford University Press, 2013
4. Shetty,M.S, Concrete Technology; Theory & Practice, S. Chand & Group, New Delhi, 2014.

Reference Books

1. Gambhir.M.I, Concrete Technology: Theory & Practice, Tata McGraw Hill Co., New Delhi, 2013.
2. Gupta. Yp, Concrete Technology& Good Construction Practices, New Age International (p) Ltd., 2013.
3. Neville. Am. & Brooks Ji., Concrete Technology, Pearson Education Ltd., 2013.
4. Krishna Raju.N, Design of Concrete Mixes, CBS Publishers, New Delhi, 2013.
5. IS :10262-(2009) Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 2009.

6. IS:10262 (2009), Mix Design
7. IS:269 (2015), Ordinary Portland Cement (33 Grade).
8. IS:12269 (2013), Ordinary Portland Cement (53 Grade).
9. IS:650 (1991), Specification of Standard Sand.
10. IS:383 (1970), Specification for Coarse and Fine aggregate.
11. The code book for concrete mix design is the IS 10262: 2019, which is published by the Bureau of Indian Standards (BIS).

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE T43	**MECHANICS OF MATERIALS**	3	1	0	4	40	60	100

Objective (s)	• *Calculate & understand the concept of determination of deflection of beams & trusses* • *Calculate the stresses due to unsymmetrical loading* • *The student is to realize the three-dimensional nature of stress and strain.* • *To study the relationships between strain and displacement.* • *To understand the concept of various theories of failure*

Module –I	**Deflection of beams**	Total Hours:12
Deflection of beams – Double Integration method - Macaulay's method, moment area method -conjugate		
Module – II	**Energy methods**	Total Hours 12
Strain energy due to axial, bending, shear and torsional forces – Impact loads. Principle of virtual displacement – principle of minimum potential energy –Castigliano's Theorems – Maxwell – Betti's theorem.		
Module –III	**Deflection of trusses**	Total Hours:12
Deflection of trusses and frames **–** strain energy and dummy/unit load methods.		
Module –IV	**Analysis of continuous beams& unsymmetrical**	Total Hours:12
Analysis of continuous beams using generalized theorem of three moments – shear force and bending moment diagrams. Unsymmetrical bending – principal moments of inertia – stresses due to unsymmetrical bending.		
Module –V	**Complex strain & Theories of failure**	Total Hours12
Complex strains – linear strains for tri-axial state of stress – principle strains in terms of stress – Mohr's strain circle – relationship between Mohr's strain and stress circles. Theories of failure – Brittle and Ductile materials.		

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	1. To analysis the concept of beam by using different methods 2. To understand the concepts of strain energy methods of axil bending shear etc., by Castigliano's Theorems 3. To learn about the deflection of truss and it types by using Strain energy methods 4. To analysis of Continues beams and un symmentrical bending by inertia moment 5. To analysis of complex strain and theories of failure by using Morh's Strain circle.

Text Books

1. Bhavikatti. S. S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi, 2012.
2. Bhavikatti. S. S., Structural Analysis – I, Vikas Publishing House (P) Ltd., New Delhi, 2012.

Reference Books

1. Shah.H.J. and Junnarkar.S.B., Mechanics of structures- Vol.I & Vol.II, Charotar Publishing house, Ltd, 2012.
2. Rattan, S.S., Strength of Materials, Tata McGraw-Hill, 2011.Ramasamy.V, Purushothama Raj.P, Strength of Materials, Pearson Education Ltd., 2012.
3. Jindal.Uc., Strength of Materials, Pearson Education Ltd.,2012
4. Negi.L.S., Strength of Materials, Tata McGraw-Hill, 2012

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET44	**FLUID MECHANICS AND MACHINERY**	3	1	0	4	40	60	100

Objective (s)	• *The properties of fluids and concept of control volume are studied* • *To understand the importance of dimensional analysis* • *The applications of the conservation laws to flow through pipes are studied.* • *To understand the importance of various types of flow in turbines.* • *To understand the importance of various types of flow in pumps.*

Module – I	**FLUID PROPERTIES AND FLOW CHARACTERISTICS**	Total Hours : 12

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume,specificgravity,viscosity,compressibility,vaporpressure,surfacetensionandcapillarity.Flowcharacteristics–conceptofcontrolvolume-applicationofcontinuityequation,energyequationandmomentumequation.

Module – II	**FLOW THROUGH CIRCULAR CONDUITS**	Total Hours : 12

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli-Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation – frictionfactor-Moodydiagram-commercialpipes-minorlosses–Flowthroughpipesinseriesandparallel.

Module – III	**DIMENSIONAL ANALYSIS**	Total Hours : 12

Need for dimensional analysis – methods of dimensional analysis – Similitude –types ofsimilitude-Dimensionless parameters-application of dimensionless parameters–Modelanalysis.

Module – IV	**TURBINES**	Total Hours : 12

Turbines: Classification, impulse and reaction turbines, characteristic curves, draft tubes, governing of turbines, specific speed, unit quantities concept, similarity, and cavitation.

Module – V	**PUMPS**	Total Hours : 12

Pumps: Centrifugal pumps- classification, work done, minimum starting speed, losses and efficiencies, specific speed, multistage pumps, specific speed, characteristic curves, NPSH, cavitation in pumps. Reciprocating pumps- types, effects of acceleration and frictional resistance, separation, Air Vessels, work saved by fitting air vessels.

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	1. To make the student to understand the basic properties of fluids and principles of mechanics of fluids. 2. To study about various types of kinematic flow. 3. To apply the above principle for solving typical elementary filed problems. 4. To calibrate discharge measuring instrument like venturimeter, orifice meter. 5. To apply the above principle for solving typical elementary filed problems.

Text Books

1. Modi,P.N.,and Seth, S.M., Hydraulics, Fluid Mechanics and Hydraulic Machines, Standard Book House, New Delhi, 2014.
2. Fluid Mechanics, Sadhu Singh, Khanna Book Publishing Co., New Delhi -2018
3. Fluid Machinery (Hydraulic Machines), Sadhu Sigh, Khanna Book Publishing Co., -2018
4. Rajput,R.K., Text Book of fluid Mechanics and Hydraulic Machinery, S.Chand & Company, (P)Ltd., New Delhi, 2014.

Reference Books

1. Gupta.S.C, Fluid Mechanics & Hydraulic Machines, Pearson Education Ltd., 2013.

2. Bansal,R.K., Text Book of fluid Mechanics and Hydraulic Machines, Lakshmi Publications(P)Ltd., 2013.
3. Subramanya.K., Fluid Mechanics & Hydraulic Machines-Problems & Solutions, Tata McGraw-hill, 2013.
4. Khurmi,R.S., A Text book of Hydraulics Fluid Mechanics & Hydraulic Machines, S.Chand & Company, 2014

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE T45	**WATER SUPPLY ENGINEERING**	3	0	0	3	40	60	100

Objective (s)	• *To study the water supply demand and distribution* • *To Identify and evaluate various natural and artificial sources of water.* • *To understand the quality of water from various sources* • *To carryout functional design of water treatment units.* • *Evaluate the impact of water supply systems on public health and environmental sustainability.*

Module – I	**Introduction**	Total Hours : 9

Water supply Scheme - objectives and requirements - Domestic, industrial, commercial and public requirements - Various methods of estimating population - Variations in rate of demand and its effects on design.

Module – II	**Sources of Water and intakes:**	Total Hours : 9

Surface and groundwater sources - Computation of storage capacity of reservoirs by analytical and graphical methods - Forms of underground sources like wells, Infiltration wells and galleries, Intake structures, tube wells - Sanitary protection of wells-transportation of water- Pipe flow formulae – pipe materials- laying of pipes-testing of pipes-

Module – III	**Quality of Water:**	Total Hours : 9

Indian and W.H.O. Standards for drinking water - impurities in water - Physical, chemical and bacteriological analysis of water - quality of water for trade purpose and swimming pools

Module – IV	**Water Treatment system:**	Total Hours : 9

Unit process of water treatment - Principles, functions and design of flocculators, sedimentation tanks, sand filters, principles of disinfection, water softening, aeration, Iron and manganese removal.

Module – V	**Distribution System**	Total Hours : 9

Service reservoir location, determination of capacity – Method of distribution - Layout of distribution systems- Design of distribution system, analysis of pipe networks by different methods, pipe appurtenance for distribution system – Plumbing works and layout of water supply system for buildings, waste detection and prevention, Effects of corrosion and its prevention.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome	1. To study the water supply demand and distribution. 2. To study various sources of water and intake structure. 3. To understand the quality of water from various sources. 4. To carryout functional design of water treatment units. 5. Plan and design water supply systems for a rural/urban area.

Text Books

1.Duggal, K.N., Elements of Environmental Engineering, S. Chand & Company , New Delhi 2013
2. Environmental Engineering, M.P. Poonia, SC. Sharma, Santosh Kumar, Khanna Book Publishing Co., New Delhi.
3. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.

Reference Books

1. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2013
2. Venugopala Rao.P,Text book of Environmental Engineering, Prentice-hall of India Pvt Ltd., 2012
3. Santosh Kumar Garg, Water Supply Engineering: Environmental Engineering 1, Khanna Publishers, 2013
4. Modi, P.N, Water Supply Engineering: Environmental Engineering 1, Standard Publishers, 2011
5. The Indian standard code for drinking water, IS 10500:2012.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE P41	**CONCRETE & HIGHWAY ENGINEERING LABORATORY**	0	0	2	1	60	40	100

Objective (s)

- *This course provides an understanding of the basic properties of construction materials, and presents laboratory standards and testing requirements for these materials.*
- *To familiarize the students to do the experiments as per the guidelines of BIS.*
- *To provide the knowledge eon mix proportioning of concrete as per the guidelines of BIS.*
- *To obtain practical knowledge about fresh and hardened properties of concrete*
- *Develop skills for analyzing experimental data and working in teams.*

I. Tests on cement

1. Determination of specific gravity of cement.
2. Determination of standard consistency of cement paste.
3. Determination of initial and final setting times of cement.
4. Determination of soundness of cement.
5. Determination of compressive strength of cement mortar.

II. Tests on aggregates

6. Determination of specific gravity and water absorption of fine& coarse aggregate.
7. Sieve analysis of fine & coarse aggregates
8. Determination of maximum bulking and corresponding optimum moisture content of fine aggregate.
9. Determination of bulk density of fine and coarse aggregates.

III. Tests on fresh concrete

10. Determination of degree of workability: Slump cone test, compaction factor test, Vee Bee time test, flow table test.

IV. Tests on hardened concrete, tiles & bricks

11. Determination of Compressive strength of concrete
12. Determination of Flexural strength of concrete
13. Determination of Splitting tensile strength of concrete
14. Determination of water absorption and flexural strength of clay tiles.
15. Determination of water absorption and crushing strength of bricks.

Lecture Periods:- **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome

1. Students are able to conduct suitable experiments construction materials also to test their properties.
2. Students are able to conduct proper test to evaluate the properties of concrete.
3. To understand the basic properties of construction materials, fresh and hardened properties of concrete
4. To familiarize the students to do the experiments as per the guidelines
5. To provide the knowledge on mix proportioning of concrete as per the guidelines

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP42	**MATERIALS TESTING LABORATORY**	0	0	2	1	60	40	100

Objective (s)	• *Master the techniques for testing the physical and mechanical properties of materials.* • *Learn to conduct standard tests for materials such as concrete, metals, and soils.* • *Analyze test results to ensure material quality and compliance with specifications.* • *Develop skills in using laboratory equipment for accurate material testing.* • *Apply testing data to evaluate and improve material performance in construction and engineering applications.*

A. Tension Test on Mild steel and Tor Steel rod specimens
B. Direct Shear Test on Steel Rod Specimens
C. Bend and Re-bend Test on Steel Rod Specimens
D. Brinell Hardness Test on Metal Specimens
E. Rockwell Hardness Test on Metal Specimens
F. Vickers Hardness Test on Metal Specimens
G. Impact Test on Metal Specimens using Izod arrangement
H. Impact Test on Metal Specimens using Charpy arrangement
I. Ductility Test on Sheet metals using Erichsen Cupping
J. Torsion Test on Metal Specimens-
K. Fatigue Test on Metal Specimens- Demonstration only
L. Spring Test- Demonstration only
M. Compression Test on wood Specimens- Parallel and Perpendicular to the Grains-
N. Direct Shear Test on Wood Specimens
O. Direct Tension Test on Wood Specimens
P. Static Bend Test on Wood Specimens

Lecture Periods:- **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome	1. To determine the mechanical properties of materials subjected to the loads 2. To take report and verify the mechanical properties of materials as per Indian standards available 3. To able to know where the mechanical property is used in the engineering design. 4. The course will enable the students to evaluate the strength of materials 5. To understand the different types of loads

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP43	**FLUID MECHANICS AND MACHINERIES LAB**	0	0	2	1	60	40	100

Objective (s)

- *Understand and apply fundamental principles of fluid mechanics in practical experiments.*
- *Learn to operate and calibrate fluid mechanics and machinery laboratory equipment.*
- *Analyze fluid behavior and flow characteristics through hands-on testing.*
- *Evaluate the performance and efficiency of various fluid machinery.*
- *Develop problem-solving skills using experimental data to validate theoretical fluid mechanics concepts.*

A. Fluid Flow Laboratory

a. Calibration of rectangular, triangular, trapezoidal notches

b. Determination of coefficient of discharge for orifices and mouthpieces

c. Calibration of venturimeters, orifice meters and Rota Meters

d. Verification of Bernoullis theorem

e. Determination of pipe friction

f. Determination of minor losses in pipe due to bends, elbows, sudden contraction, expansion etc.,

g. Determination of Metacentric height of various ship models

h. Determination of force due to Impact of jet on vanes

B. Fluid Machinery Laboratory

a. Study of performance characteristics of centrifugal pump (constant speed)

b. Study of performance characteristics of Reciprocating pump

c. Study of performance characteristics of Submersible pump

d. Tests on Turbine

Lecture Periods: - **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome

1. Students are able to measure the discharge through the channels and pipes.
2. To check fly stability of the floating bodies.
3. To Study the design the various pumps**.**
4. To verify the Turbines used in the power stations
5. Students can study about minor and major losses.

SEMESTER–V

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET51	**DESIGN OF RCC STRUCTURES**	3	1	0	4	40	60	100

Objective (s)	• *To understand design principles of reinforced concrete* • *To gain knowledge in the Limit state method of design of basic structural elements* • *Implement limit state design techniques for the effective design of columns.* • *Use limit state design principles to create safe and functional footings and staircases.* • *Design brick masonry walls considering structural requirements and performance.*

Module – I	**Introduction and Design Philosophy**	Total Hours : 12

Introduction to Reinforced concrete structures- basic material properties-behaviour of concrete under uniaxial compression and tension-reinforcing steel- Design philosophy – Introduction to WSM,ULM,LSM-behaviour in flexure – Design for limit State Method: Concepts- Assumptions- Characteristic Strength and Load, Partial Safety Factors- Limit States- Limit State of Collapse in Flexure

Module – II	**Limit State Design of Beams and Slabs**	Total Hours : 12

Limit State of Collapse in Shear, Bond and Torsion- Design of beams and one way slab for flexure - Design of beams for flexure, shear, bond and torsion. Design of two way continuous slab systems. Design of Lintel Beams.

Module – III	**Limit State Design of Columns**	Total Hours : 12

Design of compression members – Effective length – Design short column under axial compression, axial compression with uniaxial bending, axial compression with biaxial bending, Design of slender columns – Braced slender column- un-braced slender column – Strength reduction coefficient method – additional moment method

Module – IV	**Limit State Design of Footings and Staircases**	Total Hours : 12

Design of footings – isolated footings with axial eccentric loading- combined rectangular footing – design of staircases- Introduction to fire resistant design – code provisions.

Module – V	**Design of Brick Masonry Walls**	Total Hours : 12

Design of brick masonry – strength of bricks – country-wire cut-hollow block-porotherm , aerocon bricks – code provisions – Specification for mortar, Design of Axially loaded walls, eccentrically loaded walls, Retaining walls.

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	1. To gain Knowledge about the basic concepts of design of reinforced structures with different types 2. To understand the LSM design concepts for beam and slab 3. To understand the LSM design concepts for different types of column 4. To understand the design concepts of different types of footing and Staircase 5. To Understand the design concepts of Brick Masonry wall and it types

Text Books

1. Subramanian.N., Design of Reinforced Concrete Structures, Oxford University Press, may 2022
2. Varghese.P.C, Limit State Design of Reinforced Concrete, Prentice-hall of India (p) Ltd., Jan 2014

Reference Books

1. Arun Kumar Jain , Ashok Kumar Jain, Punmia.B.C, Limit state design of Reinforced Concrete, Lakshmi Publications (P) Ltd., New Delhi, First Edition, 2020
2. Ashok K. Jain, 'Reinforced Concrete Limit State Design', Nem Chand & Bros, 2019
3. Virendra Gehlot, Ram Chandra, Limit State Design of Concrete Structures, Standard Publishers, 2011.
4. Unnikrishna Pillai.S, Devdas Menon, Reinforced Concrete Design, Tata Mc Graw-hill, 4th Edn2021.
5. Indian Standard 456:2000 Plain and Reinforced Concrete - Code of Practice.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET52	**STRUCTURAL ANALYSIS**	3	1	0	4	40	60	100

Objective(s)	• *To develop an understanding of the static and kinematic indeterminacy of structures* • *To familiarize the students with various force and displacement methods of analysis* • *To analyse indeterminate structures with indirect/secondary stresses.* • *Apply the slope-deflection method to evaluate the deflections and moments in indeterminate structures.* • *Explore and apply alternative structural analysis techniques for various engineering problems.*

Module -I	**Introduction**	Total Hours : 12

Types of structures – Behaviour of different structures- Static and kinematic indeterminacies – Analysis of statically indeterminate beams by consistent deformation/force method.

Module -II	**Analysis of Trusses**	Total Hours : 12

Analysis of plane trusses with one or two redundant members by force method - trusses with lack of fit - Thermal stresses.

Module -III	**Slope Deflection Method**	Total Hours : 12

Continuous beams and rigid frames, (with and without sway) - Symmetry and anti-symmetry- gable frames - Support settlement.

Module -IV	**Moment Distribution Method**	Total Hours : 12

Stiffness and carry over factors – Analysis of continuous Beams with and without support settlement - Plane rigid frames with and without sway

Module -V	**Miscellaneous Methods**	Total Hours : 12

Kani's method of analysis of beams and frames. Analysis of frames for lateral loads by portal and cantilever methods.

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	1. To develop an understanding of the static and kinematic indeterminacy of structures 2. To familiarize the students with various force and displacement methods of analysis 3. To analyse indeterminate structures with slope deflection methods 4. To analyse indeterminate structures with moment distribution methods 5. To analyse indeterminate structures with Miscellaneous methods

Text Books

1. Devdas Menon, Structural Analysis, Narosa Publishing House, 2017
2. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory of Structures, Vol. II, Laxmi Publications, New Delhi, 2018.

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, Tata Mc Graw Hill, 2017
2. Russell C Hibbeler, Structural Analysis, Pearson Education Ltd., 2022
3. Khurmi. R.S., Theory of Structures, S.Chand &Company, 2014.
4. Bhavikatti. S. S., Structural Analysis, Vol. I, Vikas Publishing House (P) Ltd., 2021.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET53	**GEOTECHNICAL ENGINEERING**	3	1	0	4	40	60	100

Objective (s)	• *Provide the description of soil and to characterize soil as per IS Code.* • *Analyze soil permeability and its effects on water flow through soils.* • *To develop an understanding of the soil hydraulics, principles of stress distribution due to self-weight and applied loading conditions and* • *To understand about soil &its application to compressibility of soil.* • *Familiarize the students an understanding of strength of soils.*

Module – I	**Index Properties**	Total Hours : 12

Soil formation – soil minerals – soil structure - three phase system – definitions- inter- relationships (derivations and problems) – Index properties determinations - IS soil classification – sol deposits in India.

Module – II	**Soil Hydraulics**	Total Hours : 12

Soil water – capillary phenomenon – permeability – field and laboratory test - seepage and flow nets – geostatic stress - neutral and effective stress (problems).

Module – III	**Stress Analysis**	Total Hours : 12

Stress due to concentrated load, due to uniformly loaded area, line load strip load- pressure distribution diagrams - contact stress - Westergaard's analysis.(Derivations and problems)

Module – IV	**Soil Compressibility**	Total Hours : 12

Compressibility: One dimension consolidation - consolidation process - consolidation theory – laboratory test – pre consolidation pressure. Compaction – laboratory tests – field compaction (problems)

Module– V	**Shear Strength**	Total Hours : 12

Shear strength- Mohr – coulomb theory – shear strength parameter – laboratory and field tests – pore pressure parameters - stress path – insitu shear strength - factors affecting shear strength - shearing characteristics of sand and clay (problems).

