

KONGU ENGINEERING COLLEGE

(Autonomous Institution Affiliated to Anna University, Chennai)

PERUNDURAI ERODE – 638 060

TAMILNADU INDIA



Estd : 1984

REGULATIONS, CURRICULUM & SYLLABI – 2022

**(CHOICE BASED CREDIT SYSTEM AND
OUTCOME BASED EDUCATION)**

(For the students admitted during 2022 - 2023 and onwards)

BACHELOR OF ENGINEERING IN CIVIL ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING



KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638060

(Autonomous)

REGULATIONS 2022

CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION

BACHELOR OF ENGINEERING (BE) / BACHELOR OF TECHNOLOGY (BTech) DEGREE PROGRAMMES

These regulations are applicable to all candidates admitted into BE/BTech Degree programmes from the academic year 2022 – 2023 onwards.

1. DEFINITIONS AND NOMENCLATURE

In these Regulations, unless otherwise specified:

- i. “University” means ANNA UNIVERSITY, Chennai.
- ii. “College” means KONGU ENGINEERING COLLEGE.
- iii. “Programme” means Bachelor of Engineering (BE) / Bachelor of Technology (BTech) Degree programme
- iv. “Branch” means specialization or discipline of BE/BTech Degree programme, like Civil Engineering, Information Technology, etc.
- v. “Course” means a Theory / Theory cum Practical / Practical course that is normally studied in a semester like Mathematics, Physics etc.
- vi. “Credit” means a numerical value allocated to each course to describe the candidate’s workload required per week.
- vii. “Grade” means the letter grade assigned to each course based on the marks range specified.
- viii. “Grade point” means a numerical value (0 to 10) allocated based on the grade assigned to each course.
- ix. “Principal” means Chairman, Academic Council of the College.
- x. “Controller of Examinations (COE)” means authorized person who is responsible for all examination related activities of the College.
- xi. “Head of the Department (HOD)” means Head of the Department concerned.

2. PROGRAMMES AND BRANCHES OF STUDY

The following programmes and branches of study approved by Anna University, Chennai and All India Council for Technical Education, New Delhi are offered by the College.

Programme	Branch
BE	Civil Engineering
	Mechanical Engineering
	Electronics and Communication Engineering
	Computer Science and Engineering
	Electrical and Electronics Engineering
	Electronics and Instrumentation Engineering
	Mechatronics Engineering
	Automobile Engineering
	Computer Science and Design
BTech	Chemical Engineering
	Information Technology
	Food Technology
	Artificial Intelligence and Data Science
	Artificial Intelligence and Machine Learning

3. ADMISSION REQUIREMENTS

3.1 First Semester Admission

The candidates seeking admission to the first semester of the eight semester BE / BTech Degree Programme:

Should have passed the Higher Secondary Examination (10 + 2) in the academic stream with Mathematics, Physics and Chemistry as three of the four subjects of study under Part-III subjects of the study conducted by the Government of Tamil Nadu or any examination of any other University or authority accepted by the Anna University, Chennai as equivalent thereto.

(OR)

Should have passed the Higher Secondary Examination of Vocational stream (Vocational groups in Engineering / Technology) as prescribed by the Government of Tamil Nadu.

They should also satisfy other eligibility conditions as prescribed by the Anna University, Chennai and Directorate of Technical Education, Chennai from time to time.

3.2 Lateral Entry Admission

The candidates who hold a Diploma in Engineering / Technology awarded by the State Board of Technical Education, Tamilnadu or its equivalent are eligible to apply for Lateral entry admission to the third semester of BE / BTech.

(OR)

The candidates who hold a BSc degree in Science(10+2+3 stream) with mathematics as one of the subjects at the BSc level from a recognised University are eligible to apply for Lateral entry admission to the third semester of BE / BTech. Such candidates shall undergo two additional Engineering course(s) in the third and fourth semesters as prescribed by the College.

They should also satisfy other eligibility conditions prescribed by the Anna University, Chennai and Directorate of Technical Education, Chennai from time to time.

4. STRUCTURE OF PROGRAMMES

4.1 Categorisation of Courses

The BE / BTech programme shall have a curriculum with syllabi comprising of theory, theory cum practical, practical courses in each semester, professional skills training/industrial training, project work, internship, etc that have been approved by the respective Board of Studies and Academic Council of the College. All the programmes have well defined Programme Outcomes (PO), Programme Specific Outcomes (PSO) and Programme Educational Objectives (PEOs) as per Outcome Based Education (OBE). The content of each course is designed based on the Course Outcomes (CO). The courses shall be categorized as follows:

- i. Humanities and Social Sciences (HS) including Management Courses, English Communication Skills, Universal Human Values and Yoga & Values for Holistic Development.
- ii. Basic Science (BS) Courses
- iii. Engineering Science (ES) Courses
- iv. Professional Core (PC) Courses
- v. Professional Elective (PE) Courses
- vi. Open Elective (OE) Courses
- vii. Employability Enhancement Courses (EC) like Project work, Professional Skills/Industrial Training, Comprehensive Test & Viva, Entrepreneurships/Start

ups and Internship / In-plant Training in Industry or elsewhere

viii. Audit Courses (AC)

ix. Mandatory Courses (MC) like Student Induction Program and Environmental Science.

x. Honours Degree Courses (HC)

4.2 Credit Assignment and Honours Degree

4.2.1. Credit Assignment

Each course is assigned certain number of credits as follows:

Contact period per week	Credits
1 Lecture / Tutorial Period	1
2 Practical Periods	1
2 Project Work Periods	1
40 Training / Internship Periods	1

The minimum number of credits to complete the BE/BTech programme is 168.

4.2.2 Honours Degree

If a candidate earns 18 to 20 additional credits in an emerging area, then he/she can be awarded with Honours degree mentioning that emerging area as his/her specialization. The respective board of studies shall recommend the specializations for honours degree and appropriate additional courses to be studied by the candidate which shall get approval from Academic Council of the institution. A candidate shall have not less than 8 CGPA and no history of arrears to opt for the honours degree and has to maintain the same during the entire programme.

Various specializations for various branches recommended by the respective boards of studies are given below:

SNo	Specializations for Honours degree in emerging areas	To be offered as Honours, Only for the following branches mentioned against the specialization
1.	Construction Technology	BE – Civil Engineering
2.	Smart Cities	BE – Civil Engineering
3.	Smart Manufacturing *	BE – Mechanical Engineering
4.	Computational Product Design *	BE – Mechanical Engineering
5.	Intelligent Autonomous Systems *	BE – Mechatronics Engineering

6.	E-Mobility *	BE – Automobile Engineering
7.	Artificial Intelligence and Machine Learning	BE – Electronics and Communication Engineering
8.	System on Chip Design *	BE – Electronics and Communication Engineering
9.	Electric Vehicles	BE – Electrical and Electronics Engineering
10.	Microgrid Technologies	BE – Electrical and Electronics Engineering
11.	Intelligent Sensors Technology *	BE – Electronics and Instrumentation Engineering
12.	Smart Industrial Automation *	BE – Electronics and Instrumentation Engineering
13.	Data Science	BE – Computer Science and Engineering
14.	Cyber Security	BE – Computer Science and Engineering
15.	Data Science	BTech – Information Technology
16.	Cyber Security	BTech – Information Technology
17.	Petroleum and Petrochemical Engineering *	BTech – Chemical Engineering
18.	Waste Technology *	BTech – Chemical Engineering
19.	Food Processing and Management *	BTech – Food Technology
20.	Virtual and Augmented Reality	BE- Computer Science and Design
21.	Data Science	BE- Computer Science and Design
22.	Internet of Things (IoT)	BTech – Artificial Intelligence and Data Science
23.	Blockchain	BTech – Artificial Intelligence and Data Science
24.	Internet of Things (IoT)	BTech – Artificial Intelligence and Machine Learning
25.	Blockchain	BTech – Artificial Intelligence and Machine Learning

*Title by KEC

The courses specified under Honours degree in the emerging area may include theory, theory cum practical, practical, project work, etc. under the particular specialization. A candidate can choose and study these specified courses from fourth semester onwards and he/she shall successfully complete the courses within the stipulated time vide clause 5. Total number of credits earned in each semester may vary from candidate to candidate based on the courses chosen. The registration, assessment & evaluation pattern and classification of grades of these courses shall be the same as that of the courses in the regular curriculum of the programme of the candidate vide clause 6, clause 7 and clause 15 respectively. A candidate can earn Honours degree in only one specialization during the entire duration of the programme.

4.3 Employability Enhancement Courses

A candidate shall be offered with the employability enhancement courses like project work, internship, professional skills training/industrial training, comprehensive test & viva, and entrepreneurship/start ups during the programme to gain/exhibit the knowledge/skills.

4.3.1 Professional Skills Training/ Industrial Training/Entrepreneurships/Start Ups/ Internship Training

A candidate may be offered with appropriate training courses imparting programming skills, communication skills, problem solving skills, aptitude skills etc. It is offered in two phases as phase I in fourth semester and phase II in fifth semester including vacation periods and each phase can carry two credits.

(OR)

A candidate may be allowed to go for training at research organizations or industries for a required number of hours in fifth semester vacation period. Such candidate can earn two credits for this training course in place of Professional Skills Training course II in fifth semester. He/She shall attend Professional Skills Training Phase I in fourth semester and can earn two credits.

(OR)

A candidate may be allowed to set up a start up and working part-time for the start ups by applying his/her innovations and can become a student entrepreneur during BE/BTech programme. Candidates can set up their start up from fifth semester onwards either inside or outside of the college. Such student entrepreneurs may earn 2 credits in place of Professional Skills Training II. The area in which the candidate wants to initiate a start up may be interdisciplinary or multidisciplinary. The progress of the startup shall be evaluated by a panel of members constituted by the Principal through periodic reviews.

4.3.2 Comprehensive Test and Viva

The overall knowledge of the candidate in various courses he/she studied shall be evaluated by (i) conducting comprehensive tests with multiple choice questions generally with pattern similar to GATE and/or (ii) viva-voce examination conducted by a panel of experts assigned by the Head of the department. The members can examine the knowledge of the candidate by asking questions from various domains and the marks will be assigned based on their answers. This course shall carry two credits.

4.3.3 Full Time Project through Internships

The curriculum enables a candidate to go for full time project through internship during a part of seventh semester and/or entire final semester and can earn credits vide clause 7.6 and clause 7.11.

A candidate is permitted to go for full time projects through internship in seventh semester with the following condition: The candidate shall complete a part of the seventh semester courses with a total credit of about 50% of the total credits of seventh semester including Project Work-II Phase-I in the first two months from the commencement of the seventh semester under fast track mode. The balance credits required to complete the seventh semester shall be earned by the candidate through either approved One/Two Credit Courses /Online courses / Self Study Courses or Add/Drop courses as per clause 4.4 and clause 4.5 respectively.

A candidate is permitted to go for full time projects through internship during eighth semester. Such candidate shall earn the minimum number of credits required to complete eighth semester other than project through either approved One / Two Credit Courses /Online courses / Self Study Courses or Add/Drop courses as per clause 4.4 and clause 4.5 respectively.

Assessment procedure is to be followed as specified in the guidelines approved by the Academic Council.

- 4.3.4** A student shall go for in-plant training for duration of two weeks during the entire programme. It is mandatory for all the students.

4.4 One / Two Credit Courses / Online Courses / Self Study Courses

The candidates may optionally undergo One / Two Credit Courses / Online Courses / Self Study Courses as elective courses.

- 4.4.1 One / Two Credit Courses:** One / Two credit courses shall be offered by the college with the prior approval from respective Board of Studies. A candidate can earn a maximum of six credits through one / two credit courses during the entire duration of the programme.

- 4.4.2 Online Courses:** Candidates may be permitted to earn credits for online courses, offered by NPTEL / SWAYAM / a University / Other Agencies, approved by respective Board of Studies.

- 4.4.3 Self Study Courses:** The Department may offer an elective course as a self study course. The syllabus of the course shall be approved by the respective Board of Studies. However, mode of assessment for a self study course will be the same as that used for other courses. The candidates shall study such courses on their own under the guidance of member of the faculty following due approval procedure. Self study course is limited to one per semester.
- 4.4.4** The elective courses in the final year may be exempted if a candidate earns the required credits vide clause 4.4.1, 4.4.2 and 4.4.3 by registering the required number of courses in advance.
- 4.4.5** A candidate can earn a maximum of 30 credits through all one / two credit courses, online courses and self study courses.

4.5 Flexibility to Add or Drop Courses

- 4.5.1** A candidate has to earn the total number of credits specified in the curriculum of the respective programme of study in order to be eligible to obtain the degree. However, if the candidate wishes, then the candidate is permitted to earn more than the total number of credits prescribed in the curriculum of the candidate's programme.
- 4.5.2** From the first to seventh semesters the candidates have the option of registering for additional elective/Honours courses or dropping of already registered additional elective/Honours courses within two weeks from the start of the semester. Add / Drop is only an option given to the candidates.
- 4.6** Maximum number of credits the candidate can enroll in a particular semester cannot exceed 30 credits.
- 4.7** The blend of different courses shall be so designed that the candidate at the end of the programme would have been trained not only in his / her relevant professional field but also would have developed to become a socially conscious human being.
- 4.8** The medium of instruction, examinations and project report shall be English.

5. DURATION OF THE PROGRAMME

- 5.1** A candidate is normally expected to complete the BE / BTech Degree programme in 8 consecutive semesters/4 Years (6 semesters/3 Years for lateral entry candidate), but in any case not more than 14 semesters/7 Years (12 semesters/6 Years for lateral entry candidate).
- 5.2** Each semester shall consist of a minimum of 90 working days including continuous assessment test period. The Head of the Department shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus for the course

being taught.

- 5.3** The total duration for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum duration specified in clause 5.1 irrespective of the period of break of study (vide clause 11) or prevention (vide clause 9) in order that the candidate may be eligible for the award of the degree (vide clause 16). Extension beyond the prescribed period shall not be permitted.