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	1. Provide the description of soil and to characterize soil as per IS Code. 2. To develop an understanding of the soil hydraulics. 3. To develop an understanding principles of stress distribution due to self-weight and applied loading conditions. 4. To understand the application to compressibility of soil. 5. Familiarize the students an understanding of strength of soils

Text Books

1. Purushothama Raj. P, Soil Mechanics and Foundation Engineering, Pearson Education, 2019
2. Ashok Kumar Jain, Punmia, B.C., Soil Mechanics and foundations, Lakshmi Publications, 2020.

Reference Books

1. Braja M. Das Textbook of Geotechnical Engineering, Cengage Leaning, 2022
2. Venkataramiah. C., Geo Technical Engineering, NAIP, 2020.
3. Murthy. V.N.S., A Text Book of Soil Mechanics & Foundation Engineering, CBS publishers, 2019
4. Venkatramaiah.C, Geotechnical Engineering, New Age International (p) Ltd., 2014.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET54	**HIGHWAY ENGINEERING**	3	0	0	3	40	60	100

Objective (s)

- *The student should have understood the various aspects of Highway Engineering including material characterization, pavement design and management*
- *To understand the selection and properties of materials used in highway construction.*
- *To Design and evaluate flexible pavement systems for durability and performance.*
- *To Develop and assess rigid pavement structures to ensure structural integrity and longevity.*
- *To implement effective construction techniques and maintenance strategies for highway systems.*

Module – I **Highway Geometry** Total Hours : 9

Importance Road transportation, Highway alignment – Requirement, Engineering surveys for highway location. Maps & drawings to be prepared. Geometric design – Cross section element, width, camber, design – speed, sight distances, requirements and design of horizontal and vertical alignments.

Module – II **Highway Materials** Total Hours : 9

Highway materials – Properties of sub-grade pavement component materials – Tests on aggregates, sub-grade soil & bituminous materials. Design of Bituminous mixes as per M52

Module – III **Flexible Pavements** Total Hours : 9

Pavement analysis – flexible pavement – calculation of stresses – single layer, two layer theory – Computation of strain at the layers interface – computation of deflection.
Rigid pavement - calculation of stresses – load and temperature effects - Westergaard's theory - Bradbury theory.

Module – IV **Rigid Pavements** Total Hours : 9

Pavement Design Factors in the design of flexible and rigid pavements, CBR methods. IRC recommendations on flexible pavement design (IRC37) and Rigid pavement (IRC58). Design of Surface and subsurface highway drainage.

Module – V **Construction and Maintenance** Total Hours : 9

Pavement construction techniques – Types of pavements – WBM, WMM, GSB construction. Construction of bituminous pavements and rigid pavements. Pavement failures and their remedies. Pavement evaluation – structural, functional.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome

1. The student should have an adequate knowledge in highway alignment , surveys in road construction ,types of curves , maps and drawings in detail
2. The student should have understood the various aspects of Highway Engineering including material characterization.
3. To understand the design concepts of Flexible pavements
4. To understand the design concepts of Rigid pavements in detail
5. The Students should have an thorough knowledge in construction and maintenance of highways

Text Books

1. Veeraragavan.A, Khanna. S.K. , Ceg Justo, Highway Engineering, Nem Chand& Brothers, 2019.
2. Sharma, S.K. " Principles Practice and Design of Highway Engineering ", S. Chand & Co Ltd, 2019.

Reference Books

1. Gupta B.L and Amith Gupta, Highway and Bridge Engg., Standard publishers, and Distributor, 2010.
2. Partha Chakroborthy and Animesh Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2013.
3. Lr Kadiyali, Lr Kadyali, Nb Lal ," Principles and practice of highway engineering ", Khanna Publishers. 2013
4. Rangwala.S.C, Highway Engineering, Charotar Book Distributors, 2019.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET55	**SEWAGE ENGINEERING**	3	0	0	3	40	60	100

Objective(s)

- *To study the important aspects of sanitation*
- *Learn the methods and systems for the effective collection and transport of sewage.*
- *Understand the microbial processes and organisms involved in sewage treatment.*
- *To understand the sewerage system and functional design of sewage treatment units.*
- *To learn about the safe disposal of waste water*

Module – I **Introduction** Total Hours : 9

Definitions - General considerations- Interdependence of water supply and waste water disposal – source and nature of waste water - Combined and separate system – surface drainage - storm water flow – Investigation and design of sewerage schemes – Data collection - Design flow for separate, storm and combined systems.

Module – II **Microbiology of sewage** Total Hours : 9

Sewage Characteristics- Physical, chemical and biological characteristics of sewage – Chemical Analysis - D.O. and B.O.D. and its significance. Sampling, population equivalent-Significance of industrial wastes.

Module – III **Collection and transport of sewage** Total Hours : 9

Collection and Transport of sewage - Materials for sewers -– Flow formulae - Self cleansing of sewers - Full and partial flow conditions - Sewer sections. Design of separate sewers - Storm drains and combined sewer systems.- Design principles and procedures, sewer construction: Sewer laying under various conditions,– Tests for sewers. Flushing equipment for removal of sand, grit – Sewer appurtenances - Manholes - Inlets - catch basins - Sand, grease and oil traps. Sewage pumps – Necessity of pumping and classification of pumps -Sanitary fixtures and fittings - General layout and street connection - Principles of design of anti syphonage device -Types - Inspection chamber - Fresh air inlet.

Module – IV **Treatment methods** Total Hours : 9

Primary treatment: Basic principles of sewage treatment - Screens, Grit chamber - Principles of sedimentation - Design of settling tanks - Types of settling tanks - Chemical precipitation. Biological Treatment and unit Process: Contact beds - Trickling filter - Description and operation of low rate and high rate filters, intermittent sand filter - Design of the above filters. Activated sludge Process: Theory – Diffuser and Mechanical aeration - Conventional, High rate and extended aeration process - Process modification – Oxidation ditch - Principles and design of waste stabilization lagoon - aerated Lagoon. Principle of Sludge digestion - Optimum conditions - Digestion tanks -Supernatant liquid - Sludge gas - Drying beds. Septic and Imhoff tanks

Module – V **Disposal of sewage** Total Hours : 9

Wastewater Disposal and Reuse - Disposal of sewage - Land disposal - Discharge in to rivers. Lakes, estuaries and ocean – River pollution - Oxygen sag curve - recycle and reuse of waste effluents. – Disinfection –Chlorination and odour prevention. Introduction to Low cost treatment methods -Special nature of problem of industrial water - Process modifications and by product recovery

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. Students able to study, analysis and design sewerage systems
2. Students able to identify the characteristics of sewage
3. They should be capable to select and use techniques, skills and modern engineering practices to solve the sewage transpirations problem
4. Students should able to design various waste water treatment units.
5. Students can gain the knowledge in various sewage disposal methods

Text Books

1. Duggal, K.N., Elements of Environmental Engineering, S. Chand &Company, New Delhi 2020.

2. Punmia.B.C., Ashok Jain and Arun Jain., Waste Water Engineering including Air Pollution, Lakshmi Publications (P) Ltd., 2019

Reference Books

1. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2021
2. Mackenzie L Davis, Water & Wastewater Engineering, Tata Mc Graw-Hill, 2019
3. Modi. Pn., Sewage Treatment & Disposal & Wastewater Engineering Vol.2, Standard Book House, 2017.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP51	**COMPUTER AIDED DESIGN LAB**	0	0	2	1	60	40	100

Objective (s)

- *To gain basic knowledge in modelling of structures.*
- *Perform truss analysis considering factors like lack of fit, temperature stresses, and wind loads.*
- *Evaluate rigid jointed frames under different loads, support conditions, and moving loads.*
- *To familiarize and give hands on training to students using wok sheets and databases.*
- *Explore advanced 3-D modeling tools, hybrid structures, and compare STAAD Pro V8i with other software like ETABS and STRUDS.*

1. Structural analysis and Design: Introduction to STAAD Pro V 8i – Preprocessor, creating geometry, editing tools, load and support definition and structuring of output file. Types of analysis, use of post processor and report generation.
2. Analysis of continuous beams- beams with different loads, internal hinges, elastic supports, support settlement and moving loads.
3. Analysis of trusses – lack of fit and temperature stresses, wind load generation, moving loads and industrial trusses.
4. Analysis of rigid jointed frames- different types of loads, inclined supports, elastic supports, support settlement, moving loads and moment envelop.
5. Special Topics- 3-D modelling tools, modelling of hybrid structure-imparting structure from library
6. Comparison with ETABS, STRUDS software (Demo only)

Lecture Periods: - **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome

1. To be able to model structures using structural analysis software
2. To analyse structures using structural analysis software
3. To design structures using structural analysis software
4. To familiarize and give hands on training to students using woksheets and databases
5. To gain basic knowledge in modelling of structures.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP52	**GEOTECHNICAL ENGINEERING LAB**	0	0	2	1	60	40	100

Objective (s)	• *To provide the hands on training in determination of Index and Engineering and index properties of soils.* • *To familiarize the students to do the experiments as per the guidelines of BIS.* • *To provide the knowledge on interpretation experimental results to solve foundation problems.* • *To perform mechanical and sedimentation methods for grain size analysis of soils.* • *To Identify soil types visually according to IS codes and perform consolidation tests for soil behavior analysis.*

1. Specific Gravity of CG and FG Soils
2. In-situ unit weight Determination – Core Cutter Method & Water content Determination
3. Grain Size Analysis – Mechanical Method - Dry Sieve Analysis / Wet Sieve Analysis
4. Grain Size Analysis – Sedimentation Analysis - Hydrometer Method
5. Atterberg Limits: Liquid Limit Test and Plastic Limit Test
6. Atterberg Limit: Shrinkage Limit Test & Free Swell Test
7. Laboratory Permeability Test: Constant and Variable Head
8. Standard Proctor Compaction Test
9. Direct Shear Test
10. Unconfined Compression Test
11. Triaxial Shear test – UU Test
12. Visual Soil Identification as per IS Code
13. Consolidation Test (Demo)

Lecture Periods: - **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome	1. To conduct suitable experiment on soil to evaluate the index properties 2. To classify the soil types in detail 3. To evaluate other geotechnical properties of soil used in design of geotechnical structures. 4. To familiarize the students to do the experiments as per the guidelines of BIS. 5. To provide the knowledge on interpretation experimental results to solve foundation problems.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP53	**WASTE WATER ANALYSIS LABORATORY**	0	0	2	1	60	40	100

Objective (s)

- *To learn and practice on the various testing methods for water quality, waste water quality and other environmental parameters.*
- *Measure key water quality indicators such as turbidity, pH, conductivity, and residual chlorine.*
- *Assess total solids, suspended solids, and dissolved oxygen concentrations in water.*
- *Estimate E. coli levels, perform plate counts for bacterial analysis, and measure residual chlorine.*
- *To correlate theoretical and practical and measures for visual understanding and practice*

1. Determination of Turbidity, pH, Conductivity and Residual Chlorine.
2. Determination of Alkalinity.
3. Determination of Chlorides.
4. Determination of Hardness.
5. Determination of Iron
6. Determination of Manganese.
7. Determination of Fluorides.
8. Determination of Total Solids.
9. Determination of Suspended solids.
10. Determination of Dissolved Oxygen.
11. Jar test for the determination of optimum coagulant Dose.
12. Determination of B.O.D.
13. Determination of C.O.D.
14. Estimation of E-Coli.
15. Plate count (for bacterial analysis of water)
16. Determination of Residual Chlorine

Lecture Periods:- **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome

1. To study and conduct experiments on water
2. To study and conduct experiments on waste water
3. To conduct experiments on environmental pollution and their by accessing them self on the process decision making.
4. To learn and practice on the various testing methods for water quality, waste water quality and other environmental parameters.
5. To correlate theoretical and practical and measures for visual understanding and practice

SEMESTER–VI

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE T61	**FOUNDATION ENGINEERING**	3	1	0	4	40	60	100

Objective (s)

- *Provide the students with a basic understanding of the essential steps involved in a geotechnical site investigation.*
- *Introduce to the students, the principal types of foundations and the factors governing the choice of the most suitable type of foundation for a given solution. Procedures used for : a) bearing capacity estimation, b) Pile carrying capacity.*
- *To understand about pile foundation in various types of soil*
- *To familiarize the concepts of earth pressure, design Earth Retaining structures.*
- *To determine stability of slopes.*

Module – I **Soil Exploration** Total Hours : 12

Introduction - need, planning, stages - depth and spacing of soil-exploration - methods of exploration – Samples - samplers, sampling method – Insitu tests – SPT, CPT, VST, pressuremeter - exploration reports

Module – II **Lateral earth pressure** Total Hours : 12

Active, passive and earth pressure at rest, Rankine and Coulomb's theory – Rebhann's Method. Earth pressure due to inclined back fill, line load and earth quake load - Cantilever sheet pile wall in granular and clay soil. (Problems). Design of braced excavation (concept only).

Module – III **Shallow foundation** Total Hours : 12

Types and selection criteria – Shear failures - Bearing capacity Determination using Terzaghi and IS code formula (problems) – SBC form field tests - proportioning of foundation – BC of foundation subjected to moments and earthquake loading – Elastic and Consolidation settlement. Methods to increase BC (Concept only).

Module – IV **Pile foundations** Total Hours : 12

Introduction- classification-selection criteria- Individual carrying capacity- static and dynamic approach (problems) – lateral plié carrying capacity - pile group – group carrying capacity - pile load tests- - Under reamed piles-IS Codal provisions

Module – V **Stability of slopes** Total Hours : 12

Introduction- slopes failure - stability of infinite slope – landslides. Finite slope analysis - Swedish circle method – stability number (problems) – Reinforced slopes.

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome

1. Students to learn and study about the basic essential steps involved in Geotechnical Site investigation
2. Students should be gain knowledge about the concepts of earth pressure and the design earth retaining structures and its types.
3. To understand and analysis to select the foundation after analyzing the geodetic condition
4. To analysis excepted design and construct a pile foundation as per codal Provision and its types
5. To Study about the ability of slopes and its stability types.

Text Books

1. Braja M. Das Principles of Foundation Engineering, Cengage\Delmar Learning India (P) Ltd., 2022.
2. Purushothama Raj. P, Soil Mechanics and Foundation Engineering, Pearson Education Ltd., 2019.

Reference Books

1. Arora.Kr., Soil Mechanics & Foundation Engineering, Standard Publishers, 2017.
2. Varghese P.C. Foundation Engineering, Prentice-hall of India Pvt. Ltd, 2012.
3. Murthy. V.N.S., A Text Book of Soil Mechanics & Foundation Engineering, CBS publishers, 2019.
4. Ashok Kumar Jain, Punmia, B.C., Soil Mechanics and foundations, Lakshmi Publications ,2020.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE T62	**RAILWAYS AND AIRPORT ENGINEERING**	3	0	0	3	40	60	100

Objective(s)

- *Provide the students with a basic understanding of the railway and airport engineering.*
- *Introduce to the students, the role of a Civil Engineer in the above modes of transport.*
- *To understand the crossing of railway tracks*
- *Introduction of Airport planning*
- *To understand runways and taxiways*

Module – I **Components and Functions of Permanent way** Total Hours : 9

Permanent way – gauges, components of permanent way, rails; functions, requirements, types, failures, creep of rails; Sleepers - types, requirements; Ballast – functions requirements, track fittings and fastenings.

Module – II **Geometric design of track** Total Hours : 9

Geometric design of the track – gradients, grade compensation, speed, super-elevation, cant deficiency, negative cant transition curve Problems on geometric design.

Module – III **Crossings of tracks** Total Hours : 9

Points and crossings – turn outs, switches, crossings, types of crossings, Design of turnouts; stations - site selection, requirements of a railway station, classification of stations; yards – types of yards,

Module – IV **Airport planning** Total Hours : 9

Airport planning – Aircraft characteristics –airport planning, obstructions, types of airport, Wind rose diagram, Runway orientation.

Module – V **Runways and taxiways** Total Hours : 9

Basic runway length and corrections. Design of exit taxiway, Runway marking and lighting, LCN and PCN, airport drainage, Problems on LCN & PCN

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome

1. To understand the initial knowledge of permanent way and it's all components in detail.
2. The student should have a basic ideas of geometry of alignment in permanent way.
3. To understand the design concepts of points and crossings,turnout and other major areas of railway project.
4. To provide the students with a basic understanding of the railway and airport engineering
5. Introduce to the students, the role of a Civil Engineer in the above modes of transport

Text Books

1. Khanna S.K, Jain.S.S, Arora.M.G., Airport Planning and Design, Nem Chand and Bros., 2019.
2. Saxena, S.C., S. Arora. S.P., Text Book of Railway Engineering, Dhanpat Rai Publications (P) Ltd., 2013.

Reference Books

1. Mundrey.J.S, Railway Track Engineering, Tata Mc Graw-hill, 2013.
2. Subhash C Saxena, Airport Engineering Planning & Design, CBS Publishers, 2017.
3. Agarwal, M. M., Agarwal, M. M, Indian Railway track, Standard Publishers, 2019.
4. Kristi, Lal, Transportation Engineering, PHI, New Delhi, 2008.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET63	**MUNICIPAL SOLID WASTE MANAGEMENT**	3	0	0	3	40	60	100

Objective(s)

- *To familiarize students with the various types and origins of municipal solid waste. To develop some ideas of the legal and practical aspects of their profession*
- *To provide knowledge on how municipal solid waste is generated and the methods used for its storage.*
- *To study the processes and logistics involved in the collection and transport of municipal solid waste.*
- *To equip students with an understanding of the different methods used to process municipal solid waste.*
- *To enable students to learn about safe and sustainable practices for the disposal of municipal solid waste.*

Module – I **SOURCES AND TYPES** Total Hours : 9

Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management-Public awareness; Role of NGO's.

Module – II **ON-SITE STORAGE AND PROCESSING** Total Hours : 9

On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling.

Module – III **COLLECTION AND TRANSFER** Total Hours : 9

Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

Module – IV **OFF-SITE PROCESSING** Total Hours : 9

Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

Module – V **DISPOSAL** Total Hours : 9

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome

The students completing the course will have

1. an understanding of the nature and characteristics of municipal solid wastes
2. To understand the regulatory requirements regarding municipal solid waste management
3. Ability to plan waste minimization and design storage.
4. To understand the collection, transport, waste processing.
5. To understand the disposal of municipal solid waste.

Text Books:

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. "Solid. Wastes: Engineering Principles and Management Issues". McGraw Hill, New York, 1993.
2. Vesilind, P.A. and Rimer, A.E., "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981
3. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000

Reference Books:

1. Government of India, "Manual on MunicipalSolid Waste Management", CPHEEO, Ministry of UrbanDevelopment, New Delhi, 2000.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001
3. Manser A.G.R. and Keeling A.A.," Practical Handbook of Processing and Recycling of Municipal solid Wastes", Lewis Publishers, CRC Press, 1996
4. George Tchobanoglous and Frank Kreith"Handbook of Solidwaste Management", McGraw Hill, New

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
MCT301	**PROFESSIONAL PRACTICE LAW AND ETHICS**	2	0	0	0	0	0	0

Objective(s)

- *To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession*
- *To develop some ideas of the legal and practical aspects of their profession*
- *To understand ADR System*
- *To Engagement of Labour and other construction-related Laws*
- *To understand the Law relating to Intellectual property*

Module – I **Professional Practice – Respective roles of various stakeholders:** Total Hours : 6

Professional Practice - Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards)

Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.

Module – II **General Principles of Contracts Management:** Total Hours : 6

Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /" Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public Private Partnerships; International Commercial Terms;

Module – III **Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:** Total Hours : 6

Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats

Module – IV **Engagement of Labour and Labour & other construction-related Laws:** Total Hours : 6

Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

Module – V **Law relating to Intellectual property:** Total Hours : 6

Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of

copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;

Lecture Periods: 30	Tutorial Periods:-	Practical Periods:-	Total Periods: 30

Course Outcome	• To familiarise the students to what constitutes professional practice, introduction of various stakeholders and their respective roles. • To understanding the fundamental ethics governing the profession • To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement of labour To give an understanding of Intellectual Property Rights, Patents. • To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession • To develop good ideas of the legal and practical aspects of their profession.