6. COURSE REGISTRATION FOR THE EXAMINATION

- 6.1** Registration for the end semester examination is mandatory for courses in the current semester as well as for the arrear courses failing which the candidate will not be permitted to move on to the higher semester. This will not be applicable for the courses which do not have an end semester examination.
- 6.2** The candidates who need to reappear for the courses which have only continuous assessment shall enroll for the same in the subsequent semester, when offered next, and repeat the course. In this case, the candidate shall attend the classes, satisfy the attendance requirements (vide clause 8) and earn continuous assessment marks. This will be considered as an attempt for the purpose of classification.
- 6.3** If a candidate is prevented from writing end semester examination of a course due to lack of attendance, the candidate has to attend the classes, when offered next, and fulfill the attendance requirements as per clause 8 and earn continuous assessment marks. If the course, in which the candidate has a lack of attendance, is an elective, the candidate may register for the same or any other elective course in the subsequent semesters and that will be considered as an attempt for the purpose of classification.
- 6.4** A candidate shall register for the chosen courses as well as arrear courses (if any vide clause 6.2 and 6.3) from the list of courses specified under Honours degree.

7. ASSESSMENT AND EXAMINATION PROCEDURE FOR AWARDING MARKS

- 7.1** The BE/BTech programmes consist of Theory Courses, Theory cum Practical courses, Practical courses, Comprehensive Test and Viva, Project Work, Industrial Training /Professional Skills Training, Internship/In-plant Training and Entrepreneurships/ Start ups. Performance in each course of study shall be evaluated based on (i) Continuous Assessments (CA) throughout the semester and (ii) End Semester Examination (ESE) at the end of the semester except for the courses which are evaluated based on continuous assessment only. Each course shall be evaluated for a maximum of 100 marks as shown below:

Sl. No.	Category of Course	Continuous Assessment Marks	End Semester Examination Marks
1.	Theory	40	60
2.	Theory cum Practical (The distribution of marks shall be decided based on the credit)	50	50
3.	Practical	60	40
4.	Professional Skills Training / Comprehensive Test & Viva / Entrepreneurships / Start ups / Project Work I / Mandatory Course/Industrial Training/ Universal Human Values / Yoga and Values for Holistic Development	100	---
5.	Project Work II Phase I / Project Work II Phase II / Internships	50	50
6.	One / Two credit Course	The distribution of marks shall be decided based on the credit weightage assigned	---
7.	All other Courses		

7.2 Examiners for setting end semester examination question papers for theory courses, theory cum practical courses and practical courses and evaluating end semester examination answer scripts, project works, internships and entrepreneurship/start ups shall be appointed by the Controller of Examinations after obtaining approval from the Principal.

7.3 Theory Courses

For all theory courses out of 100 marks, the continuous assessment shall be 40 marks and the end semester examination shall be for 60 marks. However, the end semester examinations shall be conducted for 100 marks and the marks obtained shall be reduced to 60. The continuous assessment tests shall be conducted as per the schedule laid down in the academic schedule. The total of the continuous assessment marks and the end semester examination marks shall be rounded off to the nearest integer.

- 7.3.1** The assessment pattern for awarding continuous assessment marks shall be as follows:

Sl. No.	Type	Max. Marks	Remarks
1.	Test - I	20	Average of best 2 tests (20 marks)
	Test - II	20	
	Test - III	20	
2.	Tutorial: (Tutorial/Problem Solving (or) Simulation (or) Simulation & Mini Project (or) Mini Project (or) Case Studies (or) Any other relevant to the course)	15	Type of assessment is to be chosen based on the nature of the course and to be approved by Principal
3.	Others: Assignment / Paper Presentation in Conference / Seminar / Comprehension / Activity based learning / Class notes	05	To be assessed by the Course Teacher based on any one type.
Total		40	Rounded off to the one decimal place

However, the assessment pattern for awarding the continuous assessment marks may be changed based on the nature of the course and is to be approved by the Principal.

- 7.3.2** A reassessment test or tutorial covering the respective test or tutorial portions may be conducted for those candidates who were absent with valid reasons (Sports or any other reason approved by the Principal).

- 7.3.3** The end semester examination for theory courses shall be for a duration of three hours and shall be conducted between November and January during odd semesters and between April and June during even semesters of every year.

7.4 Theory cum Practical Courses

For courses involving theory and practical components, the evaluation pattern as per the clause 7.1 shall be followed. Depending on the nature of the course, the end semester examination shall be conducted for theory and the practical components. The apportionment of continuous assessment and end semester examination marks shall be decided based on the credit weightage assigned to theory and practical components approved by Principal.

7.5 Practical Courses

For all practical courses out of 100 marks, the continuous assessment shall be for 60 marks and the end semester examination shall be for 40 marks. Every exercise / experiment shall be evaluated based on the candidate's performance during the practical class and the candidates' records shall be maintained.

- 7.5.1** The assessment pattern for awarding continuous assessment marks for each course shall be decided by the course coordinator based on rubrics of that particular course, and shall be based on rubrics for each experiment.
- 7.5.2** The end semester examination shall be conducted for a maximum of 100 marks for duration of 3 hours and reduced to 40 marks. The appointment of examiners and the schedule shall be decided by chairman of Board of Study of the relevant board.

7.6 Project Work II Phase I / Project Work II Phase II

- 7.6.1** Project work shall be assigned to a single candidate or to a group of candidates not exceeding 4 candidates in a group. The project work is mandatory for all the candidates.
- 7.6.2** The Head of the Department shall constitute review committee for project work. There shall be two assessments by the review committee during the semester. The candidate shall make presentation on the progress made by him/her before the committee.

7.6.3 The continuous assessment and end semester examination marks for Project Work II Phase I /Project Work II Phase II and the Viva-Voce Examination shall be distributed as below.

Continuous Assessment (Max. 50 Marks)						End Semester Examination (Max. 50 Marks)			
Zeroth Review		Review I (Max.. 20 Marks)		Review II Max. 30 Marks)		Report Evaluation (Max. 20 Marks)	Viva - Voce Max. 30 Marks)		
Rv. Co m	Sup er visor	Review Commit tee (excludi ng supervi sor)	Sup ervi sor	Review Committ ee (excludi ng supervis or)	Sup er visor	Ext. Exr.	Sup er viso r	Exr. 1	Exr. 2
0	0	10	10	15	15	20	10	10	10

7.6.4 The Project Report prepared according to approved guidelines and duly signed by the Supervisor shall be submitted to Head of the Department. The candidate(s) must submit the project report within the specified date as per the academic schedule of the semester. If the project report is not submitted within the specified date then the candidate is deemed to have failed in the Project Work and redo it in the subsequent semester.

7.6.5 If a candidate fails to secure 50% of the continuous assessment marks in the project work, he / she shall not be permitted to submit the report for that particular semester and shall have to redo it in the subsequent semester and satisfy attendance requirements.

7.6.6 The end semester examination of the project work shall be evaluated based on the project report submitted by the candidate in the respective semester and viva-voce examination by a committee consisting of two examiners and supervisor of the project work.

7.6.7 If a candidate fails to secure 50 % of the end semester examination marks in the project work, he / she shall be required to resubmit the project report within 30 days from the date of declaration of the results and a fresh viva-voce examination shall be conducted as per clause 7.6.6.

7.6.8 A copy of the approved project report after the successful completion of viva-voce examination shall be kept in the department library.

7.7 Project Work I / Industrial Training

The evaluation method shall be same as that of the Project Work II as per clause 7.6 excluding 7.6.3, 7.6.5, 7.6.6 and 7.6.7. The marks distribution is given below.

Continuous Assessment (Max. 100 Marks)								
Zeroth Review		Review I (Max. 20 Marks)		Review II (Max. 30 Marks)		Review III (Max. 50 Marks)		
		Report Evaluation (Max. 20 Marks)	Viva - Voce (Max. 30 Marks)					
Review Committee	Supervisor	Review Committee (excluding supervisor)	Supervisor	Review Committee (excluding supervisor)	Supervisor	Review Committee	Supervisor	Review Committee
0	0	10	10	15	15	20	10	20

If a candidate fails to secure 50 % of the continuous assessment marks in this course, he / she shall be required to resubmit the project report within 30 days from the date of declaration of the results and a fresh viva-voce examination shall be conducted.

7.8 Professional Skills Training

Phase I training shall be conducted for minimum of 80 hours in 3rd semester vacation and during 4th semester. Phase II training shall be conducted for minimum of 80 hours in 4th semester vacation and during 5th semester. The evaluation procedure shall be approved by the board of the offering department and Principal.

7.9 Comprehensive Test and Viva

A candidate can earn 2 credits by successfully completing this course. The evaluation procedures shall be approved by the Principal.

7.10 Entrepreneurships/ Start ups

A start up/business model may be started by a candidate individually or by a group of maximum of three candidates during the programme vide clause 4.3.1. The head of the department concerned shall assign a faculty member as a mentor for each start up.

A review committee shall be formed by the Principal for reviewing the progress of the Start ups / Business models, innovativeness, etc. The review committee can recommend the appropriate grades for academic performance for the candidate(s) involved in the start ups. This course shall carry a maximum of two credits in fifth semester and shall be evaluated through continuous assessments for a maximum of 100 marks vide clause 7.1. A report about the start ups is to be submitted to the review committee for evaluation for each start up and the marks will be given to Controller of Examinations after getting approval from Principal.

7.11 In-Plant Training

Each candidate shall go for In-Plant training for a duration of minimum of two weeks during the entire programme of study and submit a brief report about the training ~~undertaken and a certificate issued from the organization concerned~~.

7.12 One / Two Credit Courses

For all one/ two credit courses out of 100 marks, the continuous assessment shall be 50 marks and the model examination shall be for 50 marks. Minimum of two continuous assessments tests shall be conducted during the one / two credit course duration by the offering department concerned. Model examination shall be conducted at the end of the course.

7.13 Online Course

The Board of Studies will provide methodology for the evaluation of the online courses. The Board can decide whether to evaluate the online courses through continuous assessment and end semester examination or through end semester examination only. In case of credits earned through online mode from NPTEL / SWAYAM / a University / Other Agencies approved by Chairman, Academic Council, the credits may be transferred and grades shall be assigned accordingly.

7.14 Self Study Course

The member of faculty approved by the Head of the Department shall be responsible for periodic monitoring and evaluation of the course. The course shall be evaluated through continuous assessment and end semester examination. The evaluation methodology shall be the same as that of a theory course.

7.15 Audit Course

A candidate may be permitted to register for specific course not listed in his/her programme curriculum and without undergoing the rigors of getting a 'good' grade, as an Audit course, subject to the following conditions.

The candidate can register only one Audit course in a semester starting from second semester subject to a maximum of two courses during the entire programme of study. Such courses shall be indicated as 'Audit' during the time of registration itself.

Only courses currently offered for credit to the candidates of other branches can be audited.

A course appearing in the curriculum of a candidate cannot be considered as an audit course. However, if a candidate has already met the Professional Elective and Open Elective credit requirements as stipulated in the curriculum, then, a Professional Elective or an Open Elective course listed in the curriculum and not taken by the candidate for credit can be considered as an audit course.

Candidates registering for an audit course shall meet all the assessment and examination requirements (vide clause 7.3) applicable for a credit candidate of that course. Only if the candidate obtains a performance grade, the course will be listed in the semester Grade Sheet and in the Consolidated Grade Sheet along with the grade SC (Successfully Completed). Performance grade will not be shown for the audit course.

Since an audit course has no grade points assigned, it will not be counted for the purpose of GPA and CGPA calculations.

7.16 Mandatory Courses

A candidate joined in first semester shall attend and complete a mandatory course namely Student Induction Program of duration three weeks at the beginning of first semester. The candidates studying in second year shall attend and complete another one mandatory course namely Environmental Science. No credits shall be given for mandatory courses and shall be evaluated through continuous assessment tests only vide clause 7.1 for a maximum of 100 marks each. Upon the successful completion, these courses will be listed in the semester grade sheet and in the consolidated grade sheet with the grade "SC" (Successfully Completed). Since no grade points are assigned, these courses will not be counted for the purpose of GPA and CGPA calculations.

7.17 Universal Human Values (UHV) and Yoga and Values for Holistic Development (YVHD)

Courses YVHD shall be offered to all first year candidates of all BE/ BTech programmes to impart knowledge on yoga and human values. Course UHV shall be offered to all the second year BE/ BTech students. These courses shall carry a maximum of 100 marks each and shall be evaluated through continuous assessment tests only vide clause 7.1. The candidate(s) can earn 2 credits for UHV and 1 credit for YVHD by successfully completing these courses. Two continuous assessment tests will be conducted and the average marks will be taken for the calculation of grades.

8. REQUIREMENTS FOR COMPLETION OF A SEMESTER

- 8.1** A candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester and permitted to appear for the examinations of that semester

- 8.1.1** Ideally, every candidate is expected to attend all classes and secure 100 % attendance. However, a candidate shall secure not less than 80 % (after rounding off to the nearest integer) of the overall attendance taking into account the total number of working days in a semester.
- 8.1.2** A candidate who could not satisfy the attendance requirements as per clause 8.1.1 due to medical reasons (hospitalization / accident / specific illness) but has secured not less than 70 % in the current semester may be permitted to appear for the current semester examinations with the approval of the Principal on payment of a condonation fee as may be fixed by the authorities from time to time. The medical certificate needs to be submitted along with the leave application. A candidate can avail this provision only twice during the entire duration of the degree programme.
- A candidate who could not satisfy the attendance requirements as per clause 8.1.1 due to his/her entrepreneurship/ start ups activities, but has secured not less than 60 % in the current semester can be permitted to appear for the current semester examinations with the recommendation of review committee and approval from the Principal.
- 8.1.3** In addition to clause 8.1.1 or 8.1.2, a candidate shall secure not less than 60 % attendance in each course.
- 8.1.4** A candidate shall be deemed to have completed the requirements of study of any semester only if he/she has satisfied the attendance requirements (vide clause 8.1.1 to 8.1.3) and has registered for examination by paying the prescribed fee.
- 8.1.5** Candidate's progress is satisfactory.
- 8.1.6** Candidate's conduct is satisfactory and he/she was not involved in any indisciplined activities in the current semester.
- 8.2.** The candidates who do not complete the semester as per clauses from 8.1.1 to 8.1.6 except 8.1.3 shall not be permitted to appear for the examinations at the end of the semester and not be permitted to go to the next semester. They have to repeat the incomplete semester in next academic year.
- 8.3** The candidates who satisfy the clause 8.1.1 or 8.1.2 but do not complete the course as per clause 8.1.3 shall not be permitted to appear for the end semester examination of that course alone. They have to repeat the incomplete course in the subsequent semester when it is offered next.

9. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATION

- 9.1** A candidate shall normally be permitted to appear for end semester examination of the current semester if he/she has satisfied the semester completion requirements as per clause 8, and has registered for examination in all courses of that semester. Registration is mandatory for current semester examinations as well as for arrear examinations failing which the candidate shall not be permitted to move on to the higher semester.

- 9.2** When a candidate is deputed for a National / International Sports event during End Semester examination period, supplementary examination shall be conducted for such a candidate on return after participating in the event within a reasonable period of time. Such appearance shall be considered as first appearance.
- 9.3** A candidate who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of letter grades / marks.

10. PROVISION FOR WITHDRAWAL FROM EXAMINATIONS

- 10.1** A candidate may, for valid reasons, be granted permission to withdraw from appearing for the examination in any regular course or all regular courses registered in a particular semester. Application for withdrawal is permitted only once during the entire duration of the degree programme.
- 10.2** The withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination (vide clause 9) and has applied to the Principal for permission prior to the last examination of that semester after duly recommended by the Head of the Department.
- 10.3** The withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for First Class with Distinction/First Class.
- 10.4** If a candidate withdraws a course or courses from writing end semester examinations, he/she shall register the same in the subsequent semester and write the end semester examinations. A final semester candidate who has withdrawn shall be permitted to appear for supplementary examination to be conducted within reasonable time as per clause 14.
- 10.5** The final semester candidate who has withdrawn from appearing for project viva-voce for genuine reasons shall be permitted to appear for supplementary viva-voce examination within reasonable time with proper application to Controller of Examinations and on payment of prescribed fee.

11. PROVISION FOR BREAK OF STUDY

- 11.1** A candidate is normally permitted to avail the authorised break of study under valid reasons (such as accident or hospitalization due to prolonged ill health or any other valid reasons) and to rejoin the programme in a later semester. He/She shall apply in advance to the Principal, through the Head of the Department, stating the reasons therefore, in any case, not later than the last date for registering for that semester examination. A candidate is permitted to avail the authorised break of study only once during the entire period of study for a maximum period of one year. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for the break of study.

- 11.2** The candidates permitted to rejoin the programme after break of study / prevention due to lack of attendance shall be governed by the rules and regulations in force at the time of rejoining.
- 11.3** The candidates rejoining in new Regulations shall apply to the Principal in the prescribed format through Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.
- 11.4** The total period of completion of the programme reckoned from the commencement of the semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5 irrespective of the period of break of study in order to qualify for the award of the degree.
- 11.5** If any candidate is prevented for want of required attendance, the period of prevention shall not be considered as authorized break of study.
- 11.6** If a candidate has not reported to the college for a period of two consecutive semesters without any intimation, the name of the candidate shall be deleted permanently from the college enrollment. Such candidates are not entitled to seek readmission under any circumstances.

12. PASSING REQUIREMENTS

- 12.1** A candidate who secures not less than 50 % of total marks (continuous assessment and end semester examination put together) prescribed for the course with a minimum of 45 % of the marks prescribed for the end semester examination in all category of courses vide clause 7.1 except for the courses which are evaluated based on continuous assessment only shall be declared to have successfully passed the course in the examination.
- 12.2** A candidate who secures not less than 50 % in continuous assessment marks prescribed for the courses which are evaluated based on continuous assessment only shall be declared to have successfully passed the course. If a candidate secures less than 50% in the continuous assessment marks, he / she shall have to re-enroll for the same in the subsequent semester and satisfy the attendance requirements.
- 12.3** For a candidate who does not satisfy the clause 12.1, the continuous assessment marks secured by the candidate in the first attempt shall be retained and considered valid for subsequent attempts. However, from the fourth attempt onwards the marks scored in the end semester examinations alone shall be considered, in which case the candidate shall secure minimum 50 % marks in the end semester examinations to satisfy the passing requirements.

13. REVALUATION OF ANSWER SCRIPTS

A candidate shall apply for a photocopy of his / her semester examination answer script within a reasonable time from the declaration of results, on payment of a prescribed fee by submitting the proper application to the Controller of Examinations. The answer script shall be pursued and justified jointly by a faculty member who has handled the course and the course coordinator and recommended for revaluation. Based on the recommendation, the candidate can register for revaluation through proper application to the Controller of Examinations. The Controller of Examinations will arrange for revaluation and the results will be intimated to the candidate concerned. Revaluation is permitted only for Theory courses and Theory cum Practical courses where end semester examination is involved.

14. SUPPLEMENTARY EXAMINATION

If a candidate fails to clear all courses in the final semester after the announcement of final end semester examination results, he/she shall be allowed to take up supplementary examinations to be conducted within a reasonable time for the courses of final semester alone, so that he/she gets a chance to complete the programme.

15. AWARD OF LETTER GRADES:

For all the passed candidates, the relative grading principle is applied to assign the letter grades.

Marks / Examination Status	Letter Grade	Grade Point
Based on the relative grading	O (Outstanding)	10
	A+ (Excellent)	9
	A (Very Good)	8
	B+ (Good)	7
	B (Average)	6
	C (Satisfactory)	5
Less than 50	U (Reappearance)	0
Successfully Completed	SC	0
Withdrawal	W	-
Absent	AB	-
Shortage of Attendance in a course	SA	-

The Grade Point Average (GPA) is calculated using the formula:

$$\text{GPA} = \frac{\sum[(\text{course credits}) \times (\text{grade points})]}{\sum(\text{course credits})} \text{ for all courses in the specific semester}$$

The Cumulative Grade Point Average (CGPA) is calculated from first semester (third semester for lateral entry candidates) to final semester using the formula

$$\text{CGPA} = \frac{\sum[(\text{course credits}) \times (\text{grade points})] \text{ for all courses in all the semesters so far}}{\sum(\text{course credits}) \text{ for all courses in all the semesters so far}}$$

The GPA and CGPA are computed only for the candidates with a pass in all the courses.

The GPA and CGPA indicate the academic performance of a candidate at the end of a semester and at the end of successive semesters respectively.

A grade sheet for each semester shall be issued containing Grade obtained in each course, GPA and CGPA.

A duplicate copy, if required can be obtained on payment of a prescribed fee and satisfying other procedure requirements.