Text Books/ Reference Books

1. Premvir Kapoor, Professional Ethics and Human Values, Khanna Publishing House.
2. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
3. The National Building Code, BIS, 2017
4. RERA Act, 2017
5. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
6. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
7. Avtarsingh (2002), Law of Contract, Eastern Book Co.
8. Dutt (1994), Indian Contract Act, Eastern Law House
9. Anson W.R. (1979), Law of Contract, Oxford University Press
10. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
11. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
12. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
13. Bare text (2005), Right to Information Act
14. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
15. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
16. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
17. Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss2,pp 117-127, MCB UP Ltd
18. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application
19. Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill
20. Engineering Ethics, National Institute for Engineering Ethics, USA
21. www.ieindia.org
22. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J.Rabins
23. CONSTRUCTION CONTRACTS, http://www.jnormanstark.com/contract.htm
24.Internet and Business Handbook, Chap 4, CONTRACTSLAW, http://www.laderapress.com/laderapress/contractslaw1.html
25. Contract & Agreements http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm
26. Contracts, http://206.127.69.152/jgretch/crj/211/ch7.ppt
27.Business & Personal Law. Chapter 7. " How Contracts Arise", http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt
28. Types of Contracts, http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt
29. TYPES OF CONTRACTSAND IMPORTANT PROVISIONS,
30. http://www.worldbank.org/html/opr/consult/guidetxt/types.html
31. Contract Types/Pricing Arrangements Guideline- 1.4.G (11/04/02), http://www.sandia.gov/policy/14g.pdf

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE P61	**TRANSPORTATION ENGINEERING LAB**	0	0	2	1	60	40	100

Objective (s)	• *To develop an understanding of the highway material.* • *Familiarize the students with various test procedures a per* • *To analyze the properties and performance of materials used in road construction.* • *To apply principles of highway geometry and design to practical lab projects.* • *To perform tests to assess the strength and durability of flexible and rigid pavements.*
Cycle – I	**Tests on soil and granular material**
Optimum water content of soil, CBR test on the soil, tests on the GSB and WMM	
Cycle – II	**Tests on Aggregate**
Crushing value test, impact value test, Specific Gravity and water absorption test, flakiness and elongation test, angularity test,	
Cycle – III	**Tests on Bitumen**
Penetration test, softening point test, ductility test, specific gravity test, flash point test, viscosity test.	
Cycle – VI	**Tests on Bituminous mixes**
Testing of BM, SDBC of mixes, arriving at Optimum bituminous content.	
Lecture Periods:-	**Tutorial Periods:- Practical Periods: 30 Total Periods: 30**
Course Outcome	1. To Study about various highway materials based on their properties 2. To create an understanding of the highway material 3. To Familiarize the students with various test procedures 4. Students can know the bitumen test deeply. 5. Students can understand the road depth.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE P62	**ESTIMATION COSTING AND VALUATION ENGINEERING LAB**	2	0	2	3	60	40	100

Objective (s)	• *To study the types of estimation* • *To study the analysis of quantities of brick work* • *To understand about the estimation of different structure.* • *To study the analysis of rates and types of specification* • *To study the method of valuation*

Module - I	**Introduction**	Total Hours : 12

Estimates – types of estimates – Advantages – Method of measurements – Unit of measurement for various item of work – Method of measurement as per IS 1200, method of estimation; Centre line method of estimation – Examples using above methods.

Module - II	**Estimation of buildings**	Total Hours : 12

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, Color washing and painting for shops, single room & double room building and simple residential buildings with flat roof.

Module - III	**Estimation of other structures**	Total Hours : 12

Estimating of septic tank, soak pit – Sanitary and water supply installations – Water supply pipe line – Sewer line – Tube well – Open well – Estimate of bituminous and cement concrete roads – Various types of arches – Calculation of brick work and RCC works in arches - Estimate of retaining walls and box culvert.

Module - IV	**Specification and rate analysis**	Total Hours : 12

Specification: purpose and basic principles of general and detailed specification of various item of work – Earthwork excavation – Cement concrete – Damp proof course – Form work – Brick and stone masonry – Flooring- Painting of wood work.

Analysis of rate – Purpose – Quantity of materials per unit rate of work – Requirement of labour and materials for different works – Obtaining the rate for different works using local schedule of rates – Cement mortar – Cement concrete – RCC- Brick masonry – Plastering – Flooring – Painting.

Module - V	**Valuation**	Total Hours : 12

Valuation – Purpose, definition of common terms used in valuation such as free and lease hold property – Gross income, net income, outgoings, sinking fund, scrap value, salvage value, market value, book value, capital cost and depreciation methods – Valuation of building using different methods with examples – Fixation of rent for a building - Valuation of land.

Lecture Periods: 30 Tutorial Periods:- Practical Periods: 30 Total Periods: 60

Course Outcome	1. To estimate the residential building by using detailed and abstract estimate method 2. To estimate the septic tank with soak pit by using detailed and abstract estimate method 3. To estimate the box culvert by using detailed and abstract estimate method 4. To know basic knowledge of rate analysis of different item of work and MB and bill of quantities. 5. To understand about study the method of valuation

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CESC63	**SURVEYING CAMP**	0	0	2	1	100	-	100

Objective (s)	• *Be able to apply the Knowledge gained during the Surveying course* • *Able to take decisions to tackle the site specific problems* • *Practice and master fundamental field surveying methods and equipment.* • *Develop skills in creating detailed maps and plans based on survey data.* • *Identify and correct errors in surveying measurements and calculations.*

Reconnaissance, selection of main stations- measurement of horizontal and vertical angles- measurement of base line-determination of R.L. of main station by double leveling from B.M.- measurement of bearing of any one line- computation of coordinates of station points- plotting of details- interpolation of contours.

Lecture Periods:- **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome	1. To make the students in determining the elevation of vertical and horizontal control in the field 2. To train the students in handling contour p[points 3. To Study about the levelling in survey 4. Students can learn about the equipment's used in Survey. 5. Student will possess the knowledge in using Modern tools like Remote Sensing and GIS

*The Camp will be conducted at the end of 5th semester so that course can be credited in 6th semester.

SEMESTER–VII

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET71	**DESIGN OF STEEL STRUCTURES**	3	1	0	4	40	60	100

Objective (s)	• *To understand the principles of design philosophy* • *To understand the provisions in Codes and learn follow Codal practices* • *Apply design techniques to flexural members to resist bending stresses and ensure structural integrity.* • *Design and analyze built-up beams for strength, stability, and performance under various loading conditions.* • *Design eccentric joints to effectively transfer loads and ensure structural reliability.*

Module – I	**Introduction to limit state design**	Total Hours : 12
Design of tension members – single and compound sections – tension splices – design of lug angles. Failures in bolted and welded joints – design of joints with bolts and welding.		
Module – II	**Compression Members**	Total Hours : 12
Design of axially and eccentrically loaded members, Built-up columns, Design of Lacings and Battens, Design of Column Splices. Design of column bases.		
Module – III	**Design of flexural members**	Total Hours : 12
Laterally supported and unsupported members design of purlins.		
Module – IV	**Design of built-up Beams**	Total Hours : 12
Design of gantry girders and plate girders.		
Module – V	**Design of Eccentric Joints**	Total Hours : 12
Design of eccentric joints by bolting and welding – design of stiffened and unstiffened seated connections.		

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	1. To understand the principles of design philosophy 2. The student should have an knowledge of limit state design of column and Built-up column 3. To understand the design concepts of Flexural members (Purlins,laterally supported members etc..) 4. To understand the design concepts of Built- up beam. 5. To understand the provisions in Codes and learn follow Codal practices

Text Books

1. S.K. Duggal, Limit State Design of Steel Structures, Tata McGraw Hill Education Private Limited, 2017. (ISBN: 9789351343493/9351343499).
2. V.L. Shah and V. Gore, Limit State Design of Steel Structures IS:800-2007, Structures Publication, 2012. (ISBN: 8190371754).

Reference Books

1. S.S. Bhavikatti, Design of Steel Structures, I.K. International Publishing House Limited, 2017.
2. N. Subramanian, Design of Steel Structures, Oxford University Press, 2011.
3. IS 800 (2007), General Construction in Steel- Code of Practice, Ced 7: Structural Engineering and Structural Section, Published by Bureau of Indian Standard ManakBhavan, New Delhi.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET72	**HYDROLOGY AND WATER RESOURCES ENGINEERING**	3	0	0	3	40	60	100

Objective (s)

- *To understand the various physical processes in the hydrologic cycle and the methods of estimation thereof.*
- *To Study the processes of evapotranspiration and infiltration and their effects on water balance.*
- *To understand groundwater movement, storage, and management techniques.*
- *To evaluate runoff processes and their influence on surface water flow and drainage systems.*
- *To analyze flood events, their causes, and strategies for flood prediction and management.*

Module – I **Precipitation** Total Hours : 9

Hydrologic cycle, precipitation, stream flow, evaporation, transpiration and infiltration, types and measurement of precipitation, gauge networks, hyetographs, average depth of precipitation over the basin, mass rainfall curves, intensity duration curves – estimates of missing data and adjustment of records.

Module – II **Evapo-transpiration and Infiltration** Total Hours : 9

Evaporation, factors affecting, measurement and estimation of evaporation, transpiration, factors affecting and determination of transpiration, methods of estimating evapo-transpiration, factors affecting and measurement of infiltration, infiltration indices.

Module – III **Groundwater and Types of models** Total Hours : 9

Occurrence and movement of ground water, Darcy's law, aquifers – types and specific yield of aquifers and basin, steady & unsteady flow in wells in confined and unconfined aquifers, well loss and specific capacity of a well-Ground water modelling, types – Desalination – saline water and its application.

Module – IV **Runoff** Total Hours : 9

Factors affecting runoff, Hydrograph analysis – Unit hydrograph theory and analysis, Space distribution and variability of runoff, stream flow measurement – selection of site, velocity and discharge measurements – base flow separation methods. Probability Concepts: Rainfall frequency, Flood frequency, Stream flow synthesis – Elements of stochastic methods.

Module – V **Floods** Total Hours : 9

Design flood, estimation by empirical and statistical methods, Flood control Measures – Levees and flood walls, Flood control reservoirs, Water shed management, Flood forecasting methods, Flood routing (elementary treatment only). Planning for Water Resources Development: Level, phases, objectives, Project formulation, systems analysis, multipurpose projects.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome

1. Students should know about different forms of precipitation.
2. Students will gain the knowledge in the various techniques and methods involved to quantify the total evaporation loss for water from the water bodies
3. Students understands the ground water concepts and identify the yield capacity of any given ground water sources.
4. They will capable to solve and analyses the runoff problems
5. They will capable to solve and analyses the flood problems

Text Books

1. Santosh kumar Garg, Hydrology and Water Resources Engineering, Khanna Publishers, 2017.
2. Satyanarayana murthy.C., Water Resources Engineering Principles & Practice, New Age International (P) Ltd, 2017.

Reference Books

1. Subramanya.K, Engineering Hydrology, Tata McGraw-Hill, 2024.
2. Varshney, R.S., Engineering Hydroloy, Nem Chand & Bros., 2014.

3. L W Mays, Water Resources Engineering, Wiley., 2019.
4. 4. K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill., 2020.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET73	**DISASTER MITIGATION AND MANAGEMENT**	3	0	0	3	40	60	100

Objective (s)

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction.
4. To enhance awareness of institutional processes in the country and
5. To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live,with due sensitivity

Module - I **Understanding disaster** Total Hours : 9

Concept of disaster - Different approaches - Concept of Risk - Levels of disasters - Disaster phenomena and events *(Global, national and regional)*

Module - II **Hazards and Vulnerability** Total Hours : 9

Natural and man-made hazards - response time, frequency and forewarning levels of different hazards- Characteristics and damage potential of natural hazards- hazard assessment-Dimensions of vulnerability factors- vulnerability assessment- Vulnerability and disaster risk- Vulnerabilities to flood and earthquake hazards.

Module - III **Disaster Management Mechanism** Total Hours : 9

Concepts of risk management and crisis management - Disaster management cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness- Planning for relief

Module - IV **Capacity building & Coping with disaster** Total Hours : 9

Capacity building-Concept- Structural and nonstructural measures- Capacity assessment; strengthening capacity for reducing risk - Counter disaster resources and their utility in disaster management- Legislative support at the state and national levels-Coping strategies- Industrial safety plan.

Module - V **Planning for disaster management** Total Hours : 9

Strategies for disaster management planning- Steps for formulating a disaster risk reduction plan- Disaster management Act and Policy in India- Organizational structure for disaster management in India- Preparation of state and district disaster management plans.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
4. To enhance awareness of institutional processes in the country.
5. To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

Text Books

1. Leelakrishna Rao.K, Siddhartha Gautam, Murthy.N.J, Disaster Mitigation, Vista International (P) Ltd., 2012.
2. Tilottama Senapati, Rajan Kumar Sahoo, Disaster Management & Mitigation, Dominant Publishers, 2014.

Reference Books

1. Abarquez I. & Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.

2. Chakrabarty, U. K. Industrial Disaster Management and Emergency Response, Asian Books Pvt. Ltd., New Delhi 2007
3. Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP71	**DESIGN AND DRAWING (RCC & STEEL)**	2	0	2	2	60	40	100

Objective (s)

- *To prepare working drawings for steel and concrete structures.*
- *Preparation of layout of the structure with detailed design details.*
- *Preparation of working drawings with all dimensions required for execution / fabrication of structures.*
- *Understand and implement design techniques for steel structures.*
- *Analyze and apply load conditions to RCC and steel structures for safety and performance.*

Detailed Design and Drawing of the following RCC elements/Structures:

1. Continuous beams, slab and RC column systems with using of CAD software.
2. Rectangular Combined footings.
3. Cantilever retaining walls
4. Elevated - circular and rectangular water tanks (excluding staging)
5. Staircases.

Detailed Design and Drawing of the following Steel elements/Structures:

1. Roof trusses and joints including purlins.
2. Stiffened welded seat connections – moment resisting welded connections for beams.
3. Welded plate girder.
4. Gantry girder.
5 .Self-supporting chimney.

Lecture Periods: 30 **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 60**

Course Outcome

1. Prepare working drawings for steel and concrete structures
2. Preparation of layout of the structure with detailed design details
3. Preparation of working drawings with all dimensions
4. Students know about design of RCC
5. To know about to draw the diagram with steel detailing.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEP72	**INTERNSHIP**	0	0	2	1	100	-	100

Objective (s)	• *To Gain hands-on experience in various civil engineering practices and project workflows.* • *To apply academic concepts and theories to real-world civil engineering problems and projects.* • *To understand industry standards, regulations, and best practices through direct involvement in engineering tasks.* • *To enhance technical, analytical, and professional skills in a practical work environment.* • *To Contribute to and learn from ongoing civil engineering projects and their execution processes.*

During the course of study on 6th semester or Summer Vacation leave each student is expected to undertake a minimum of two to four weeks of internship training. The students to be plan to do internship at Govt. organization and Reputed construction companies. The students are expected to submit a report, which shall be evaluated by an internal assessment committee at the end of seventh semester for 100 marks.

Lecture Periods:- **Tutorial Periods:-** **Practical Periods: 30** **Total Periods: 30**

Course Outcome	1. To analyze the Project on various aspects 2. To gain knowledge about the all types of project 3. To familiarized in project by the way of analytically and experimentally. 4. To have confidence to tackle any situation in the field 5. To know to handle all critical; suitations in site

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEPW73	**PROJECT PHASE - I**	0	0	4	2	100	-	100

Objective (s)	• *The students are encouraged to get hands on experience to work in various area of civil engineering.* • *Foster teamwork and collaborative skills by working in groups on a civil engineering design project.* • *To Develop and define a clear and specific problem statement relevant to civil engineering.* • *To Create and implement a structured approach for solving the identified problem using analytical and/or experimental methods.* • *To Present and defend the project outcomes based on a committee assessment, demonstrating comprehensive understanding and practical application.*

The objective of the design project is to enable students to work in groups of no more than four members on a project involving analytical, experimental, design, or a combination of these approaches in the area of Civil Engineering. Each project shall have a guide. The students are required to conduct a literature survey, formulate the problem, and develop a tittle, scope, objective and methodology for arriving at a solution to the problem. Evaluation will be based on a committee assessment, with a total of 100 marks

Lecture Periods:- **Tutorial Periods:-** **Practical Periods: 60** **Total Periods: 60**

Course Outcome	1. To analyze the literature towards the project 2. To gain basic knowledge of various area in Civil Engineering. 3. To enable students to work in groups. 4. Students will able to perceive the problem and find the suitable solution 5. Students familiarized in project by the way of analytically and experimentally.

SEMESTER–VIII

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CET81	**CONSTRUCTION MANAGEMENT**	3	0	0	3	40	60	100

Objective (s)	• *To understand construction management importance* • *To become aware on organization, planning, scheduling and analysis* • *To study the M.I.S and labour, safety and related regulation* • *To gain knowledge of construction contracts, including terms, conditions, and legal implications.* • *Learn to create and analyze project schedules using network analysis techniques.*

Module – I	**Construction Project Management**	Total Hours: 9

Construction Project- Project Categories, Management objectives, functions – Project Development Process-Project Life Cycle- Project Team-Role of Project Manager-Management failure

Module-II	**Organization and Planning**	Total Hours: 9

Definition, Levels of Organization, Principles of Organization, process of organizing, Span of Control, Authority, Responsibility and Delegation –Forms of Organizations-merits and demerits of each..

Module-III	**Scheduling and Network Analysis**	Total Hours: 9

Scheduling: Definition, objectives, Importance of Planning, Scheduling and Controlling of Projects. Network Techniques in Construction Management- Bar Chart, Gaint Chart, PERT, CPM, Time& cost optimization

Module-IV	**Contracts**	Total Hours: 9

Types of Contract, Contract document, Specification, Condition of Contract, Tender and Tender documents- Deposits by the Contractor- Arbitration-M.Book-Muster roll-Stores.

Module-V	**M.I.S Applications and Construction**	Total Hours: 9

Labour Legislations-Safety in Construction: Objectives, Steps in Safety Programme, Safety Costs, Safety Codes, Occupational Safety and Hazards, Accidents- Causes of Accident

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome	1. They should able to understand construction management importance 2. Can able to understand the various organization in the construction 3. To become aware on scheduling and analysis 4. Can able to become aware on Contract 5. Students should able to understand the M.I.S and labor, safety and related regulation

Text Books

1. Sharma, S.C. & Deodhar S.V., Construction Engineering and Management, Khanna Book Publishing Co., 2022.

2. Rajoria, K.B., Case Studies in Construction Project Management, Khanna Publishing House, 2023.

Reference Books

1. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015

2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.

3. P.D.Mason., Construction poject management, A Construction Education Alliance Publication, 2024

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CE PW82	**PROJECT WORK –PHASE- II**	0	0	24	12	60	40	100

Objective (s)	• *The students will be encouraged to handle the field problem independently* • *To identify and define a relevant civil engineering problem for the academic project.* • *To apply appropriate engineering methods and techniques to address the identified problem.* • *To develop and implement a design or solution based on project requirements.* • *To present findings and document the project outcomes effectively for assessment and evaluation.*

Project work phase II will be an extension of the project work Phase-I started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee for 60 marks. The external university examination, which carries a total of 40 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

Lecture Periods:- **Tutorial Periods:-** **Practical Periods:360** **Total Periods: 360**

Course Outcome	1. To analyze the Project by conducting various test 2. To gain knowledge about the project as well as communication 3. To familiarized in project by the way of analytically and experimentally. 4. To have confidence to tackle any situation in the field and will become employable 5. To know the various test and properties of the Project

PROFESSIONAL ELECTIVE SUBJECTS

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE01	**DESIGN OF PRESTRESSED CONCRETE STRUCTURES**	3	0	0	3	40	60	100

Objective (s)

- To learn various principals of prestressing.
- To calculate different losses in prestressing.
- To learn flexural design of prestressed concrete elements.
- To understand various aspects of shear and torsional strength Design
- To solve problems related to prestressed compression and tension members

Module– I **Basic Principle of pre-stressing** Total Hours: 9

Introduction-Principles of pre-stressing-Materials-Losses-Systems of pre-stressing-Simple cable profiles-Load balancing method.

Module – II **Prestressed Concrete Beams** Total Hours: 9

Pre-tensioned and Post-tensioned beams-Principles of designs-Design for flexure, bond and shear – IS Code provisions-Ultimate Strength of pre-stressed concrete beams in flexure and shear- Design of end anchorage Zones using I S Code method.

Module – III **Deflections and Composite Beams** Total Hours: 9

Deflection of pre-stressed concrete members – Methods of pre-stressing-principles of partial pre-stressing –non-pre-stressed reinforcements-Analysis and Design of composite beams.