Withholding of Grades: The grades of a candidate may be withheld if he/she has not cleared his/her dues or if there is a disciplinary case pending against him/her or for any other reason.

16. ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall be declared to be eligible for the award of the BE / BTech Degree provided the candidate has

- i. Successfully completed all the courses under the different categories, as specified in the regulations.
- ii. Successfully gained the required number of total credits as specified in the curriculum corresponding to the candidate's programme within the stipulated time (vide clause 5).
- iii. Successfully passed any additional courses prescribed by the respective Board of Studies whenever readmitted under regulations other than R-2022 (vide clause 11.3)
- iv. No disciplinary action pending against him / her.

17. CLASSIFICATION OF THE DEGREE AWARDED

17.1 First Class with Distinction:

17.1.1. A candidate who qualifies for the award of the degree (vide clause 16) and who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

- Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause 11) after the commencement of his / her study.
- Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50

(OR)

17.1.2 A candidate who joins from other institutions on transfer or a candidate who gets readmitted and has to move from one regulations to another regulations and who

qualifies for the award of the degree (vide clause 16) and satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

- Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause 11) after the commencement of his / her study.
- Submission of equivalent course list approved by the respective Board of studies.
- Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 9.00

17.2

First Class:

A candidate who qualifies for the award of the degree (vide clause 16) and who satisfies the following conditions shall be declared to have passed the examination in First class:

- Should have passed the examination in all the courses of all eight semesters (six semesters for lateral entry candidates) within ten consecutive semesters (eight consecutive semesters for lateral entry candidates) excluding authorized break of study (vide clause 11) after the commencement of his / her study.
- Withdrawal from the examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 6.50

17.3

Second Class:

All other candidates (not covered in clauses 17.1 and 17.2) who qualify for the award of the degree (vide clause 16) shall be declared to have passed the examination in Second Class.

17.4

A candidate who is absent for end semester examination in a course / project work after having registered for the same shall be considered to have appeared for that examination for the purpose of classification.

17.5

Honors Degree:

A candidate who qualifies for the award of the degree (vide clause 16) and who satisfies the following conditions shall be declared to have earned the BE/BTech degree with Honours (vide clause 16 and clause 4.2.2):

- Should have passed the examination in all the courses of all the eight semesters (six semesters for lateral entry candidates) in the **First Appearance** within eight consecutive semesters (six consecutive semesters for lateral entry candidates) excluding the authorized break of study (vide clause

11) after the commencement of his / her study.

- Withdrawal from examination (vide clause 10) shall not be considered as an appearance.
- Should have secured a CGPA of not less than 7.50

18. MALPRACTICES IN TESTS AND EXAMINATIONS

If a candidate indulges in malpractice in any of the tests or end semester examinations, he/she shall be liable for punitive action as per the examination rules prescribed by the college from time to time.

19. AMENDMENTS

Notwithstanding anything contained in this manual, the Kongu Engineering College through the Academic council of the College, reserves the right to modify/amend without notice, the Regulations, Curricula, Syllabi, Scheme of Examinations, procedures, requirements, and rules pertaining to its BE / BTech programme.

OPEN ELECTIVE COURSES OFFERED BY OTHER DEPARTMENTS (OE)

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
1.	22MEX01	Renewable Energy Sources	3	0	2	4	MECH	V
2.	22MEX02	Design of Experiments	3	0	2	4	MECH	VI
3.	22MEO01	Fundamentals of Ergonomics	3	0	0	3	MECH	VII
4.	22MEO02	Principles of Management and Industrial Psychology	3	0	0	3	MECH	VII
5.	22MEO03	Waste Heat Recovery System and Storage	3	0	0	3	MECH	VII
6.	22MEO04	Safety Measures for Engineers	3	0	0	3	MECH	VIII
7.	22MEO05	Energy Conservation in Thermal Equipments	3	0	0	3	MECH	VIII
8.	22MEO06	Climate Change and New Energy Technology	3	0	0	3	MECH	VIII
9.	22MTO01	Design of Mechatronics Systems	3	1	0	4	MTS	V
10.	22MTX01	Data Acquisition and Virtual Instrumentation	3	0	2	4	MTS	V
11.	22MTX02	Factory Automation	3	0	2	4	MTS	V
12.	22MTO02	Robotics	3	1	0	4	MTS	VI
13.	22MTO03	3D Printing and Design	3	1	0	4	MTS	VI
14.	22MTO04	Drone System Technology	3	0	0	3	MTS	VII
15.	22MTO05	Micro and Nano Electromechanical Systems	3	0	0	3	MTS	VIII
16.	22AUX01	Automotive Engineering	3	0	2	4	AUTO	V
17.	22AUO01	Automotive Electronics	3	1	0	4	AUTO	VI
18.	22AUO02	Vehicle Maintenance	3	0	0	3	AUTO	VII
19.	22AUO03	Public Transport Management	3	0	0	3	AUTO	VII
20.	22AUO04	Autonomous Vehicles	3	0	0	3	AUTO	VIII
21.	22ECX01	Basics of Electronics in Automation Appliances	3	0	2	4	ECE	V
22.	22ECX02	Image Processing	3	0	2	4	ECE	V
23.	22ECX03	PCB Design and Fabrication	3	0	2	4	ECE	VI
24.	22ECO01	Wearable Devices	3	0	0	3	ECE	VII
25.	22ECX04	Electronic Hardware and Troubleshooting	2	0	2	3	ECE	VII
26.	22ECO02	Optical Engineering	3	0	0	3	ECE	VIII
27.	22EEO01	Solar and Wind Energy Systems	3	1	0	4	EEE	V
28.	22EEO02	Electrical Wiring and Lighting	3	1	0	4	EEE	V
29.	22EEO03	Programmable Logic Controller and SCADA	3	1	0	4	EEE	V
30.	22EEO04	Analog and Digital Electronics	3	1	0	4	EEE	V

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
31.	22EEO05	Power Electronics and Drives	3	1	0	4	EEE	V
32.	22EEO06	Introduction to Sensors and Actuators	3	1	0	4	EEE	V
33.	22EEO07	Energy Conservation and Management	3	1	0	4	EEE	VI
34.	22EEO08	Microprocessors and Microcontrollers Interfacing	3	1	0	4	EEE	VI
35.	22EEO09	Electrical Safety	3	1	0	4	EEE	VI
36.	22EEO10	VLSI System Design	3	1	0	4	EEE	VI
37.	22EEO11	Automation for Industrial Applications	3	1	0	4	EEE	VI
38.	22EEO12	Electric Vehicle	3	0	0	3	EEE	VII
39.	22EEO13	E-Waste Management	3	0	0	3	EEE	VII
40.	22EEO14	Embedded Systems and IOT	3	0	0	3	EEE	VII
41.	22EEO15	Energy Storage Systems and Controllers	3	0	0	3	EEE	VII
42.	22EEO16	AI Techniques in Engineering Applications	3	0	0	3	EEE	VII
43.	22EEO17	Smart Grid Technologies	3	0	0	3	EEE	VIII
44.	22EEO18	Biomass Energy Systems	3	0	0	3	EEE	VIII
45.	22EIO01	Measurements and Instrumentation	3	1	0	4	EIE	V
46.	22EIO02	Biomedical Instrumentation and Applications	3	1	0	4	EIE	V
47.	22EIO03	Industrial Automation	3	1	0	4	EIE	V
48.	22EIO04	PLC Programming with High Level Languages	3	1	0	4	EIE	VI
49.	22EIO05	Virtual Instrumentation	3	1	0	4	EIE	VI
50.	22EIO06	Introduction to Distributed Control Systems	3	0	0	3	EIE	VII
51.	22EIO07	Instrumentation in Aircraft Navigation and Control	3	0	0	3	EIE	VII
52.	22EIO08	Industry 4.0 with Industrial IoT	3	0	0	3	EIE	VII
53.	22EIO09	Industrial Data Communication	3	0	0	3	EIE	VII
54.	22EIO10	Wireless Instrumentation	3	0	0	3	EIE	VII
55.	22EIO11	Instrumentation Techniques in Agriculture	3	0	0	3	EIE	VII
56.	22EIO12	Environmental Sensors	3	0	0	3	EIE	VIII
57.	22EIO13	Pollution Control and Management	3	0	0	3	EIE	VIII
58.	22CSX01	Fundamentals of Database	3	0	2	4	CSE	V
59.	22CSX02	Data Science for Engineers	3	0	2	4	CSE	V
60.	22CSX03	Enterprise Application Development Using Java	3	0	2	4	CSE	V
61.	22CSO01	Computational Science for Engineers	3	1	0	4	CSE	V
62.	22CSO02	Formal Languages and Automata Theory	3	1	0	4	CSE	V

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
63.	22CSX04	Foundations of Machine Learning	3	0	2	4	CSE	VI
64.	22CSX05	Web Engineering	3	0	2	4	CSE	VI
65.	22CSO03	Nature Inspired Optimization Techniques	3	0	0	3	CSE	VII
66.	22CSO04	Machine Translation	3	0	0	3	CSE	VIII
67.	22CSO05	Fundamentals of Blockchain	3	0	0	3	CSE	VIII
68.	22ITO01	Artificial Intelligence	3	1	0	4	IT	V
69.	22ITX01	Next Generation Databases	3	0	2	4	IT	V
70.	22ITX02	Advanced Java Programming	3	0	2	4	IT	V / VI
71.	22ITX03	Java Programming	3	0	2	4	IT	V
72.	22ITO02	Internet of Things	3	1	0	4	IT	VI
73.	22ITO03	Fundamentals of Software Development	3	1	0	4	IT	VI
74.	22ITO04	Mobile Application Development	3	1	0	4	IT	VI
75.	22ITO05	Fundamentals of Cloud Computing	3	0	0	3	IT	VII
76.	22ITO06	Introduction to Ethical Hacking	3	0	0	3	IT	VII
77.	22ITO07	Business Continuity Planning	3	0	0	3	IT	VIII
78.	22CDO01	Fundamentals of User Experience Design	3	1	0	4	CSD	V
79.	22CDX01	Fundamentals of User Interactive Design	3	0	2	4	CSD	VI
80.	22CDO02	Introduction to Mobile Game Design	3	0	0	3	CSD	VII
81.	22CDO03	Introduction to Graphics Design	3	0	0	3	CSD	VII
82.	22CDO04	Virtual Reality and Augmented Reality	3	0	0	3	CSD	VIII
83.	22ADO01	Data Warehousing and Data Mining	3	1	0	4	AD	V
84.	22ADX01	Data Visualization	3	0	2	4	AD	VI
85.	22ADO02	Neural Networks and Deep Learning	3	0	0	3	AD	VII
86.	22ADO03	Business Analytics	3	0	0	3	AD	VIII
87.	22ALO01	Business Intelligence	3	1	0	4	AIML	V
88.	22ALX01	Data Exploration and Visualization Techniques	3	0	2	4	AIML	VI
89.	22ALO02	Industrial Machine Learning	3	0	0	3	AIML	VII
90.	22ALO03	Machine Learning for Smart Cities	3	0	0	3	AIML	VIII
91.	22CHO01	Industrial Enzymology	3	1	0	4	CHEM	V
92.	22CHO02	Waste to Energy Conversion	3	1	0	4	CHEM	V
93.	22CHO03	Applied Nanotechnology	3	1	0	4	CHEM	V
94.	22CHO04	Air Pollution Monitoring and Control	3	1	0	4	CHEM	VI

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
95.	22CHO05	Paints and Coatings	3	1	0	4	CHEM	VI
96.	22CHO06	Powder Technology	3	1	0	4	CHEM	VI
97.	22CHO07	Hydrogen Energy	3	0	0	3	CHEM	VII
98.	22CHO08	Rubber Technology	3	0	0	3	CHEM	VII
99.	22CHO09	Industrial Accident Prevention and Management	3	0	0	3	CHEM	VIII
100.	22CHO10	Electrochemical Engineering	3	0	0	3	CHEM	VIII
101.	22CHO11	Smart and Functional Materials	3	0	0	3	CHEM	VIII
102.	22FTX01	Baking Technology	3	0	2	4	FT	V
103.	22FTO01	Food Processing Technology	3	1	0	4	FT	V
104.	22FTX02	Processing of milk and milk products	3	0	2	4	FT	VI
105.	22FTX03	Processing of Fruits and Vegetables	3	0	2	4	FT	VI
106.	22FTO02	Principles of Food safety	3	0	0	3	FT	VII
107.	22FTO03	Fundamentals of Food Packaging and Storage	3	0	0	3	FT	VII
108.	22FTO04	Food Ingredients	3	0	0	3	FT	VIII
109.	22FTO05	Food and Nutrition	3	0	0	3	FT	VIII
110.	22MAO01	Mathematical Foundations of Machine Learning	3	1	0	4	Maths	V
111.	22MAO02	Numerical Computing	3	1	0	4	Maths	V
112.	22MAO03	Stochastic Processes and Queuing Theory	3	1	0	4	Maths	V
113.	22MAO04	Statistics for Engineers and Data Scientists	3	1	0	4	Maths	V
114.	22MAO05	Graph Theory and its Applications	3	1	0	4	Maths	VI
115.	22MAX01	Data Analytics Using R Programming	3	0	2	4	Maths	VI
116.	22MAO06	Operations Research	3	1	0	4	Maths	VI
117.	22MAO07	Number Theory and Cryptography	3	1	0	4	Maths	VI
118.	22MAO08	Non-Linear Optimization	3	0	0	3	Maths	VII
119.	22MAO09	Optimization for Engineers	3	0	0	3	Maths	VII
120.	22PHO01	Thin Film Technology	3	1	0	4	Physics	V
121.	22PHO02	High Energy Storage Devices	3	1	0	4	Physics	V
122.	22PHO03	Structural and optical Characterization of Materials	3	1	0	4	Physics	V
123.	22PHO04	Synthesis, Characterization And Biological Applications Of Nanomaterial	3	1	0	4	Physics	VI
124.	22PHO05	Techniques of Crystal Growth	3	1	0	4	Physics	VI
125.	22CYO01	Instrumental Methods of Analysis	3	1	0	4	Chemistry	V
126.	22CYO02	Chemistry Concepts for Competitive Examinations	3	1	0	4	Chemistry	V