Module -IV **Axial and Circular prestressing** Total Hours: 9

Design of Tension and Compression members-Circular pre-stressing-Pipes- Water Tanks- Analysis and design –IS-Code provisions

Module - V **Prestressed continuous Beams** Total Hours: 9

Analysis of continuous beams –Primary moment-secondary moment-cable layout-Linear Transformation – Concordant cable.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. Apply the basic concepts of prestressing in various Civil Engineering Structures.
2. Assess the various prestressing losses in prestressed concrete elements as per Indian Standard Codal provisions
3. Analyse and design statically determinate prestressed concrete flexural elements and draught prestressing details
4. Analyse and design the prestressed concrete elements for Shear and Torsion and draught detailing
5. Analyze and design Prestressed Compression and Tension Members and draught prestressing details

Text Books

1. Krishna Raju. N., Prestressed Concrete, Tata McGraw-Hill, 2013.
2. Sinha.N.C, Roy.S.K, Fundamentals of Prestreesed Concrete, S.Chand & Company (P) Ltd.,2013.

Reference Books

1. Rajagopalan.N., Rajagopalan.N, Prestressed Concrete, Narosa Publishing House, 2013.
2. Dayaratnam. P. Prestressed Concrete Structures, Oxford & I B H, 2013.
3. Pandit. G.S, Gupta. S.P, Prestressed Concrete, CBS Publishers and Distributors, 2013.
4. Lin. T.Y. , Ned H Burns, Design of Pre-stressed Concrete Structures, John Wiley & Sons, 2013.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE02	**COASTAL ENGINEERING**	3	0	0	3	40	60	100

Objective (s)	• *To introduce the various components in Harbour and offshore structures.* • *Introduce to the students, planning and design principles of various components in Docks and harbours.* • *Design and evaluate various harbour structures to ensure their stability and functionality.* • *To develop an idea about types off offshore structures forces on offshore structures design concepts and foundation for offshore structures* • *Develop skills in the construction techniques and methods used for building offshore structures.*

Module – I	**Growth of Ports**	Total Hours: 9

History of Port – Classification of Harbours - Factors affecting the growth of Port. Requirement of a Harbour - General Planning - Site investigation. Description of selected Indian ports.

Module – II	**Harbour Planning (Technical):**	Total Hours: 9

Harbour entrance - Navigational Channel – Depth of harbour – Turning basin – berthing area – Shipping terminal facilities – Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals. Navigational aids – Light house.

Module – III	**Harbour Structures**	Total Hours: 9

Break waters: Types – Selection – Forces and – Design principles of break waters. Berthing structures: Types – Loads – Selection and design principles of berthing structures –Selection and Design principles of Dock fenders and Mooring accessories. Types of dock structures, Dredging.

Module – VI	**Offshore Structure**	Total Hours: 9

Types of offshore structures – selection – function - Physical, environmental and geotechnical aspects of marine and offshore construction – Loads and responses of offshore structures.

Module – V	**Construction of Offshore Structures**	Total Hours: 9

Foundations for offshore structures – Introduction to design and installation of offshore piled platforms, concrete offshore platforms, Moored floating structures and Submarine pipelines.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome	1. To demonstrate knowledge of the growth dynamics and economic impact of ports. 2. To create effective harbour plans using technical principles to meet operational requirements. 3. To design and assess harbour structures for performance and durability. 4. To apply principles of offshore structure design to address engineering challenges. 5. To execute construction techniques for offshore structures with a focus on practical application and safety.

Text Books

1. Narasimhan & S. kathiroli, Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol – II, NIOT- Chennai
2. Chakrabarti.,S.K., Hand Book of Offshore Engineering (Vols. 1 & 2)" Elsevier Publications

Reference Books

1. Gerwick, C., Construction of Marine and Offshore structures, CRC Press.
2. Alonzo Def. Quinn., Design and construction of Port and Marine structures McGraw Hill Book co.

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE03	**SAFETY PRACTICES IN CONSTRUCTION**	3	0	0	3	40	60	100

Objective (s)	• *To explore the causes of accidents and the relevant laws that govern safety in the workplace.* • *To equip students with the knowledge to develop, implement, and assess safety procedures in various work environments.* • *To examine the responsibilities and collaboration between safety workers and management in maintaining a safe work environment.* • *To study different safety methods and techniques that can be applied to prevent accidents and ensure workplace safety.* • *To familiarize students with the selection, use, and maintenance of safety equipment in compliance with industry standards.*

Module - I **Accidents and Related Law** Total Hours: 9

Construction accidents - Construction Safety Management: Importance - causes of accident, Construction industry related laws. Legal and financial aspects of accidents in construction – occupational and safety hazard assessment.

Module – II **Safety Procedures** Total Hours: 9

Elements of an Effective Safety Programmes - Job-site assessment - Safety Meetings - Safety Incentives. Contractual Obligations - Substance Abuse - safety Record Keeping Safety Culture - Safe Workers-.

Module –III **Safety Workers and Managements** Total Hours 9

Safety and First Line Supervisors - Safety and Middle Managers - Top Management Practices, Company Activities and Safety - Project Coordination and Safety Procedures - Workers Compensation -Accident prevention-cost of accidents-accident reporting investigation

Module –IV **Safety Methods** TotalHours:9

Total loss control and damage control-Safety sampling- safety audit - safety equipment -planning and site preparation- safety system of storing construction materials-Excavation - blasting- timbering-scaffolding- safe use of ladders-Fire Safety & Disaster Safety.

Module –V **Safety Equipments** TotalHours:9

Safety in hand tools- Safety in Hoisting apparatus and conveyors- Safety in the use of mobile cranes-Manual handling- Safety in demolition work- Trusses, girders and beams- Fire hazards and preventing methods.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome	1. Students will be able to identify the legal aspects of accidents and apply the appropriate laws in safety management. 2. Students will demonstrate the ability to design and implement effective safety procedures in the workplace. 3. Students will understand the roles of safety personnel and management and be able to collaborate effectively to enhance workplace safety. 4. Students will be able to apply various safety methods and techniques to prevent accidents and mitigate risks. 5. Students will be proficient in selecting, using, and maintaining safety equipment in line with industry regulations.

Text Books

1. Mishra. R.K., Construction Safety, Aitbs Publishers, 2012.
2. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997

Reference Books

1. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamil Nadu. Health Management, Prentice Hall Inc., 2001.
2. Bhattacharjee. S.K., Safety Management in Construction Principles & Practice,Khanna Publishers, 2011.
3. Hand Book on Construction Safety Practices, SP:70, BIS, 2001.
4. Muraleedharan Pillai.K, Construction Safety Hand Book, Sujatha Publishers, 2012.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE04	**CONSTRUCTION METHODS AND EQUIPMENTS**	3	0	0	3	40	60	100

Objective (s)	• *To introduce various construction equipments, selection and apply scientific principles for effectively utilizing them* • *To make aware of the various techniques and practices on construction of various civil engineering structures.* • *To study and understand the latest construction techniques applied to engineering Construction* • *To develop an understanding of the methods adopted in construction of high rise buildings with basement floors.* • *To optimize the construction by using right equipment's.*

Module – I	**Excavation**	Total Hours : 9

Excavations for foundations and Basement floors – Methods – temporary earth retaining structures: braced wall, sheet pile wall, soil nail wall – Dewatering methods – water proofing methods – Trenching - Excavators – pumps. Under water concreting.

Module – II	**Sub structures**	Total Hours : 9

Methods and equipments for: Pile foundation, well foundation, cofferdam. Shoring and under pinning – Pile wall - RCC Diaphragm walls.

Module – III	**Super Structures**	Total Hours : 9

Methods and equipments for: Scaffolding, Form work, Hoisting and Rigging (cranes), plastering and flooring. Concrete: Aggregates, RMC plants, pumping, finishing, - shotcreting – Building Demolition Techniques.

Module – IV	**Bridges**	Total Hours : 9

Methods and equipments for RCC & Cable stayed Bridges: Balanced cantilever method, Span by Span Method, Incremental lunching methods.

Module – V	**Roads and Tunnels**	Total Hours : 9

Methods and equipments for construction Flexible and rigid pavements, Tunnels in soft ground- Cut and cover method, TBMs, Tunnel Lining.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome	1. To develop an understanding of the methods adopted in Excavation and to optimize the construction by using right equipments. 2. To develop an understanding of the methods adopted in Sub structures and to optimize the construction by using right equipments. 3. To develop an understanding of the methods adopted in Super Structures and to optimize the construction by using right equipments. 4. To develop an understanding of the methods adopted in Bridges and to optimize the construction by using right equipments. 5. To develop an understanding of the methods adopted in Roads and Tunnels and to optimize the construction by using right equipments.

Text Books

1. Antil J.M., Civil Engineering Construction, McGraw Hill Book Co., 1982
2. Peurifoy, R.L., Clifford.J.,et al.,Construction Planning, Equipment and Methods McGraw Hill Co, 2011

Reference Books

1. Varma., M., Construction Equipment and its Planning & Application, Metropolitan Book Co., 1979
2. Smith, R.C, Andres, C.K Principles and Practice of Heavy Construction, Prentice Hall, 1986

3. Chew, M. Y. L., Michael Chew Yit Lin Construction Technology for Tall Buildings, 3rd Ed., World Scientific Publishing Co. Pte. Ltd., 2009

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE05	**REMOTE SENSING AND GIS**	3	0	0	3	40	60	100

Objective (s)	1. To introduce the students to the basic concepts and principles of various components of remote sensing. 2. To provide an exposure to GIS and its practical applications in civil engineering. 3. To understand techniques for interpreting and analyzing remote sensing images. 4. To understand the application and functionality of Geographic Information Systems in spatial data analysis. 5. To gain skills in entering, storing, and analyzing spatial and remote sensing data.

Module – I	**EMR and its interaction with atmosphere & earth material**	Total Hours : 9

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions, important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein‟s Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

Module – II	**Platforms and sensors**	Total Hours : 9

Types of sensor systems-Types of remote sensing platforms – remote sensing satellite orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and space-borne TIR and microwave sensors.

Module – III	**Image interpretation and analysis**	Total Hours : 9

Types of Data Products – types of image interpretation – basic elements of image interpretation - visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

Module – IV	**Geographic information systems**	Total Hours : 9

Introduction – Maps – Definitions – Map projections – types of map projections – map analysis – GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS) – GPS.

Module – V	**Data entry, storage and analysis**	Total Hours : 9

Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System – Landslide.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome	1. To understand how EMR interacts with atmospheric conditions and earth materials. 2. To effectively use various platforms and sensors for remote sensing data collection. 3. Students will be adept at interpreting and analyzing images from remote sensing data. 4. Students will effectively use GIS tools and systems for spatial data analysis. 5. Students will proficiently manage data entry, storage, and analysis processes.

Text Books

1. Kumar.S., Basics of Remote Sensing &GIS, Lakshmi Publications, 2014.
2. Narayana.L.R.A, Remote sensing and its applications, University Press (India)Ltd., 2011.

Reference Books

1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman. (2004). Remote Sensing and Image Interpretation. V Edn. John Willey and Sons (P) Ltd., 2013.

2. Ghosh.S.K., Chandra.A.M, Remote Sensing & Geographical Information System, Narosa Publishing House, 2006.
3. Kali Charan Sahu, A Text Book of Remote Sensing & Geographical Information Systems, Atlantic Publishers, 2008.
4. Anji Reddy.M., Textbook of Remote Sensing and Geographical Information System,. BS Publications, 2014.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE06	**UNDER GROUND STRUCTURES**	3	0	0	3	40	60	100

Objective (s)	1. To introduce the students the concept of design of underground structures. 2. To introduce the various construction techniques in construction of underground structures. 3. To understand the safety measures and regulations essential for tunnel construction and operation. 4. To explore the design, construction, and applications of various underground structures. 5. To learn about the design and construction considerations for buried structures.

Module – I	**Tunnel Planning**	Total Hours : 9
Tunnel – Types - elements - Layout – Survey and Alignment – Geotechnical Investigation – Deep Shafts Rock tunneling – Methods– Lining		
Module – II	**Tunnel Construction Methods**	Total Hours : 9
Soft Ground Tunneling- Methods – TBMs - monitoring ground movement - Lining. Tunneling in Difficult Ground. Tunnel Boring Machines – Material Handling and construction plant.		
Module – III	**Safety Provisions**	Total Hours : 9
Fire life safety – Tunnel Ventilation – tunnel Lighting – Drainage in tunnels – Tunnel Rehabilitation.		
Module – IV	**Underground structures:**	Total Hours : 9
Advantages – Planning– planning for underground parking – civic facilities – Liquid storage facilities. – Construction Methods: cut and cover methods		
Module – V	**Buried Structures**	Total Hours : 9
Design of buried pipelines – Box jacking - Trenchless Technology: construction Methods and Machines – Repair and rehabilitation of buried pipelines.		

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome	1. To understand the basics of design and construction of underground structures. 2. To understand and apply various methods for constructing tunnels. 3. Students will ensure that appropriate safety measures are implemented in tunnel projects. 4. Get knowledge to design and assess underground structures for various applications. 5. Students will be proficient in designing and constructing buried structures, considering relevant factors and challenges.

Text Books

1. Tunnel Engineering Handbook 0002 Edition (Paperback) Authors: Thomas R. Kuesel, Elwyn H. King, John O. Bickel.CBS Publishers, New Delhi.
2. Trenchless Technology: Pipeline and Utility Design, Construction, and Renewal: Pipeline and Utility Design, Construction, and Renewal. Mohammad Najafi - McGraw Hill Professional

Reference Books

1. Introduction to Tunnel Construction. David N. Chapman, Nicole Metje, and Alfred Strk (Paperback) Alfred Stark, David N. Chapman, Nicole Metje. Applied Geotchnique Vol-3. Taylor and Francis.
2. Practical Tunnel Construction, Gray B. Hemphill, John Wiley & Sons.2013.
3. Technical Manual for Design and Construction of Road Tunnels--civil Elements – American Association of State Highway and transportation official (AASHTO) Washington DC. ISBN:978-56051-457-2.
4. Underground Infrastructures: Planning, Design, and Construction (Hardcover) Bhawani Singh, R. K. Goel, Jian Zhao. Butterworth – Heinemann-Elsevier ISBN: 978-0-12-397168-5

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE07	**AIR AND NOISE POLLUTION**	3	0	0	3	40	60	100

Objective (s)

- To have a basic knowledge on the air pollution on environment
- To understand the interaction of air pollutants on the meteorological parameters
- To study about the control measures of air pollutants from various sources
- Understand methods for controlling gaseous pollutants to reduce environmental impact.
- Learn strategies for controlling noise pollution to improve community well-being and regulatory compliance.

Module – I **Introduction** Total Hours : 9

Definition of clean air –air pollutants - Sources and classification - Effects of air pollution on man, animal, vegetation and properties -Ambient Air Quality Standards, Air pollution control legislation.

Module – II **Meteorology and Air pollution** Total Hours : 9

Meteorology and Air pollution – Atmospheric stability – Inversions – Mixing height –Plume behaviour – Plume rise estimation – Effluent dispersion theories –Air pollutants Modelling.

Module – III **Control of particulate pollutants** Total Hours : 9

Control of Air pollutants: particulates – Filters – Gravitational settling chambers – Centrifugal-multiple type cyclones – Collection efficiency - Electrostatic precipitators – Wet collectors-Centrifugal spray scrubbers - Venturi scrubbers.

Module – IV **Control of gaseous pollutants** Total Hours : 9

Gaseous pollution control – Absorption - Principles – Description of equipment, Adsorption – Principal adsorbents – Equipment descriptions – Condensation – Contact condensers, Incineration –Equipment description

Module – V **Control of Noise pollution** Total Hours : 9

Sound and noise - Source of noise pollution - Environmental and industrial noise -Effects of noise pollution - Fundamentals of sound - generation, propagation, etc., Sound measurement, sound level meters – Measures for prevention and control of noise -Environmental and industrial noise - Noise control legislation.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. To study about the sources and Classification of air pollution and its effects
2. To learn about the dispersion modelling of air pollution
3. To study about the Controlling of air particulate matter
4. To study about the controlling of gaseous pollutants with Equipment's
5. To study about the sources, types and effects of noise pollution and its Controlling Method

Text Books

1. Rao.M.N. et al., Air Pollution, Tata Mc.Graw Hill, 2013.
2. Rao.C.S., EnvironmentalPollution Control Engineering, New Age International Publishers, 2014.

Reference Books

1. Noel de Nevers, Air Pollution Control Engineering, Mc.Graw Hill, New York. 2012.
2. Stern, A.C., Air Pollution , Vol.I, II and III, Academic Press, 2012.
3. Cunniff, P.F., Environmental Noise Pollution, John Wiley and Sons, 2010.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE08	**FAILURE ASSESSMENT AND REHABILITATION OF STRUCTURES**	3	0	0	3	40	60	100

Objective (s)	1. *To assess the condition of the structure* 2. *To understand the deterioration process of materials* 3. *Identify and differentiate between structural and non-structural cracks and understand their implications* 4. *To know about repair materials* 5. *Understand the corrosion process and methods for monitoring and managing the integrity of structures*

Module–I	**Assessment of Structures**	Total Hours : 9

Condition Assessment – Procedure for assessment – survey – Field visits – inspection – Sampling – structural capacity – load testing – condition assessment of structures – NDT methods – Evaluation and health monitoring.

Module-II	**Deterioration Process**	Total Hours : 9

Agencies causing material deterioration - shrinkage, settlement, weathering, chemical attack, creep, fire, honey combing etc., durability of materials –Safety evaluation of existing structures

Module-III	**Cracks**	Total Hours : 9

Structural and non-structural cracks -Types of structural distress in foundations, roofs, floors, walls.

Module-IV	**Repair Materials and Techniques**	Total Hours : 9

Repair Techniques - Materials for repair – Repair of concrete structures - bridges and water retaining structures – water proofing methods and materials - Non-structural repairs.

Module-V	**Corrosion Process & Monitoring of Structures**	Total Hours : 9

Factors influencing corrosion of rebar steel – Corrosion protection in concrete / steel structures – Masonry deterioration, Seismic retrofitting, introduction to health monitoring of structures.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome	1. To understand the deterioration process of materials 2. To know about repair materials 3. To assess the condition of the structure 4. To understand about the Repair Materials and Techniques 5. To understand about the Corrosion Process & Monitoring of Structures

Text Books

1. Ransom,W.H., Building Failures, Tayloar & Francis, 2002.
2. Perkins.P, Repair, Protection and Waterproofing of Concrete Structures, CRC Press, 2002.

Reference Books

1. Ravindra.V, Jeffrey.G, Protection of Concrete, CRC Press, 2003.
2. Richardson,B.A., Remedial Treatment of Buildings, Butterworth-Heinemann, 1995.
3. Breysse.D, Non-Destructive Assessment of Concrete Structures: Reliability and Limits of Single and Combined Techniques, Springer Publishers, 2012.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE09	**BRIDGE ENGINEERING**	3	0	0	3	40	60	100

Objective (s)

- *To know the investigation of Bridges*
- *To know the design of Bridge foundation*
- *To know the bridge loads*
- *To know the Bridge construction and maintenance*
- *Understand the principles and practices involved in the maintenance of bridges*

Module –I **Introduction** Total Hours 9

History and Development of Bridges, Classification of Bridges-Investigations for culverts and minor bridge, Investigations for major bridge – Topography, catchment, hydrology, Geotechnical aspects, Construction Resources – Design Flood Discharge-Methods, Linear waterway.

Module – II **Bridge Foundation** Total Hours 9

Choice of Foundation for piers and abutments –Types - relative suitability. Load on Foundation - Well foundation – types –Design well foundation – Scour Depth – Stability of well foundation - well sinking - methods – Tilt correction – Case studies

Module–III **Loads on Bridge** Total Hours 9

Loading standards for road and railway bridges- Setting out for piers and abutments, Minor Bridges and Culverts, Single span Bridge, Multispan Bridge, Major/Important Bridges.

Module–IV **Construction of Bridges** Total Hours 9

Bridge superstructure – supports and centering for RC bridges – erection process of RC girders and steel girder bridges.

Module–V **Maintenance of Bridges** Total Hours 9

Maintenance-Inspection of bridges, Maintenance of substructure girders-Load testing on bridges-Temporary and movable bridges- Re-building of bridges- bridge failure.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. Identify and categorize various types of bridges based on their classification.
2. Understand the design and construction principles of bridge foundations.
3. Analyze the different loads that affect bridge structures and their impact.
4. Apply construction methods and techniques for building various types of bridges.
5. Implement effective maintenance practices to ensure the longevity and safety of bridges.

Text Books

1. Ponnuswamy S, “Bridge Engineering” Tata McGraw Hill Publishing Co., 2013.
2. Rangwala.S.C, Rangwala.P.S, Rnagwala.K.S., Bridge Engineering, Charotar Books Publishers, 2013.

Reference Books

1. David Blockley, Bridges, Oxford University Press,2010.
2. Singh, V.P , Wells and Caissons, Nemchand & Brothers,1981.
3. Victor.D.J., Essentials of Bridge Engineering, Oxford IBH Publishers, 2013.

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE10	**DESIGN AND CONSTRUCTION OF PREFABRICATED STRUCTURES**	3	0	0	3	40	60	100

Objective (s)

1. *To familiarize the design of basic elements in precast construction.*
2. *To familiarize the students with various prefabrication construction techniques adopted in practice.*
3. *To learn the design and construction methods for precast concrete floors and beams.*
4. *To understand the fabrication and installation of precast concrete columns and their connections.*
5. *To explore the application and benefits of prefabricated structures in construction projects.*

Module -I **Materials in Precast Structures** Total Hours : 9

Materials, admixtures, pigments - Modular co-ordination, standardization and tolerances-system of pre-fabrication. Pre-cast concrete manufacturing techniques, Moulds –construction design, maintenance and repair – Fold form structure – Petrol bunk.

Module -II **Precast Construction Techniques** Total Hours : 9

Pre-casting techniques - Planning, analysis and design considerations - Handling techniques - Transportation Storage and erection of structures. Curing techniques including accelerated curing such as steam curing, hot air blowing, etc

Module -III **Precast concrete floors and beams** Total Hours : 9

Simplified frame analysis, Precast concrete flooring options, flooring arrangements, structural design of individual units, design of composite floors, Composite and non-composite reinforced beams

Module -IV **Precast concrete columns and connections** Total Hours : 9

Precast concrete columns and their design. Basic mechanism of joints and connections, compression joints, shear joints, tension joints. Connections-pin jointed and moment resisting connections.

Module -V **Application of Prefabricated structures** Total Hours : 9

Pre-cast and pre-fabricating technology for low cost and mass housing schemes. Small pre-cast products like door frames, shutters, Ferro-cement in housing - Water tank service core unit.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. Student should able to design precast elements.
2. To be able to execute the construction sequence in a project with precast elements.
3. Students will be able to design and construct precast concrete floors and beams
4. Students will be adept at handling precast concrete columns and their connections in structural design.
5. To understand how to implement prefabricated structures to enhance construction efficiency and quality.

Text Books

1. Levitt. M., Precast concrete - Materials, Manufacture Properties and Usage, Applied Science Publs. 2007,
2. Konex.T., Handbook of Pre-cast Construction, Vol..1.2&3.
3. Kim S Elliott, Precast Concrete Structures, Butterworth Heinemann Publishers, 2002.

Reference Books

1. Richardson,J.G., Pre-cast concrete Production, Cement and Concrete Association, London, 1973.
2. Madhava Rao.A-G., Modern Trends in Housing in Developing Countries, Oxford & UBH Publishing co., 1985. -
3. Lewicki.B., Building with Large Pre-fabrications, Elsevier Publishers

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE11	**EARTHQUAKE RESISTANT DESIGN OF STRUCTURES**	3	0	0	3	40	60	100

Objective(s)

- To learn the fundamental principles and components of engineering seismology..
- To explore the concepts and mathematical models underlying vibrational analysis in structures.
- To understand the design and behavior of different structural systems under various loads.
- To familiarize with the relevant Indian Standards (IS) codes used in structural engineering.
- To understand the methods for calculating design lateral loads on structures.

Module - I **Elements of Engineering Seismology** Total Hours : 9

Elements of engineering seismology - characteristics of earthquake- earthquake size- plate tectonics – types of seismic waves – seismographs - effect of earthquake - earthquake history- seismicity of India.

Module - II **Theory of Vibrations** Total Hours : 9

Theory of vibrations - formulation of equation of motion- single degree of freedom system- free and forced vibrations - damped and undamped vibrations - Basic introduction to multiple degree of freedom systems.

Module – III **Structural Systems** Total Hours : 9

Performance of structures under past earthquakes- lessons learnt from past earthquakes– soil liquefaction - Principles of earthquake resistant design - Structural system requirements of buildings – Plan and vertical irregularities - Landslide resistant buildings - coastal erosion resistance buildings.

Module -IV **Introduction to IS Codes** Total Hours : 9

Behaviour of reinforced concrete and steel elements under cyclic loading –Confinement- ductility and energy dissipation- Introduction to Indian Standard Codes -IS:4326 – 1993 and IS13920-1993.

Module - V **Computation of Design lateral loads** Total Hours :9

Design of RC frames for earthquake loads – equivalent static force procedure as per IS 1893 – 2002 – Load combinations - Design of beams and columns for earthquake resistance.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course outcome

1. Students will gain an understanding of the key elements and principles of engineering seismology.
2. Students will be able to apply the theory of vibrations to analyze and predict structural responses.
3. Students will understand and assess different structural systems for their suitability in engineering projects.
4. Students will be familiar with IS codes and able to apply them in structural design and analysis.
5. Students will be able to compute design lateral loads accurately for various structural systems.

Text Books

1. Pankaj Agrarwal & Manish Shrikhande “Earthquake resistant Design of Structures” Prentice Hall of India Pvt Ltd. New Delhi, 2013
2. Duggal.S.K. Earthquake Resistant Design of Structures, Oxford University Press, 2014.

Reference Books

1. Leigh.W., Mario Paz. “Structural Dynamics – Theory & Computations”, Springer Verlag, 2010.
2. A K.Chopra, “Dynamics of Structures Theory and Applications to Earthquake Engineering” Prentice Hall of India (P) Ltd., 2008.
3. Pauley T and Priestley M.J.N, Seismic Design of Reinforced Concrete and Masonry Buildings, John Wiley & Sons, New York, 2012.
4. Stratta, J.L “Manual of seismic Design”, Pearson Education Ltd.,2004.

5. IS:4326 – 2013 Earthquake Resistant Design And Construction Of Buildings - Code Of Practice, Bureau of Indian Standards, New Delhi.
6. IS13920-2016 Ductile Design and detailing of reinforced concrete structures subjected to seismic forces-Code of practice, Bureau of Indian Standards, New Delhi
7. IS 1893 – 2016 (Part I & II)Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE12	**DESIGN OF INDUSTRIAL STRUCTURES**	3	0	0	3	40	60	100

Objective (s)

- *To understand the planning aspects of industrial structures.*
- *To understand the design principles of industrial structures.*
- *Understand and apply the classifications of various industrial structures based on their functional and structural requirements.*
- *Develop proficiency in designing joints within structures to ensure stability and efficient load transfer.*
- *Understand and design key structural components, including beams, columns, and supports, for various industrial applications*

Module - I	**Classification of Industrial Structures**	Total Hours : 9

Classification of Industrial Structures - Layout requirements - lighting and Ventilation - protection against noise and vibration - fire safety - factories act.

Module II	**Types of Trusses**	Total Hours : 9

Roofing configuration – types of trusses - Beams and lattice trusses - Type of roof covering materials - purlins - detailed design.

Module III	**Silos and Bunkers Design**	Total Hours : 9

Silos and Bunkers - Shape of hopper for different materials - design of vertical sides - hopper bottom - stiffening girder - staging -design - Conveyors and supporting structures.

Module IV	**Design of Joints**	Total Hours : 9

Gable frames of uniform cross sections - varying depth – pin-jointed knee bracings - design of joints - analysis by various methods.

Module V	**Structural Components**	Total Hours : 9

Design of pre-engineered structures – design examples.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. The students would become confident of design of practical industrial design problems.
2. To understand the design principles of industrial structures.
3. Understand and apply the classifications of various industrial structures based on their functional and structural requirements.
4. Develop proficiency in designing joints within structures to ensure stability and efficient load transfer.
5. Understand and design key structural components, including beams, columns, and supports, for various industrial applications

Reference Books

1 Punmia .B.C., Jain A.K, Arun Kumar Jain ,"Comprehensive R C C Designs", Laxmi Publications (P) Ltd., New Delhi, 2012.

2. Lother, "Advance Design in Steel Structure", Prentice Hall, USA, 1980
3. Salmon. C.G. and Johnson J.E. "Steel Structure - Design and Behaviour", Harper and Row - 1980
4. Wiliam McGuire - "Steel Structures", Prentice Hall of India New Jersey, 1968
5. Arya and Ajmani, "Design of Steel Structures" Nem Chand Bros, 2012.

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE13	**FORMWORK FOR CONCRETE STRUCTURES**	3	0	0	3	40	60	100

Objective (s)

- To learn about the different materials used in formwork and the principles behind their design.
- To explore the design and application of formwork specific to footings, walls, and columns.
- To understand the methods and considerations in designing formwork for slabs and beams.
- To investigate the unique formwork requirements for special structures such as bridges or tunnels.
- To study the role and design of supports and scaffolding in formwork construction.

Module -I **Formwork materials and design concepts** Total Hours : 9

Introduction, requirements, selection and classification of formworks. Formwork materials – Timber, Plywood, Plastic, steel and other materials. Form coatings and linings.

Design Concepts-Loads on formwork- estimation of permissible stresses. Maximum Bending Moment, Shear Force, and Deflection

Module -II **Forms for footings, walls and columns** Total Hours : 9

Conventional Formwork for Foundation, Conventional Wall Formwork, Design illustrations.

Conventional Column Formwork, Modular Column Formwork System, Disposable Column Formwork, All Metal Column Formwork, Achieving Formwork Economy in Column Construction, Design illustration for Column Form

Module -III **Slab and Beam Formwork** Total Hours : 9

Traditional Slab and Beam Formwork, Various Slab and Beam Formwork Solutions Offered, Achieving Economy in Slab Construction, Design of Slab and Beam Formwork, Illustration of Slab and Beam Formwork Design

Module -IV **Formwork for special structures** Total Hours : 9

Formwork for Shells, Domes, Overhead Water Tanks, Tunnel, Bridge formwork and flying formwork, Advantages and Limitations of Flying Forms, Slip forms Form failures-causes, Avoiding Formwork Failure

Module -V **Formwork Supports and Scaffold** Total Hours : 9

Shores/Props and Drop heads, Multi-Legged Shoring Towers, Design of Vertical Supports for Formwork, Classification of Scaffolds, Timber Scaffolds and Metal Scaffolds

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. To identify and select appropriate materials for formwork, understanding the principles that guide their design.
2. To design and implement formwork for footings, walls, and columns in construction projects.
3. Students will gain practical knowledge in creating effective formwork for slabs and beams, ensuring structural integrity.
4. To design and adapt formwork for complex and specialized structures, meeting unique project requirements.
5. Students will understand and apply proper formwork support and scaffolding techniques, ensuring safety and stability in construction.

Text Books

1. K. N.Jha, "Formwork for Concrete Structures" Mc Graw Hill Education Pvt Ltd, New Delhi, 2012

Reference Books

1. K. N.Jha, "Formwork for Concrete Structures" Mc Graw Hill Education Pvt Ltd, New Delhi, 2012
2. Modern Practices in Formwork for Civil Engineering Construction Works" University Science Press. 2014

3. Robert L Peurifoy and G D Oberlender, “Formwork for Concrete Structures” Mc Graw Hill, New York, Fourth Edition 2014
4. PERI Handbook on Formwork Scaffolding Engineering, PERI International 2012.

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEE14	**IRRIGATION AND DRAINAGE ENGINEERING**	3	0	0	3	40	60	100

Objective (s)

- *To familiarize the students with various irrigation practices adopted*
- *To identify the irrigation requirements of various crops.*
- *Gain knowledge on the principles and practices of irrigation*
- *To Explore different types of drainage treatment techniques & design irrigation channels*
- *Acquire knowledge about the application and benefits of drip irrigation.*

Module -I **Types of Irrigation Systems** Total Hours : 9

Introduction: Need, advantages and disadvantages of Irrigation - Environmental effects - Types of Irrigation systems - Gravity irrigation, canals, Tanks, Wells and Irrigation galleries - Water lifts. Soil - water - plant relationship: Soil and its function - Physical properties of soil and their importance in relation to irrigation - Classes and availability of soil water - Movement of water in soils - Measurement of soil moisture - Crop growth and moisture relationship - Salt problems in soil and effect of salts on plant growth.

Module -II **Irrigation Water Requirement** Total Hours :9

Evaporation, Evapo transpiration, Consumptive use and its estimation - Crop factor - Lysimeters - Effective rain fall and irrigation requirements - Water requirements of various crops - Duty of water - Quality of irrigation water.

Module -III **Methods of Irrigation** Total Hours : 9

Surface, subsurface and overhead methods - Check basin, border & furrow, Drip and sprinkler irrigation - Irrigation efficiency, Depth, Rate and frequency of irrigation - Irrigation schedule.

Module -IV **Design of Irrigation Channels** Total Hours : 9

Design of unlined and lined channels for irrigation - Location and design of canal regulation structures - Cross drainage structures - Measuring devices.

Module -V **Land Development and Management** Total Hours : 9

Land Development: Reclamation and management of saline & alkaline soils, water logging, Causes and remedial measures - Design, construction and maintenance of drainage systems. Irrigation Management: Management of irrigation system - water charge assessment and water use management.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. To understand the various method to calculate delta etc.,
2. To understand the various drainage methods available for construction work.
3. To gain knowledge on irrigation
4. To know about different types of drainage treatment
5. To gain knowledge about application of drip irrigation

Text Books

1. Basak.K.N, Irrigation Engineering, Tata Mc-Graw-Hill, 2013.
2. Sharma.R.K., and Sharma. T.K., Irrigation Engineering, S.Chand & Company Ltd, 2014.

Reference Books

1. Punmia B.C, Ashok Kumar Jain, Pande Bb Lal, Irrigation & Water Power Engineering, Lakshmi Publications, 2013.
2. Arora.,K.R., Irrigation Water Power & Water Resources Engineering, Standard Publishers, 2013.
3. Raghunath. H.M., Irrigation Engineering, Wiley India (P) Ltd., 2012.
4. Das, M.M, Saikia, M.S Irrigation and water power Engineering, PHI, Learning, (P) Ltd, New Delhi, 2009

OPEN ELECTIVE SUBJECTS

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEO01	**BUILDING LIGHTING AND VENTILATION ENGINEERING**	3	0	0	3	40	60	100

Objective (s)

- *To familiarize students with the principles of building lighting and ventilation as per regulatory codes.*
- *To provide knowledge on insulation techniques and methods for measuring acoustical levels in buildings.*
- *To equip students with the skills to design natural lighting and artificial illumination systems for various structures.*
- *To study the specific requirements and considerations for ventilating industrial buildings effectively.*
- *To enable students to design natural and mechanical ventilation systems, as well as air conditioning systems, for different types of structures.*

Module -I **Building Lighting** Total Hours : 9

Building Lighting - National Building Codal provisions for lighting and ventilation aspects in buildings –Natural illumination- artificial illumination

Module -II **Methods of sound insulation** Total Hours : 9

Methods of sound insulation – materials used for sound insulation – measurement of acoustical level – methods of acoustical improvement for existing structures

Module -III **Lighting** Total Hours : 9

Lighting: Day lighting (or) Natural lighting - design of windows -orientation of buildings - lighting for industrial structures - supplementary illumination -summary.

Module -IV **Ventilation** Total Hours : 9

Ventilation: Ventilation due to wind - ventilation due to stack effect -ventilation due to combined effect -infiltration - ventilation of industrial building

Module -V **Design of ventilation** Total Hours : 9

Calculation of natural ventilation - mechanical ventilation - examples - building regulation - air conditioning – summary

Course Outcome

1. To become familiar with building lighting and ventilation aspects as per code
2. To become familiar with insulation methods and acoustical level measurements.
3. Able to design natural day light and illumination system of structures.
4. To become familiar with aspects of ventilation of industrial buildings
5. Able to design natural ventilation, mechanical ventilation and air conditioning system of the structure.

Text Books/ Reference Books

1. Bhavikatti,S.S and Rajashekarappa,K.G., Engineering Mechanics, New Age International (P) Ltd, NewDelhi, 2013.
2. Hopkinson R.G. and Galbraith R, Architectural Physics: Lighting, HMSO, London,1963.
3. George A.Hool S.B & Nathan, Handbook of Building Construction: Data for Architects, Design and Constructing Engineers and Contractors, Nabu Press, 2010.
4. Andrews F.T., Building Mechanical Systems, Krieger Huntington, N.Y.,1976.
5. CE Hagentoft, Introduction to Building Physics, Student Literature, 2001.

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEO02	**GREEN BUILDING DESIGN**	3	0	0	3	40	60	100

Objective (s)

- *Analyze the environmental impacts of building construction and operation on ecosystems and resources.*
- *Understand the implications of various building technologies and the concept of embodied energy in buildings.*
- *Evaluate factors affecting comfort in buildings, including thermal, acoustic, and visual aspects.*
- *Explore and apply solar energy technologies to enhance energy efficiency and sustainability in building design.*
- *Study the use of green composites in building materials to promote sustainability and reduce environmental impact.*

Module -I **ENVIRONMENTAL IMPLICATIONS OF BUILDINGS** Total Hours : 9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

Module -II **IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS** Total Hours : 9

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

Module -III **COMFORTS IN BUILDING** Total Hours : 9

Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations.

Module -IV **UTILITY OF SOLAR ENERGY IN BUILDINGS** Total Hours : 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

Module -V **GREEN COMPOSITES FOR BUILDINGS** Total Hours : 9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. Demonstrate an understanding of the environmental implications of building practices and their effects on ecosystems.
2. Assess the embodied energy associated with different building technologies and materials.
3. Evaluate and improve comfort levels in buildings based on various environmental and design factors.
4. Effectively integrate solar energy solutions into building designs to enhance energy efficiency.
5. Apply green composites in building projects to promote sustainable construction practices.

Text Books

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

Reference Books

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEO03	**FINITE ELEMENT ANALYSIS**	3	0	0	3	40	60	100

Objective (s)

- *To gain basic knowledge in modeling of structures using finite element Methods*
- *To understand the concepts of developing finite elements and FE packages*
- *Understand and apply one-dimensional (I-D) elements in structural analysis and design.*
- *Learn to use two-dimensional (II-D) elements for modeling and analyzing planar structures.*
- *Analyze and design beam structures using three-dimensional (III-D) elements and techniques.*

Module – I **Introduction** Total Hours : 9

Need for Numerical Technique – Solutions to Differential Equations –Finite Difference Methods – Limitations Variation and Weighted Residual and Potential energy formulations – Finite Element Method – Basic steps.

Module – II **I-D Elements** Total Hours : 9

Shape functions – convergence Criteria –Geometric Invariance – Pascal's Triangle – Shape Functions forone Dimensional Structures - Formulation of Element Matrix - Formation of Element Nodal load Vector - Coordinate systems – Global, Local & Natural – Formation of global stiffness matrix - Formation of global load vector.

Module – III **II – D Elements** Total Hours : 9

Two dimensional elements – Plane stress – Plane strain – 3,6 Nodded Triangular elements – Rectangular elements – Lagrange and serendipity elements –Isoparmetric elements -shape functions, Element stiffness Matrix – Load vector formulations –Gauss Quadrate rule.

Module – IV **Beam & III-D Elements** Total Hours : 9

Beam elements –Axisymmetric elements Tetrahedral, hexahedral elements –Formation of shape functions only.

Module – V **Solution Techniques** Total Hours : 9

Mesh generation techniques – static condensation. Solution Techniques- Gauss elimination –Matrix Decomposition – Frontal solvers. Requirements of Pre and post processor in GUI based FE packages. Demo of modelling using FEM packages.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

- An ability to generate the shape functions of various elements used in FE packages understand the assembly and solution techniques.
- Effectively apply II-D elements to analyze and design planar structures.
- Successfully analyze and design beam structures using III-D elements.
- Utilize various solution techniques to address complex problems involving different types of elements.
- Integrate and apply dimensional elements and solution methods to achieve accurate and effective structural analysis.

Text Books

1. Rajasekaran.S, Finite Element Analysis in Engineering Design, S.Chand Company (p) Ltd.,2013.
2. Krishnamoorthy,C.S, Finite Element Analysis – Theory and Programming , Tata Mc Graw-Hill, 2014.

Reference Books

1. Reddy.J.N., Introduction to the Finite Element Method, Tata Mc Graw-Hill, 2013.
2. Cook, R.D, M.E.Plesha, D.S.Malkus, Concepts and applications of Finite element Analysis, John Wiley and Sons, 2013.
3. David V Hutton, Finite Element Analysis, Tata Mc Graw-Hill, 2012.
4. Bhavikatti.S.S., Finite Element Analysis, New Age International (P) Ltd.,2013.

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEO04	**SELECTION OF MATERIALS**	3	0	0	3	40	60	100

Objective (s)

- The subject exposes students to the basics parameter for selection of materials
- To understand about different classes of materials, manufacturing processes and their properties, applications of materials.
- Study the manufacturing processes, cost implications, and economic factors associated with material production.
- Utilize materials selection charts and conduct testing to make informed decisions on material choice.
- Apply knowledge of material properties and processing to determine suitable materials for specific engineering applications.

Module -I **ENGINEERING MATERIALS** Total Hours : 9

Introduction – classification of engineering materials – selection of materials for engineering purposes –selection of materials and shape –classification metal and alloys, polymers, ceramics and glasses, composites, natural materials,-non metallic materials- smart materials - physical, metrical properties of metals

Module -II **MATERIAL PROPERTIES** Total Hours : 9

Mechanical properties – fatigue strength – fracture Toughness - Thermal Properties - Magnetic Properties - Fabrication Properties –electrical , optical properties - Environmental Properties , Corrosion properties –shape and size - Material Cost and Availability– failure analysis

Module -III **MANUFACTURING PROCESSING AND ECONOMIC ANALYSIS** Total Hours : 9

Interaction of Materials Selection, Design, and Manufacturing Processes - Production Processes and Equipment for Metals - Metal Forming, Shaping, and Casting - Plastic Parts Processing - Composites Fabrication Processes - Advanced Ceramics Processing – surface treatment - Resource -The Price and Availability of Materials

Module -IV **MATERIALS SELECTION CHARTS AND TESTING** Total Hours : 9

Ashby material selection charts-Testing of Metallic Materials - Plastics Testing - Characterization and Identification of Plastics - Professional and Testing Organizations - Ceramics Testing - Nondestructive Inspection.

Module -V **APPLICATIONS AND USES** Total Hours : 9

Selection of Materials for Biomedical Applications - Medical Products - Materials in Electronic Packaging - Advanced Materials in Sports Equipment - Materials Selection for Wear Resistance - Advanced Materials in Telecommunications - Using Composites - Manufacture and Assembly with Plastics, fiber and Diamond Films.

Course Outcome

1. Understand different types of availability materials
2. Easy and effective way to select required materials
3. Ability to identify the material properties
4. Apply materials selection charts and testing methods to choose the best materials for given applications.
5. Understand and apply materials knowledge to real-world engineering problems and applications.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Text Books

1. Ashby, M. F. Materials selection in mechanical design, 3rd edition. Elsevier, 2005.
2. Ashby, M. F. and Johnson, K. Materials and design – the art and science of material selection in product design. Elsevier, 2002.

Reference Books

1. Charles, J. A., Crane, F. A. A. and Furness, J. A. G. Selection and use of engineering materials, 3rd edition. Butterworth-Heinemann, 1997
2. Handbook of Materials Selection. Edited by Myer Kutz2002 John Wiley & Sons, Inc., NewYork.

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEO05	**TESTING OF MATERIALS**	3	0	0	3	40	60	100

Objective (s)

- *To understand the various destructive and non-destructive testing methods of materials and its industrial applications.*
- *Apply mechanical testing methods to assess the strength, durability, and performance of materials.*
- *Learn and implement non-destructive testing techniques to evaluate material properties without causing damage*
- *Conduct tests to characterize material properties, including composition, structure, and behavior under various conditions.*
- *Explore and apply additional testing methods relevant to specific materials and applications.*

Module -I **INTRODUCTION TO MATERIALS TESTING** Total Hours : 9

Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

Module -II **MECHANICAL TESTING** Total Hours : 9

Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) - Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test - Principles, Techniques, Methods, Advantages and Limitations, Applications

Module -III **NON DESTRUCTIVE TESTING** Total Hours : 9

Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test – Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission- Principles, Techniques, Methods, Advantages and Limitations, Applications.

Module -IV **MATERIAL CHARACTERIZATION TESTING** Total Hours : 9

Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) - Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques- Principles, Types, Advantages and Limitations, Applications.

Module -V **OTHER TESTING** Total Hours : 9

Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermomechanical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass Spectrometry.

Lecture Periods: 45 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 45**

Course Outcome

1. Identify suitable testing technique to inspect industrial component
2. Ability to use the different technique and know its applications and limitations
3. Effectively use non-destructive testing techniques to inspect and evaluate materials without damaging them.
4. Successfully conduct and interpret material characterization tests to assess various properties and behaviors.
5. Apply a range of testing methods to address specific material properties and meet testing requirements.

Text Books

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2009.
2. Cullity, B. D., "Elements of X-ray diffraction", 3rd Edition, Addison-Wesley Company Inc., New York, 2000.
3. P. Field Foster, "The Mechanical Testing of Metals and Alloys" 7th Edition, Cousens Press, 2007.

Reference Books

1. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9th Edition, American Society for Metals, 1978.
2. ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA.
3. Brandon D.G., "Modern Techniques in Metallography", Von Nostrand Inc. NJ, USA, 1986.

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEO06	**INDUSTRIAL EFFLUENT TREATMENTS**	3	0	0	3	40	60	100

Objective (s)

- *To impart awareness about the pollution created by different stages of wet processing*
- *To familiarize the students about the importance of water and its analysis*
- *To enable the students to understand about the waste water treatment plants and various treatments carried out*
- *To learn to utilize advanced oxidation systems for enhanced wastewater treatment.*
- *To familiarize with ambient air quality standards and regulations for maintaining air quality.*

Module -I **Water Constituents Impact** Total Hours : 9

Constituents of water and their effect on textile wet processing, Effluent discharge standards for inland surface water public sewers, on land for irrigation, marine coastal areas and drinking water parameters, Quality requirements of water for cotton and synthetic Textile processing.

Module -II **Primary Treatment Methods** Total Hours : 9

Characteristics and treatment of cotton, synthetics and wool processing effluents, Reduction of pollution load, Primary treatment methods - screening, sedimentation, equalization, neutralization, coagulation and flocculation.

Module -III **Secondary Treatment Methods** Total Hours : 9

Secondary treatment methods – Trickling filtration, Activated sludge process, aerated lagoons, secondary sedimentation, oxidation ponds, Anaerobic Digestion, sludge disposal.

Module -IV **Tertiary Treatment** Total Hours : 9

Tertiary treatment – Evaporation (solar and steam), Advanced oxidation system, Membrane technologies (MF, UF, NF & RO), Reverse osmosis, ion exchange and activated carbon treatment. Quality parameters at entry and exit of RO.

Module -V **Pollution Control Equipment** Total Hours : 9

Air Pollution - Properties of air pollutants, control of air pollutants – Air pollution control equipment, Ambient air quality standards. Noise pollution – Types of noise – Noise measurement and – Control of noise pollution.

Lecture Periods: 45 Tutorial Periods:- Practical Periods:- Total Periods: 45

Course Outcome

1. Upon completion of the course, the students will be able to
2. Understand the textile processing related causes for pollution
3. Understand the effluent discharge standards and different processes involved in waste water treatment
4. Perform the research and development to produce zero discharge effluents
5. Identify different types of noise pollution and their sources accurately.

Text Books

1. Rao,C.S., “Environment Pollution control Engineering”, New age International Ltd. and Publishers, N.Delhi, 2004.
2. Reife, A., and Freeman, H.S., (Ed)., “Environmental chemistry of dyes and pigment”, Wiley., London, 2000, ISBN: 047158276.

Reference Books

1. Horrockks, A.R (Ed)., “Ecotextiles’98: Sustainable development”, The Text.Inst., Manchester 1999, ISBN: 1855732426.
2. Modak.P., “The textile industry and the environment”, UNEP:HMSO, Blackwells, Leeds, 2003, ISBN: 9280713671

MINOR

(Construction Engineering and Management)

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM01	**ENGINEERING GEOLOGY**	4	0	0	4	40	60	100

Objective (s)

- *To familiarize the students to interior of the earth, plate tectonics, geomorphological processes and their significance in civil Engineering.*
- *To provide an insight on minerals, rocks and their geological characteristics.*
- *To understand their effects and significance in various areas of civil Engineering.*
- *Facilitate the students to understand various defects associate with geological formations.*
- *To emphasize their significance in the selection of site for various structures.*

Module – I **General Geology** Total Hours : 12

Scope of geology in Civil Engineering – interior of the earth- Fundamentals of plate tectonics - geomorphological (surface) processes –weathering – types , weathered products, assessment of degree of weathering , Fluvial processes, glaciations , wind action, their land forms and their significance in Civil Engineering – earthquake, its causes, classification, earthquake zones of India, - Landslides, its causes, classification and remediation.

Module – II **Mineralogy** Total Hours : 12

Physical properties of minerals – classification - study of important rock forming minerals –Quartz family, feldspar family, Augite, Hornblend, Mica family, calcite, Iron oxide minerals, Augite, Hornblend, and Clay minerals - effect of minerals on the performance of soils and rocks.

Module – III **Petrology** Total Hours : 12

Classification of rocks - mode of formation – Texture, structure and forms of igneous, sedimentary and metamorphic rocks - Physical properties, Mechanical properties of rocks-. Study of important rocks - granite, syenite, diorite, gabbro, pegmatite, dolerite, basalt, sand stone, limestone, shale, breccia , conglomerate, gneiss, quartzite, marble, slate, schist, phyllite and conglomerate - role of petrology in the field of construction.

Module – IV **Structural geology and Geophysical methods** Total Hours : 12

Attitude of beds - out crops, study of structural features such as folds, faults, joints, unconformities ,their brief classification and their bearing on engineering construction – principles of geophysical methods, electrical resistivity method , seismic method and its applications in civil engineering

Module – V **Geological applications** Total Hours : 12

Role of geology in site investigation, Geotechnical classification of rock, geological considerations in tunnels and dam site, reservoir site, buildings, road cuttings, study of air photographs and satellite images and interpretation for civil engineering projects, groundwater- types of aquifers , properties of geological formations affecting groundwater and its significance in construction.

Lecture Periods: 60 **Tutorial Periods: -** **Practical Periods:-** **Total Periods: 60**

Course Outcome

1. To familiarize the students to interior of the earth, plate tectonics, geomorphological processes and their significance in civil Engineering.
2. To provide an insight on minerals, rocks and their geological characteristics to understand their effects and significance in various areas of civil Engineering.
3. To Facilitate the students to understand various defects associate with geological formations and to emphasize their significance in the selection of site for various structures.
4. To understand the structural geology and its features
5. To familarize the Students in geological applications and also petrology

Text Books

1.Chenna Kesavulu.N, "Engineering Geology ", Macmillan Publishers Pvt. Ltd., 2009
2. Varghese, P.C," Engineering Geology for Civil Engineers", Prentice-hall of India Pvt.Ltd., 2012.

Reference Books

1. Leggot, R.F.," Geology and Engineers ", McGraw Hill , New York.2002

2. Blyth, F.G.M., “A Geology for Engineers”, Arnold, London, 2003.
3. Bell.F.G, “Fundamentals of Engineering Geology” Butterworth-Heinemann, 1983.
4. Bell. F.G. “ Engineering Geology” Elsevier publications, 2007

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM02	**BUILDING TECHNOLOGY**	4	0	0	4	40	60	100

Objective (s)	• *Understand the properties and applications of various building materials.* • *Learn about finishing and protective materials used in construction.* • *Explore the components of buildings and their treatment methods.* • *Study plumbing systems and temporary structures in construction.* • *Familiarize with modern techniques and innovations in building construction.*

Module –I	**Building Materials**	TotalHours12
Lime, Timber and its Products, Floor and Wall Tiles, Pozzolanas, Ferrous metals, Thermal Insulation		
Module – II	**Finishing and Perfective materials**	TotalHours:12
Finishing Materials: Glass, Aluminium, Plastics, Paints, Varnishes, Distemper, Waterproofing and Damp Proofing Materials, Ferro cement and its application.		
Module –III	**Components of building and Treatment**	TotalHours12
Partition wall and Cavity wall, Composite Masonry, Doors, Windows, Ventilators, Stairs, Lift, Ramps, Escalators, Anti Termite Treatment		
Module –IV	**Plumbing and Temporary Structures**	TotalHours:12
Materials for Plumbing and Sanitation, Fire Protection, Temporary Structures, Introduction to Building Maintenance.		
Module –V	**Modern Techniques**	TotalHours:12
Principles of Energy Efficient Buildings, Disasters Resistant Buildings (as per IS), Ventilation and Air Conditioning, Cost - effective Construction Techniques		

Lecture Periods: 60 **Tutorial Periods: -** **Practical Periods:-** **Total Periods:**

Course Outcome	1. To learn the various types of building materials and its engineering application like lime, timber, floor and wall tiles, pozzolanas, ferrous metal etc 2. **T**o understand finishing and perfective materials like glass, paints, varnishes 3. To Study about the components of building like wall, doors, window, ventilators, and vertical transportation 4. To gain knowledge about the various plumbing accessories and temporary structures in the construction practices in the field 5. To understand the Apply geological principles for mitigation of natural hazards and select sites for constructions and gain knowledge in modern equipments and the recent techniques to be used

Text Books

1. Bhavikatti.S.S., Building Materials, Vikas Publishing House.Pvt. Ltd., New Delhi, 2012.
2. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publishing (P).Ltd., New Delhi-2, 2012.

Reference Books

1. Rajput, R.K., Engineering Material, S.Chand &Co. Ltd., New Delhi, 2008.
2. Bhavikatti.S.S.,Building Technology, Vikas Publishing House. Pvt. Ltd., New Delhi, 2013.
3. Shrivastava.U.K, Building Materials Technology, Galgotia Publications Pvt., Ltd., 2012.
4. Varghese, P.C, Building Materials, Prentice-hall of India Pvt.Ltd., 2013.
5. SP 21 : 2005 First Published March 1985 First Revision November 2009 © BIS
6. IS SP 7-NBC: National Building Code of India 2016.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM03	**CONCRETE TECHNOLOGY**	4	0	0	4	40	60	100

Objective (s)	• *Should be able to understand the Engineering properties of materials, Cement, Aggregates, Admixtures* • *Understand the hydration mechanism of Cement & properties of fresh and Hardened concrete* • *Explore the methods for improving concrete durability and strength.* • *To understand about durability of concrete* • *To design concrete mixes.*

Module – I	**Cement**	Total Hours : 12

Portland cement- chemical composition- hydration of Portland cement- heat of hydration- Test on Cement - hardening of cement paste- Types of Portland cement- special hydraulics cements.

Module – II	**Aggregates & Fresh Concrete**	Total Hours : 12

Aggregates- natural and mineral aggregates- characteristics of aggregate and their significant- testing of aggregates- admixture for concrete- concrete at early ages- Workability of concrete- early Volume changes- setting time.

Module – III	**Hardened Concrete**	Total Hours : 12

Concrete- introduction- components of concrete- types- properties of hardened concrete and their significance, structure of the hardened concrete- Compressive strength of concrete and factors affecting it- elastic behaviour of concrete- drying shrinkage and creep.

Module – IV	**Durability Properties**	Total Hours : 12

Durability of concrete- significant- causes of concrete deterioration- alkali-aggregate reaction- deterioration by chemical actions- concrete in marine environment.

Module – V	**Mix Design**	Total Hours : 12

Concept of proportioning concrete mixes- mix design- IS code method- ACI method. Testing evaluation and control of concrete quality.

Lecture Periods: 60 Tutorial Periods:- Practical Periods:- Total Periods: 60

Course Outcome	1. To understand the various properties of cement, and types its applications. 2. Students should be able to understand the various properties of aggregates and fresh concrete and its workability. 3. To study about the Properties of hardened concrete with factors effecting on it. 4. To Study about the durability of concrete and chemical action of aggregate 5. Students should be able to understand the Mix design as per IS codes and ACI standards

Text Books

1. M.L. Gambhir, Concrete Technology, McGraw Hill Book Company, Fifth Edition, 2017. (ISBN-1259062554, 978-1259062551).
2. M.S. Shetty, Concrete Technology, Theory and Practice, S. Chand Publication, Sixth Edition, 2018. (ISBN-9788121900034,978-8121900034)
3. Santhakumar.Ar, Concrete Technology, Oxford University Press, 2013
4. Shetty,M.S, Concrete Technology; Theory & Practice, S. Chand & Group, New Delhi, 2014.

Reference Books

12. Gambhir.M.I, Concrete Technology: Theory & Practice, Tata McGraw Hill Co., New Delhi, 2013.
13. Gupta. Yp, Concrete Technology& Good Construction Practices, New Age International (p) Ltd., 2013.
14. Neville. Am. & Brooks Ji., Concrete Technology, Pearson Education Ltd., 2013.
15. Krishna Raju.N, Design of Concrete Mixes, CBS Publishers, New Delhi, 2013.
16. IS 10262-(2009) Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 2009.
17. IS:10262 (2009), Mix Design

18. IS:269 (2015), Ordinary Portland Cement (33 Grade).
19. IS:12269 (2013), Ordinary Portland Cement (53 Grade).
20. IS:650 (1991), Specification of Standard Sand.
21. IS:383 (1970), Specification for Coarse and Fine aggregate.
22. The code book for concrete mix design is the IS:10262: 2019, which is published by the Bureau of Indian Standards (BIS).

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM04	**WATER SUPPLY ENGINEERING**	4	0	0	4	40	60	100

Objective (s)	• *To study the water supply demand and distribution* • *To Identify and evaluate various natural and artificial sources of water.* • *To understand the quality of water from various sources* • *To carryout functional design of water treatment units.* • *Evaluate the impact of water supply systems on public health and environmental sustainability.*

Module – I	**Introduction**	Total Hours : 12

Water supply Scheme - objectives and requirements - Domestic, industrial, commercial and public requirements - Various methods of estimating population - Variations in rate of demand and its effects on design.

Module – II	**Sources of Water and intakes:**	Total Hours : 12

Surface and groundwater sources - Computation of storage capacity of reservoirs by analytical and graphical methods - Forms of underground sources like wells, Infiltration wells and galleries, Intake structures, tube wells - Sanitary protection of wells-transportation of water- Pipe flow formulae – pipe materials- laying of pipes-testing of pipes-

Module – III	**Quality of Water:**	Total Hours : 12

Indian and W.H.O. Standards for drinking water - impurities in water - Physical, chemical and bacteriological analysis of water - quality of water for trade purpose and swimming pools

Module – IV	**Water Treatment system:**	Total Hours : 12

Unit process of water treatment - Principles, functions and design of flocculators, sedimentation tanks, sand filters, principles of disinfection, water softening, aeration, Iron and manganese removal.

Module – V	**Distribution System**	Total Hours : 12

Service reservoir location, determination of capacity – Method of distribution - Layout of distribution systems- Design of distribution system, analysis of pipe networks by different methods, pipe appurtenance for distribution system – Plumbing works and layout of water supply system for buildings, waste detection and prevention, Effects of corrosion and its prevention.

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome	1. To study the water supply demand and distribution. 2. To study various sources of water and intake structure. 3. To understand the quality of water from various sources. 4. To carryout functional design of water treatment units. 5. Plan and design water supply systems for a rural/urban area.

Text Books

1.Duggal, K.N., Elements of Environmental Engineering, S. Chand & Company , New Delhi 2013
2. Environmental Engineering, M.P. Poonia, SC. Sharma, Santosh Kumar, Khanna Book Publishing Co., New Delhi.
3. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.

Reference Books

1. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2013
2. Venugopala Rao.P,Text book of Environmental Engineering, Prentice-hall of India Pvt Ltd., 2012
3. Santosh Kumar Garg, Water Supply Engineering: Environmental Engineering 1, Khanna Publishers, 2013
4. Modi, P.N, Water Supply Engineering: Environmental Engineering 1, Standard Publishers, 2011
5. The Indian standard code for drinking water, IS 10500:2012.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM05	**HIGHWAY ENGINEERING**	4	0	0	4	40	60	100

Objective (s)	• *The student should have understood the various aspects of Highway Engineering including material characterization, pavement design and management* • *To understand the selection and properties of materials used in highway construction.* • *To Design and evaluate flexible pavement systems for durability and performance.* • *To Develop and assess rigid pavement structures to ensure structural integrity and longevity.* • *To implement effective construction techniques and maintenance strategies for highway systems.*

Module – I	**Highway Geometry**	Total Hours : 12

Importance Road transportation, Highway alignment – Requirement, Engineering surveys for highway location. Maps & drawings to be prepared. Geometric design – Cross section element, width, camber, design – speed, sight distances, requirements and design of horizontal and vertical alignments.

Module – II	**Highway Materials**	Total Hours : 12

Highway materials – Properties of sub-grade pavement component materials – Tests on aggregates, sub-grade soil & bituminous materials. Design of Bituminous mixes as per M52

Module – III	**Flexible Pavements**	Total Hours : 12

Pavement analysis – flexible pavement – calculation of stresses – single layer, two layer theory – Computation of strain at the layers interface – computation of deflection.Rigid pavement - calculation of stresses – load and temperature effects - Westergaard's theory - Bradbury theory.

Module – IV	**Rigid Pavements**	Total Hours : 12

Pavement Design Factors in the design of flexible and rigid pavements, CBR methods. IRC recommendations on flexible pavement design (IRC37) and Rigid pavement (IRC58). Design of Surface and subsurface highway drainage.

Module – V	**Construction and Maintenance**	Total Hours : 12

Pavement construction techniques – Types of pavements – WBM, WMM, GSB construction. Construction of bituminous pavements and rigid pavements. Pavement failures and their remedies. Pavement evaluation – structural, functional.

Lecture Periods: 60 Tutorial Periods:- Practical Periods:- Total Periods: 60

Course Outcome	1. The student should have an adequate knowledge in highway alignment , surveys in road construction ,types of curves , maps and drawings in detail 2. The student should have understood the various aspects of Highway Engineering including material characterization. 3. To understand the design concepts of Flexible pavements 4. To understand the design concepts of Rigid pavements in detail 5. The Students should have an thorough knowledge in construction and maintenance of highways

Text Books

1. Veeraragavan.A, Khanna. S.K. , Ceg Justo, Highway Engineering, Nem Chand & Brothers, 2019.
2. Sharma, S.K. "Principles Practice and Design of Highway Engineering", S. Chand & Co Ltd, 2019.

Reference Books

1. Gupta B.L and Amith Gupta, Highway and Bridge Engg., Standard publishers, and Distributor, 2010.
2. Partha Chakroborthy and Animesh Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2013.
3. Lr Kadiyali, Lr Kadyali, Nb Lal ," Principles and practice of highway engineering ", Khanna Publishers. 2013
4. Rangwala.S.C, Highway Engineering, Charotar Book Distributors, 2019.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM06	**RAILWAYS AND AIRPORT ENGINEERING**	4	0	0	4	40	60	100

Objective(s)

- *Provide the students with a basic understanding of the railway and airport engineering.*
- *Introduce to the students, the role of a Civil Engineer in the above modes of transport.*
- *To understand the crossing of railway tracks*
- *Introduction of Airport planning*
- *To understand runways and taxiways*

Module – I **Components and Functions of Permanent way** Total Hours : 12

Permanent way – gauges, components of permanent way, rails; functions, requirements, types, failures, creep of rails; Sleepers - types, requirements; Ballast – functions requirements, track fittings and fastenings.

Module – II **Geometric design of track** Total Hours : 12

Geometric design of the track – gradients, grade compensation, speed, super-elevation, cant deficiency, negative cant transition curve Problems on geometric design.

Module – III **Crossings of tracks** Total Hours : 12

Points and crossings – turn outs, switches, crossings, types of crossings, Design of turnouts; stations - site selection, requirements of a railway station, classification of stations; yards – types of yards,

Module – IV **Airport planning** Total Hours : 12

Airport planning – Aircraft characteristics –airport planning, obstructions, types of airport, Wind rose diagram, Runway orientation.

Module – V **Runways and taxiways** Total Hours : 12

Basic runway length and corrections. Design of exit taxiway, Runway marking and lighting, LCN and PCN, airport drainage, Problems on LCN & PCN

Lecture Periods: 60 Tutorial Periods:- Practical Periods:- Total Periods: 60

Course Outcome

1. To understand the initial knowledge of permanent way and it's all components in detail.
2. The student should have a basic ideas of geometry of alignment in permanent way.
3. To understand the design concepts of points and crossings, turnout and other major areas of railway project.
4. To provide the students with a basic understanding of the railway and airport engineering
5. Introduce to the students, the role of a Civil Engineer in the above modes of transport

Text Books

1. Khanna S.K, Jain.S.S, Arora.M.G., Airport Planning and Design, Nem Chand and Bros., 2012
2. Saxena, S.C., S. Arora. S.P., Text Book of Railway Engineering, Dhanpat Rai Publications (P) Ltd., 2013.

Reference Books

1. Mundrey.J.S, Railway Track Engineering, Tata Mc Graw-hill, 2013.
2. Subhash C Saxena, Airport Engineering Planning & Design, CBS Publishers, 2012
3. Agarwal, M. M., Agarwal, M. M, Indian Railway track, Standard Publishers, 2008.
4. Kristi, Lal, Transportation Engineering, PHI, New Delhi, 2008.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM07	**CONSTRUCTION METHODS AND EQUIPMENT**	4	0	0	4	40	60	100

Objective (s)	• *To introduce various construction equipments, selection and apply scientific principles for effectively utilizing them* • *To make aware of the various techniques and practices on construction of various civil engineering structures.* • *To study and understand the latest construction techniques applied to engineering Construction* • *To develop an understanding of the methods adopted in construction of high rise buildings with basement floors.* • *To optimize the construction by using right equipment's.*

Module – I	**Excavation**	Total Hours : 12

Excavations for foundations and Basement floors – Methods – temporary earth retaining structures: braced wall, sheet pile wall, soil nail wall – Dewatering methods – water proofing methods – Trenching - Excavators – pumps. Under water concreting.

Module – II	**Sub structures**	Total Hours : 12

Methods and equipments for: Pile foundation, well foundation, coffer dam. Shoring and under pinning – Pile wall - RCC Diaphragm walls.

Module – III	**Super Structures**	Total Hours : 12

Methods and equipments for: Scaffolding, Form work, Hoisting and Rigging (cranes), plastering and flooring. Concrete: Aggregates, RMC plants, pumping, finishing, - shotcreting – Building Demolition Techniques.

Module – IV	**Bridges**	Total Hours : 12

Methods and equipments for RCC & Cable stayed Bridges: Balanced cantilever method, Span by Span Method, Incremental lunching methods.

Module – V	**Roads and Tunnels**	Total Hours : 12

Methods and equipments for construction Flexible and rigid pavements, Tunnels in soft ground- Cut and cover method, TBMs, Tunnel Lining.

Lecture Periods: 60 Tutorial Periods:- Practical Periods:- Total Periods: 60

Course Outcome	1. To develop an understanding of the methods adopted in Excavation and to optimize the construction by using right equipments. 2. To develop an understanding of the methods adopted in Sub structures and to optimize the construction by using right equipments. 3. To develop an understanding of the methods adopted in Super Structures and to optimize the construction by using right equipments. 4. To develop an understanding of the methods adopted in Bridges and to optimize the construction by using right equipments. 5. To develop an understanding of the methods adopted in Roads and Tunnels and to optimize the construction by using right equipments.

Text Books

1. Antil J.M., Civil Engineering Construction, McGraw Hill Book Co., 1982
2. Peurifoy, R.L., Clifford.J.,et al.,Construction Planning, Equipment and Methods McGraw Hill Co, 2011

Reference Books

1. Varma., M., Construction Equipment and its Planning & Application, Metropolitan Book Co., 1979
2. Smith, R.C, Andres, C.K Principles and Practice of Heavy Construction, Prentice Hall, 1986

3. Chew, M. Y. L., Michael Chew Yit Lin Construction Technology for Tall Buildings, 3rd Ed., World Scientific Publishing Co. Pte. Ltd., 2009.

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM08	**SAFETY PRACTICES IN CONSTRUCTION**	4	0	0	4	40	60	100

Objective (s)

- *To explore the causes of accidents and the relevant laws that govern safety in the workplace.*
- *To equip students with the knowledge to develop, implement, and assess safety procedures in various work environments.*
- *To examine the responsibilities and collaboration between safety workers and management in maintaining a safe work environment.*
- *To study different safety methods and techniques that can be applied to prevent accidents and ensure workplace safety.*
- *To familiarize students with the selection, use, and maintenance of safety equipment in compliance with industry standards.*

Module - I **Accidents and Related Law** Total Hours: 12

Construction accidents - Construction Safety Management: Importance - causes of accident, Construction industry related laws. Legal and financial aspects of accidents in construction – occupational and safety hazard assessment.

Module – II **Safety Procedures** Total Hours: 12

Elements of an Effective Safety Programmes - Job-site assessment - Safety Meetings - Safety Incentives. Contractual Obligations - Substance Abuse - safety Record Keeping Safety Culture - Safe Workers-.

Module –III **Safety Workers and Managements** Total Hours: 12

Safety and First Line Supervisors - Safety and Middle Managers - Top Management Practices, Company Activities and Safety - Project Coordination and Safety Procedures - Workers Compensation -Accident prevention-cost of accidents-accident reporting investigation

Module –IV **Safety Methods** Total Hours: 12

Total loss control and damage control-Safety sampling- safety audit - safety equipment -planning and site preparation- safety system of storing construction materials-Excavation - blasting- timbering-scaffolding- safe use of ladders

Module –V **Safety Equipments** Total Hours: 12

Safety in hand tools- Safety in Hoisting apparatus and conveyors- Safety in the use of mobile cranes-Manual handling- Safety in demolition work- Trusses, girders and beams- Fire hazards and preventing methods.

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome

1. Students will be able to identify the legal aspects of accidents and apply the appropriate laws in safety management.
2. Students will demonstrate the ability to design and implement effective safety procedures in the workplace.
3. Students will understand the roles of safety personnel and management and be able to collaborate effectively to enhance workplace safety.
4. Students will be able to apply various safety methods and techniques to prevent accidents and mitigate risks.
5. Students will be proficient in selecting, using, and maintaining safety equipment in line with industry regulations.

Text Books

1. Mishra. R.K., Construction Safety, Aitbs Publishers, 2012.
2. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997

Reference Books

1. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamil Nadu. Health Management, Prentice Hall Inc., 2001.
2. Bhattacharjee. S.K., Safety Management in Construction Principles & Practice,Khanna Publishers, 2011.
3. Hand Book on Construction Safety Practices, SP:70, BIS, 2001.
4. Muraleedharan Pillai.K, Construction Safety Hand Book, Sujatha Publishers, 2012.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM09	**AIR AND NOISE POLLUTION**	4	0	0	4	40	60	100

Objective (s)	• To have a basic knowledge on the air pollution on environment • To understand the interaction of air pollutants on the meteorological parameters • To study about the control measures of air pollutants from various sources • Understand methods for controlling gaseous pollutants to reduce environmental impact. • Learn strategies for controlling noise pollution to improve community well-being and regulatory compliance.

Module – I	**Introduction**	Total Hours : 12

Definition of clean air –air pollutants - Sources and classification - Effects of air pollution on man, animal, vegetation and properties -Ambient Air Quality Standards, Air pollution control legislation.

Module – II	**Meteorology and Air pollution**	Total Hours : 12

Meteorology and Air pollution – Atmospheric stability – Inversions – Mixing height –Plume behaviour – Plume rise estimation – Effluent dispersion theories –Air pollutants Modelling.

Module – III	**Control of particulate pollutants**	Total Hours : 12

Control of Air pollutants: particulates – Filters – Gravitational settling chambers – Centrifugal-multiple type cyclones – Collection efficiency - Electrostatic precipitators – Wet collectors-Centrifugal spray scrubbers - Venturi scrubbers.

Module – IV	**Control of gaseous pollutants**	Total Hours : 12

Gaseous pollution control – Absorption - Principles – Description of equipment, Adsorption – Principal adsorbents – Equipment descriptions – Condensation – Contact condensers, Incineration –Equipment description

Module – V	**Control of Noise pollution**	Total Hours : 12

Sound and noise - Source of noise pollution - Environmental and industrial noise -Effects of noise pollution - Fundamentals of sound - generation, propagation, etc., Sound measurement, sound level meters – Measures for prevention and control of noise -Environmental and industrial noise - Noise control legislation.

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome	1. To study about the sources and Classification of air pollution and its effects 2. To learn about the dispersion modelling of air pollution 3. To study about the Controlling of air particulate matter 4. To study about the controlling of gaseous pollutants with Equipment's 5. To study about the sources, types and effects of noise pollution and its Controlling Method

Text Books

1. Rao.M.N. et al., Air Pollution, Tata Mc.Graw Hill, 2013.
2. Rao.C.S., Environmental Pollution Control Engineering , New Age International Publishers, 2014.

Reference Books

1. Noel de Nevers, Air Pollution Control Engineering, Mc.Graw Hill, New York. 2012.
2. Stern, A.C., Air Pollution , Vol.I, II and III, Academic Press, 2012.
3. Cunniff, P.F., Environmental Noise Pollution, John Wiley and Sons, 2010.

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEM10	**IRRIGATION AND DRAINAGE ENGINEERING**	4	0	0	4	40	60	100

Objective (s)

- *To familiarize the students with various irrigation practices adopted*
- *To identify the irrigation requirements of various crops.*
- *Gain knowledge on the principles and practices of irrigation*
- *To Explore different types of drainage treatment techniques & design irrigation channels*
- *Acquire knowledge about the application and benefits of drip irrigation.*

Module -I **Types of Irrigation Systems** Total Hours : 12

Introduction: Need, advantages and disadvantages of Irrigation - Environmental effects - Types of Irrigation systems - Gravity irrigation, canals, Tanks, Wells and Irrigation galleries - Water lifts. Soil - water - plant relationship: Soil and its function - Physical properties of soil and their importance in relation to irrigation - Classes and availability of soil water - Movement of water in soils - Measurement of soil moisture - Crop growth and moisture relationship - Salt problems in soil and effect of salts on plant growth.

Module -II **Irrigation Water Requirement** Total Hours: 12

Evaporation, Evapo transpiration, Consumptive use and its estimation - Crop factor - Lysimeters - Effective rain fall and irrigation requirements - Water requirements of various crops - Duty of water - Quality of irrigation water.

Module -III **Methods of Irrigation** Total Hours: 12

Surface, subsurface and overhead methods - Check basin, border & furrow, Drip and sprinkler irrigation - Irrigation efficiency, Depth, Rate and frequency of irrigation - Irrigation schedule.

Module -IV **Design of Irrigation Channels** Total Hours: 12

Design of unlined and lined channels for irrigation - Location and design of canal regulation structures - Cross drainage structures - Measuring devices.

Module -V **Land Development and Management** Total Hours: 12

Land Development: Reclamation and management of saline & alkaline soils, water logging, Causes and remedial measures - Design, construction and maintenance of drainage systems. Irrigation Management: Management of irrigation system - water charge assessment and water use management.

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome

1. To understand the various method to calculate delta etc.,
2. To understand the various drainage methods available for construction work.
3. To gain knowledge on irrigation
4. To know about different types of drainage treatment
5. To gain knowledge about application of drip irrigation

Text Books

1. Basak.K.N, Irrigation Engineering, Tata Mc-Graw-Hill, 2013.
2. Sharma.R.K., and Sharma. T.K., Irrigation Engineering, S.Chand & Company Ltd, 2014.

Reference Books

1. Punmia B.C, Ashok Kumar Jain, Pande Bb Lal, Irrigation & Water Power Engineering, Lakshmi Publications, 2013.
2. Arora.,K.R., Irrigation Water Power & Water Resources Engineering, Standard Publishers, 2013.
3. Raghunath. H.M., Irrigation Engineering, Wiley India (P) Ltd., 2012.
4. Das, M.M, Saikia, M.S Irrigation and water power Engineering, PHI, Learning, (P) Ltd, New Delhi, 2009

HONORS

(Construction Engineering and Management)

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH01	**MECHANICS OF MATERIALS**	3	1	0	4	40	60	100

Objective (s)	• *Calculate & understand the concept of determination of deflection of beams & trusses* • *Calculate the stresses due to unsymmetrical loading* • *The student is to realize the three-dimensional nature of stress and strain.* • *To study the relationships between strain and displacement.* • *To understand the concept of various theories of failure*

Module –I	**Deflection of beams**	Total Hours:12
Deflection of beams – Double Integration method - Macaulay's method, moment area method -conjugate		
Module – II	**Energy methods**	Total Hours 12
Strain energy due to axial, bending, shear and torsional forces – Impact loads. Principle of virtual displacement – principle of minimum potential energy –Castigliano's Theorems – Maxwell – Betti's theorem.		
Module –III	**Deflection of trusses**	Total Hours:12
Deflection of trusses and frames **–** strain energy and dummy/unit load methods.		
Module –IV	**Analysis of continuous beams& unsymmetrical**	Total Hours:12
Analysis of continuous beams using generalized theorem of three moments – shear force and bending moment diagrams. Unsymmetrical bending – principal moments of inertia – stresses due to unsymmetrical bending.		
Module –V	**Complex strain & Theories of failure**	Total Hours12
Complex strains – linear strains for tri-axial state of stress – principle strains in terms of stress – Mohr's strain circle – relationship between Mohr's strain and stress circles. Theories of failure – Brittle and Ductile materials.		

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	1. To analysis the concept of beam by using different methods 2. To understand the concepts of strain energy methods of axil bending shear etc., by Castigliano's Theorems 3. To learn about the deflection of truss and it types by using Strain energy methods 4. To analysis of Continues beams and un symmentrical bending by inertia moment 5. To analysis of complex strain and theories of failure by using Morh's Strain circle.

Text Books

1. Bhavikatti. S. S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi, 2012.
2. Bhavikatti. S. S., Structural Analysis – I, Vikas Publishing House (P) Ltd., New Delhi, 2012.

Reference Books

1. Shah.H.J. and Junnarkar.S.B., Mechanics of structures- Vol.I & Vol.II, Charotar Publishing house, Ltd, 2012.
2. Rattan, S.S., Strength of Materials, Tata McGraw-Hill, 2011.Ramasamy.V, Purushothama Raj.P, Strength of Materials, Pearson Education Ltd., 2012.
3. Jindal.Uc., Strength of Materials, Pearson Education Ltd.,2012
4. Negi.L.S., Strength of Materials, Tata McGraw-Hill, 2012

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH02	**ADVANCED RCC STRUCTURES**	3	1	0	4	40	60	100

Objective (s)	• *To understand design retaining walls and beam-column joints* • *To understand design slabs and grid floors* • *To understand design deep beams and crack width estimation* • *To understand design overhead tanks* • *To understand design formwork for wall, column, beam and slab*

Module – I	Design of Wall and Beam-Column Joint	Total Hours : 12

Design of Shear walls, Design of Beam-Column Joints- detailing of joints.

Module – II	Design of Slabs and Floors	Total Hours : 12

Design of Slabs by Yield Line theory and Hillerborg's Strip method, Design of Flat Plates, Design of Grid floors by Approximate Analysis, Post-Tensioned Slabs.

Module – III	Design of Beams and Serviceability Requirements	Total Hours : 12

Design of Deep Beams, Design of beams curved in Plan, Deflection of RC beams, Estimation of Crack width in RC Beams, Redistribution moments in RC beams

Module – IV	Design of Storage Structures	Total Hours : 12

Design of Bunkers and Silos, Design of Overhead Circular and Rectangular Water Tanks (without staging)

Module – V	Formworks and composite construction	Total Hours : 12

Introduction to Formwork, Selection of formwork materials, Formwork for wall, column, beam and slab elements. Introduction to composite construction

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	1. Able to design retaining walls and beam-column joints 2. Able to design slabs and grid floors 3. Able to design deep beams and crack width estimation 4. Able to design overhead tanks 5. Able to design formwork for wall, column, beam and slab

TextBooks/ Reference Books

1. Varghese, P.C., "Advanced Reinforced Concrete Design", Prentice-hall of India (p) Ltd., 2012.
2. Jha. K.N, "Formwork for Concrete Structures" McGraw Hill Education Pvt Ltd, New Delhi 2012
3. Shah.V.L and KarveS.R, Limit State Theory & Design of Reinforced Concrete-IS 456 2000,Standard Publishers, 2013.
4. Sinha, S.N., Reinforced Concrete Design, Tata McGraw Hill, 2014.
5. Johnson, R.P, Composite Structures of steel and concrete, Black Well Publishing, 2011.
6. Unnikrishna Pillai.S, DevdasMenon, Reinforced Concrete Design, Tata McGraw-hill, 2013
7. IS 456-2000 Plain and Reinforced Concrete – Code of Practice, Bureau of Indian Standards, New Delhi
8. IS: 4995 (Part-I &II)-1974 Criteria For Design Of Reinforced Concrete Bins For Storage Of Granular And Powdery Materials, Bureau of Indian Standards, New Delhi
9. IS 5503 (Part I)-1969 General requirements for Silos for Grain Storage, Bureau of Indian Standards, New Delhi

Department : Civil Engineering		Programme : B.Tech. Civil Engineering						
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH03	**FINITE ELEMENT ANALYSIS**	3	1	0	4	40	60	100

Objective (s)	• *To gain basic knowledge in modeling of structures using finite element Methods* • *To understand the concepts of developing finite elements and FE packages* • *Understand and apply one-dimensional (I-D) elements in structural analysis and design.* • *Learn to use two-dimensional (II-D) elements for modeling and analyzing planar structures.* • *Analyze and design beam structures using three-dimensional (III-D) elements and techniques.*

Module – I	**Introduction**	Total Hours : 12

Need for Numerical Technique – Solutions to Differential Equations –Finite Difference Methods – Limitations Variation and Weighted Residual and Potential energy formulations – Finite Element Method – Basic steps.

Module – II	**I-D Elements**	Total Hours : 12

Shape functions – convergence Criteria –Geometric Invariance – Pascal's Triangle – Shape Functions forone Dimensional Structures - Formulation of Element Matrix - Formation of Element Nodal load Vector - Coordinate systems – Global , Local & Natural – Formation of global stiffness matrix - Formation of global load vector .

Module – III	**II – D Elements**	Total Hours : 12

Two dimensional elements – Plane stress – Plane strain – 3,6 Nodded Triangular elements – Rectangular elements – Lagrange and serendipity elements –Isoparmetric elements -shape functions, Element stiffness Matrix – Load vector formulations –Gauss Quadrate rule.

Module – IV	**Beam & III-D Elements**	Total Hours : 12

Beam elements –Axisymmetric elements Tetrahedral, hexahedral elements –Formation of shape functions only.

Module – V	**Solution Techniques**	Total Hours : 12

Mesh generation techniques – static condensation. Solution Techniques- Gauss elimination –Matrix Decomposition – Frontal solvers. Requirements of Pre and post processor in GUI based FE packages. Demo of modelling using FEM packages.

Lecture Periods: 45 Tutorial Periods: 15 Practical Periods:- Total Periods: 60

Course Outcome	• An ability to generate the shape functions of various elements used in FE packages understand the assembly and solution techniques. • Effectively apply II-D elements to analyze and design planar structures. • Successfully analyze and design beam structures using III-D elements. • Utilize various solution techniques to address complex problems involving different types of elements. • Integrate and apply dimensional elements and solution methods to achieve accurate and effective structural analysis.

Text Books

1. Rajasekaran.S, Finite Element Analysis in Engineering Design, S.Chand Company (p) Ltd.,2013.
2.Krishnamoorthy,C.S, Finite Element Analysis – Theory and Programming , Tata Mc Graw-Hill, 2014.

Reference Books

1. Reddy.J.N., Introduction to the Finite Element Method, Tata Mc Graw-Hill, 2013.
2. Cook, R.D, M.E.Plesha, D.S.Malkus, Concepts and applications of Finite element Analysis, John Wiley and Sons, 2013.

3. David V Hutton, Finite Element Analysis, Tata Mc Graw-Hill, 2012.
4. Bhavikatti.S.S., Finite Element Analysis, New Age International (P) Ltd.,2013.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH04	**REMOTE SENSING AND GIS**	4	0	0	4	40	60	100

Objective (s)

- *To introduce the students to the basic concepts and principles of various components of remote sensing.*
- *To provide an exposure to GIS and its practical applications in civil engineering.*
- *To understand techniques for interpreting and analyzing remote sensing images.*
- *To understand the application and functionality of Geographic Information Systems in spatial data analysis.*
- *To gain skills in entering, storing, and analyzing spatial and remote sensing data.*

Module – I **EMR and its interaction with atmosphere & earth material** Total Hours : 12

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions, important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein‟s Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

Module – II **Platforms and sensors** Total Hours : 12

Types of sensor systems-Types of remote sensing platforms – remote sensing satellite orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and space-borne TIR and microwave sensors.

Module – III **Image interpretation and analysis** Total Hours : 12

Types of Data Products – types of image interpretation – basic elements of image interpretation - visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

Module – IV **Geographic information systems** Total Hours : 12

Introduction – Maps – Definitions – Map projections – types of map projections – map analysis – GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS).

Module – V **Data entry, storage and analysis** Total Hours : 12

Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System.

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome

1. To understand how EMR interacts with atmospheric conditions and earth materials.
2. To effectively use various platforms and sensors for remote sensing data collection.
3. Students will be adept at interpreting and analyzing images from remote sensing data.
4. Students will effectively use GIS tools and systems for spatial data analysis.
5. Students will proficiently manage data entry, storage, and analysis processes.

Text Books

1. Kumar.S., Basics of Remote Sensing &GIS, Lakshmi Publications, 2014.
2. Narayana.L.R.A, Remote sensing and its applications, University Press (India)Ltd., 2011.

Reference Books

1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman. (2004). Remote Sensing and Image Interpretation. V Edn. John Willey and Sons (P) Ltd., 2013.

2. Ghosh.S.K., Chandra.A.M, Remote Sensing & Geographical Information System, Narosa Publishing House, 2006.
3. Kali Charan Sahu, A Text Book of Remote Sensing & Geographical Information Systems, Atlantic Publishers, 2008.
4. Anji Reddy.M., Textbook of Remote Sensing and Geographical Information System,. BS Publications, 2014.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH05	**GEOTECHNICAL PROCESSES AND APPLICATION**	4	0	0	4	40	60	100

Objective (s)	• *To understand the field compaction and equipments.* • *To understand the design of dewatering system and sand drains.* • *To understand the types of grouting and grouting equipments.* • *To understand the different soil reinforcement and chemical Stabilization methods for soil improvement.* • *To understand the design and practical applications of Geo synthetic materials*.

Module – I	**Compaction and Modification**	Total Hours : 12

Introduction: Need – methods – suitability – Mechanical modification: principle - Surface compaction: Field compaction and equipments, compaction specification and controls. Vibration methods: dynamic consolidation, vibratory rollers, Vibro floatation.

Module – II	**Drainage Methods**	Total Hours : 12

Drainage methods: Well point systems, deep well drainage, vacuum dewatering system, design of dewatering system – field permeability tests, dewatering by electro osmosis. Preloading, sand drains, wick drains- Thermal methods case studies.

Module – III	**Grouting**	Total Hours : 12

Grouting: Classification – Methods – Types – grouts – equipments, grouting design and layout, grout monitoring – applications – Case studies.

Module – IV	**Stabilization**	Total Hours : 12

Stabilization: cement stabilization, Lime stabilisation – chemical stabilistion - methods, principles, applications and field control. Stabilization using reinforcement – rock anchorsoil tie backs.

Module – V	**Geo synthesis**	Total Hours : 12

Geo synthetics: Geotextiles, Geogrids, Geomembranes, Geonets, Geomats, Geomeshes, principles Design and applications – Case studies

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome	1. Able to understand the field compaction and equipments. 2. Able to understand the design of dewatering system and sand drains. 3. Able to understand the types of grouting and grouting equipments. 4. Able to understand the different soil reinforcement and chemical Stabilization methods for soil improvement. 5. Able to understand the design and practical applications of Geo synthetic materials.

Reference Books

1. Purushothama raj. P. Ground improvement techniques, Laxmi Publications (P) Ltd, India, 2007
2. Hausmann. M.R. Engineering principles of Ground Modification, McGraw-Hill, 2009
3. Koerner, R.M., Construction & Geotechnical methods in foundation engineering, MGH, New York,1985
4. Jones.C.J.F.P., Earth reinforcement and soil structures, Butter worth &co., London,1985
5. Sivakumar babu. G.I., Introduction to Soil Reinforcement & Geosynthetics, Universities Press Ltd., 2013

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH06	**DESIGN AND CONSTRUCTION OF PREFABRICATED STRUCTURES**	4	0	0	4	40	60	100

Objective (s)

- *To familiarize the design of basic elements in precast construction.*
- *To familiarize the students with various prefabrication construction techniques adopted in practice.*
- *To learn the design and construction methods for precast concrete floors and beams.*
- *To understand the fabrication and installation of precast concrete columns and their connections.*
- *To explore the application and benefits of prefabricated structures in construction projects.*

Module -I **Materials in Precast Structures** Total Hours : 12

Materials, admixtures, pigments - Modular co-ordination, standardization and tolerances-system of pre-fabrication. Pre-cast concrete manufacturing techniques, Moulds –construction design, maintenance and repair.

Module -II **Precast Construction Techniques** Total Hours : 12

Pre-casting techniques - Planning, analysis and design considerations - Handling techniques - Transportation Storage and erection of structures. Curing techniques including accelerated curing such as steam curing, hot air blowing, etc

Module -III **Precast concrete floors and beams** Total Hours : 12

Simplified frame analysis, Precast concrete flooring options, flooring arrangements, structural design of individual units, design of composite floors, Composite and non-composite reinforced beams

Module -IV **Precast concrete columns and connections** Total Hours : 12

Precast concrete columns and their design. Basic mechanism of joints and connections, compression joints, shear joints, tension joints. Connections-pin jointed and moment resisting connections.

Module -V **Application of Prefabricated structures** Total Hours : 12

Pre-cast and pre-fabricating technology for low cost and mass housing schemes. Small pre-cast products like door frames, shutters, Ferro-cement in housing - Water tank service core unit.

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome

1. Student should able to design precast elements.
2. To be able to execute the construction sequence in a project with precast elements.
3. Students will be able to design and construct precast concrete floors and beams
4. Students will be adept at handling precast concrete columns and their connections in structural design.
5. To understand how to implement prefabricated structures to enhance construction efficiency and quality.

Text Books

1. Levitt. M., Precast concrete - Materials, Manufacture Properties and Usage, Applied Science Publs. 2007,
2. Konex.T., Handbook of Pre-cast Construction, Vol..1.2&3.
3. Kim S Elliott, Precast Concrete Structures, Butterworth Heinemann Publishers, 2002.

Reference Books

1. Richardson,J.G., Pre-cast concrete Production, Cement and Concrete Association, London, 1973.
2. Madhava Rao.A-G., Modern Trends in Housing in Developing Countries, Oxford & UBH Publishing co., 1985. -
3. Lewicki.B., Building with Large Pre-fabrications, Elsevier Publishers

Course code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH07	**FORMWORK FOR CONCRETE STRUCTURES**	4	0	0	4	40	60	100

Objective (s)	• To learn about the different materials used in formwork and the principles behind their design. • To explore the design and application of formwork specific to footings, walls, and columns. • To understand the methods and considerations in designing formwork for slabs and beams. • To investigate the unique formwork requirements for special structures such as bridges or tunnels. • To study the role and design of supports and scaffolding in formwork construction.

Module -I **Formwork materials and design concepts** Total Hours : 12

Introduction, requirements, selection and classification of formworks. Formwork materials – Timber, Plywood, Plastic, steel and other materials. Form coatings and linings.

Design Concepts-Loads on formwork- estimation of permissible stresses. Maximum Bending Moment, Shear Force, and Deflection

Module -II **Forms for footings, walls and columns** Total Hours : 12

Conventional Formwork for Foundation, Conventional Wall Formwork, Design illustrations.

Conventional Column Formwork, Modular Column Formwork System, Disposable Column Formwork, All Metal Column Formwork, Achieving Formwork Economy in Column Construction, Design illustration for Column Form

Module -III **Slab and Beam Formwork** Total Hours : 12

Traditional Slab and Beam Formwork, Various Slab and Beam Formwork Solutions Offered, Achieving Economy in Slab Construction, Design of Slab and Beam Formwork, Illustration of Slab and Beam Formwork Design

Module -IV **Formwork for special structures** Total Hours : 12

Formwork for Shells, Domes, Overhead Water Tanks, Tunnel, Bridge formwork and flying formwork, Advantages and Limitations of Flying Forms, Slip forms Form failures-causes, Avoiding Formwork Failure

Module -V **Formwork Supports and Scaffold** Total Hours : 12

Shores/Props and Drop heads, Multi-Legged Shoring Towers, Design of Vertical Supports for Formwork, Classification of Scaffolds, Timber Scaffolds and Metal Scaffolds

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome	1. To identify and select appropriate materials for formwork, understanding the principles that guide their design. 2. To design and implement formwork for footings, walls, and columns in construction projects. 3. Students will gain practical knowledge in creating effective formwork for slabs and beams, ensuring structural integrity. 4. To design and adapt formwork for complex and specialized structures, meeting unique project requirements. 5. Students will understand and apply proper formwork support and scaffolding techniques, ensuring safety and stability in construction.

Text Books

1. K. N.Jha, "Formwork for Concrete Structures" Mc Graw Hill Education Pvt Ltd, New Delhi, 2012

Reference Books

1. Robert L Peurifoy and G D Oberlender, "Formwork for Concrete Structures" Mc Graw Hill, New York, 1995

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH08	**COASTAL ENGINEERING**	4	0	0	4	40	60	100

Objective (s)

- *To introduce the various components in Harbour and offshore structures.*
- *Introduce to the students, planning and design principles of various components in Docks and harbours.*
- *Design and evaluate various harbour structures to ensure their stability and functionality.*
- *To develop an idea about types off offshore structures forces on offshore structures design concepts and foundation for offshore structures*
- *Develop skills in the construction techniques and methods used for building offshore structures.*

Module – I **Growth of Ports** Total Hours: 12

History of Port – Classification of Harbours - Factors affecting the growth of Port. Requirement of a Harbour - General Planning - Site investigation. Description of selected Indian ports.

Module – II **Harbour Planning (Technical):** Total Hours: 12

Harbour entrance - Navigational Channel – Depth of harbour – Turning basin – berthing area – Shipping terminal facilities – Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals. Navigational aids – Light house.

Module – III **Harbour Structures** Total Hours: 12

Break waters: Types – Selection – Forces and – Design principles of break waters. Berthing structures: Types – Loads – Selection and design principles of berthing structures –Selection and Design principles of Dock fenders and Mooring accessories. Types of dock structures, Dredging.

Module – VI **Offshore Structure** Total Hours: 12

Types of offshore structures – selection – function - Physical, environmental and geotechnical aspects of marine and offshore construction – Loads and responses of offshore structures.

Module – V **Construction of Offshore Structures** Total Hours: 12

Foundations for offshore structures – Introduction to design and installation of offshore piled platforms, concrete offshore platforms, Moored floating structures and Submarine pipelines.

Lecture Periods: 60 Tutorial Periods:- Practical Periods:- Total Periods: 60

Course Outcome

1. To demonstrate knowledge of the growth dynamics and economic impact of ports.
2. To create effective harbour plans using technical principles to meet operational requirements.
3. To design and assess harbour structures for performance and durability.
4. To apply principles of offshore structure design to address engineering challenges.
5. To execute construction techniques for offshore structures with a focus on practical application and safety.

Text Books

1. Narasimhan & S. kathiroli, Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol – II, NIOT- Chennai
2. Chakrabarti.,S.K., Hand Book of Offshore Engineering (Vols. 1 & 2)" Elsevier Publications

Reference Books

1. Gerwick, C., Construction of Marine and Offshore structures, CRC Press.
2. Alonzo Def. Quinn., Design and construction of Port and Marine structures McGraw Hill Book co.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH09	**ADVANCED STRUCTURAL ANALYSIS**	4	0	0	4	40	60	100

Objective (s)

- *To understand flexibility and stiffness matrices for each element.*
- *To understand flexibility and stiffness method for degree of redundancy 3 for continuous beams.*
- *To understand settlements for rigid joint frames using flexibility and stiffness method.*
- *To understand flexibility and stiffness method for pin jointed frames with degree of redundancy.*
- *To understand solution techniques.*

Module – I **Strain Energy Methods** Total Hours: 12

Degree of redundancy- Flexibility and stiffness characteristics of structures- Flexibility and stiffness matrices, and their relationship -Element and global stiffness matrices- Transformation matrices

Module – II **Analysis of continuous beams** Total Hours: 12

Analysis of continuous beams (with redundancy restricted to three) by flexibility and stiffness method- support settlement- comparison of methods. Transfer Beam Analysis

Module – III **Analysis of rigid jointed frames** Total Hours: 12

Analysis of rigid jointed plane frames (with redundancy restricted to three) by flexibility and stiffness method- support settlement- choice of methods

Module – VI **Analysis of pin jointed frames** Total Hours: 12

Analysis of pin jointed plane frames (with redundancy restricted to three) by flexibility and stiffness method- lack of fit and temperature stress- choice of methods

Module – V **Solution Techniques** Total Hours: 12

Assembly of structure stiffness matrix – Bandedness – Bandwidth calculation – Solvers – Band width solvers – Triangulation, Condensation Techniques.

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome

1. Able to apply flexibility and stiffness matrices for each element.
2. Able to find flexibility and stiffness method for degree of redundancy 3 for continuous beams.
3. Able to find settlements for rigid joint frames using flexibility and stiffness method.
4. Able to find flexibility and stiffness method for pin jointed frames with degree of redundancy.
5. Able to find solution techniques.

Text Books/ Reference Books

1. Natarajan, C and Revathi, P, Matrix methods of structural analysis-Theory and problems, PHI learning Pvt Ltd., New Delhi 2014.
2. Pandit, G.S. and Gupta S.P., "Structural Analysis- A matrix approach", Tata McGraw Hill Publishing, New Delhi 2014.
3. Devdas Menon, Advanced Structural Analysis, Narosa Publishing House,2012
4. Willium Weaver and James M Gere Matrix Analysis of Framed Structure, Van Nostrand Reinhold Company; 2nd edition.

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	IA	UE	Total
CEH10	**ADVANCED STEEL DESIGN**	4	0	0	4	40	60	100

Objective (s)

- *To understand the behavior of beam column joint and to know the design procedure*
- *To calculate the wind loads and design of industrial steel structures such as trusses, gantry girders, and columns.*
- *To make load calculation and combinations of load and its effects on structures like Chimney and Towers*
- *To understand the behavior of bridges under various loads and can design the bridges to withstand the loads*
- *Students are exposed to various steel section, techniques, and the latest software for analysis and design of steel structures*

Module – I **Design of Beam-Columns** Total Hours: 12

Behavior – torsional buckling in beam-columns- interaction under biaxial loading- design of beam-columns – design of eccentrically loaded base plates.

Module – II **Industrial Structures** Total Hours: 12

Loads – wind load calculations - design of Trusses, Design of gantry girders, and gantry girder columns, design of inclined columns.

Module – III **Chimneys &Towers** Total Hours: 12

Chimneys: loading and load combinations – design and stability considerations – design of base and foundations for chimneys. Towers: Analysis and design of lattice towerstransmission line towers- configurations- types-loads and load combinations- temperature effect-design principles

Module – VI **Bridges** Total Hours: 12

Design of Plate girder bridges – influence line diagram - IRC guidelines- effect of wind. Design of truss girder bridges- types of bearings and design of bearings.

Module – V **Cold Formed Sections** Total Hours: 12

Design in light gauge steel sections. Pre-Engineered Buildings: Advantages – design principles. Introduction to various software for design of steel structures.

Lecture Periods: 60 **Tutorial Periods:-** **Practical Periods:-** **Total Periods: 60**

Course Outcome

1. Able to understand the behavior of beam column joint and to know the design procedure
2. Able to calculate the wind loads and design of industrial steel structures such as trusses, gantry girders, and columns.
3. Able to make load calculation and combinations of load and its effects on structures like Chimney and Towers
4. Able to understand the behavior of bridges under various loads and can design the bridges to withstand the loads
5. Students are exposed to various steel section, techniques, and the latest software for analysis and design of steel structures

Text Books/ Reference Books

1.Shiyekar, M.R., Limit State Design in Structural Steel, Second Edition, PHI Learning Private Ltd., Delhi, 2013.
2. Shah, V.L., and Veena Gore, Limit State Design of Steel Structures, Structures Publications, Pune, 2012.
3. Subramanian, P., Design of steel structures, Oxford Publishers, New Delhi, 2007
4. Bhavikatti, S.S., Design of Steel Structures, IK International Publishing House Pvt Ltd, New Delhi, 2014.
5. Sai Ram K.S., Design of Steel Structures, Pearson Education Ltd., 2013.
6. Virendra Gehlot, Ram Chandra, Design of steel structures, Vol .I & II, Standard Publishers, 2012
9. IS: 800- 2007, General Construction in Steel-Code of Practice, Bureau of Indian Standards, New Delhi
7. IS: 6533(Part 1&II): Code of Practice for Design and Construction of steel Chimneys Bureau of Indian Standards, New Delhi

8. IS :802 -1995 Use of Structural steel in overhead transmission line towers- code of practice, Bureau of Indian Standards, New Delhi
9. IRC:24-2001 Standard Specifications and Code of Practice for Road Bridges, Section V, Indian Roads Congress, 2001
10. IS: 811-1987, Specification for Cold formed Light Gauge Structural Steel Sections, Bureau of Indian Standards, New Delhi