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
127.	22CYO03	Organic Chemistry for Industry	3	1	0	4	Chemistry	V
128.	22CYO04	Corrosion Science and Engineering	3	1	0	4	Chemistry	VI
129.	22CYO05	Chemistry of Cosmetics in Daily Life	3	1	0	4	Chemistry	VI
130.	22CYO06	Nano composite Materials	3	1	0	4	Chemistry	VI
131.	22CYO07	Waste and Hazardous Waste Management	3	0	0	3	Chemistry	VII
132.	22CYO08	Chemistry in Everyday Life	3	0	0	3	Chemistry	VII
133.	22CYO09	Chemistry of Nutrition for Women Health	3	0	0	3	Chemistry	VIII

GENERAL OPEN ELECTIVE
(Common to All BE/BTech branches)

SNo	Course Code	Course Title	L	T	P	C	Offering Department	Semester
1.	22GEO01	German Language Level 1	4	0	0	4	ECE	ALL
2.	22GEO02	Japanese Language Level 1	4	0	0	4	ECE	ALL
3.	22GEO03	Design Thinking for Engineers	3	1	0	4	CSE	5
4.	22GEO04	Innovation and Business Model Development	3	1	0	4	MTS	6
5.	22GEO05	German Language Level 2	4	0	0	4	ECE	ALL
6.	22GEO06	German Language Level 3	3	0	0	3	ECE	ALL
7.	22GEO07	German Language Level 4	3	0	0	3	ECE	ALL
8.	22GEO08	Japanese Language Level 2	4	0	0	4	ECE	ALL
9.	22GEO09	Japanese Language Level 3	3	0	0	3	ECE	ALL
10.	22GEO10	Japanese Language Level 4	3	0	0	3	ECE	ALL
11.	22GEO11	French Language Level 1	4	0	0	4	ECE	ALL
12.	22GEO12	French Language Level 2	4	0	0	4	ECE	ALL
13.	22GEO13	French Language Level 3	3	0	0	3	ECE	ALL
14.	22GEO14	Spanish Language Level 1	4	0	0	4	ECE	ALL
15.	22GEO15	Spanish Language Level 2	4	0	0	4	ECE	ALL
16.	22GEO16	Spanish Language Level 3	3	0	0	3	ECE	ALL
17.	22GEO17	Entrepreneurship Development	3	0	0	3	MTS	7
18.	22GEO18	Fundamentals of Hindi Language	4	0	0	4	ENG	5
19.	22GEX01	NCC Studies (Army Wing) - I	3	0	2	4	EEE	5 / 6
20.	22GEX02	NCC Studies (Air Wing) - 1	3	0	2	4	IT	5 / 6
21.	22MBO01	Cost Accounting for Engineers	3	1	0	4	MBA	5
22.	22MBO02	Economic Analysis for Decision Making	3	1	0	4	MBA	6
23.	22MBO03	Marketing Analytics	3	1	0	4	MBA	7

B.E. - CIVIL ENGINEERING CURRICULUM UNDER R2022
(For the candidates admitted in the academic year 2022-23)

SEMESTER – I										
Course Code	Course Title	Hours/ Week			Credit	Maximum Marks			Category	
		L	T	P		CA	ESE	Total		
	Theory/Theory with Practical									
22EGT11	Communication Skills - I	3	0	0	3	40	60	100	HS	
22MAC11	Matrices and Ordinary Differential Equations	3	1*	2*	4	50	50	100	BS	
22PHT11	Physics for Civil Engineering	3	0	0	3	40	60	100	BS	
22CET11	Construction Materials and Practices	3	0	0	3	40	60	100	PC	
22CSC11	Problem Solving and Programming in C	3	0	2	4	100	0	100	ES	
22MET11	Engineering Drawing	2	1	0	3	40	60	100	ES	
	Practical/ Employability Enhancement									
22MEL11	Engineering Practices Laboratory	0	0	2	1	60	40	100	ES	
22PHL11	Physics Laboratory for Civil Engineering	0	0	2	1	60	40	100	BS	
22VEC11	Yoga and Values for Holistic Development	1	0	1	1	100	0	100	HS	
22MNT11	Student Induction Program	-	-	-	0	100	0	100	MC	
	Total				23					

SEMESTER – II										
Course Code	Course Title	Hours/ Week			Credit	Maximum Marks			Category	
		L	T	P		CA	ESE	Total		
	Theory/ Theory with Practical									
22EGT21	Communication Skills – II	3	0	0	3	40	60	100	HS	
22MAC21	Multivariable Calculus and Complex Analysis	3	1*	2*	4	50	50	100	BS	
22CYT21	Chemistry for Civil Engineering	3	0	0	3	40	60	100	BS	
22CEC21	Surveying and Geomatics	3	0	2	4	50	50	100	PC	
22CSC21	Fundamentals of Data Structures	3	0	2	4	50	50	100	ES	
22CET21	Engineering Mechanics	3	0	0	3	40	60	100	ES	
22TAM01	Heritage of Tamils	1	0	0	1	100	0	100	HS	
	Practical/ Employability Enhancement									
22CEL21	Computer Aided Building Drawing Laboratory	0	0	2	1	60	40	100	PC	
22CYL21	Chemistry Laboratory for Civil Engineering	0	0	2	1	60	40	100	BS	
	Total				24					

*Alternate Weeks

B.E. – CIVIL ENGINEERING CURRICULUM UNDER R2022
(For the candidates admitted in the academic year 2022-23)

SEMESTER – III									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22ITC32	Introduction to Python	3	0	2	4	100	0	100	ES
22CEC31	Concrete Technology	3	0	2	4	50	50	100	PC
22CET31	Mechanics of Materials	3	1	0	4	40	60	100	PC
22CET32	Fluid Mechanics and Hydraulics Engineering	3	0	0	3	40	60	100	PC
22CET33	Construction Engineering and Management	3	0	0	3	40	60	100	PC
22TAM02	Tamils and Technology	1	0	0	1	100	0	100	HS
22MNT31	Environmental Science	2	0	0	0	100	0	100	MC
Practical / Employability Enhancement									
22CEL31	Strength of Materials Laboratory	0	0	2	1	60	40	100	ES
22CEL32	Fluid Mechanics and Hydraulics Engineering Laboratory	0	0	2	1	60	40	100	PC
22EGL31	Communication Skills Development Laboratory	0	0	2	1	60	40	100	HS
Total Credits to be earned					22				

SEMESTER – IV									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22MAT41	Numerical Methods for Engineers	3	1	0	4	40	60	100	BS
22CEC41	Geotechnical Engineering - I	2	0	2	3	50	50	100	PC
22CEC42	Environmental Engineering	2	0	2	3	50	50	100	PC
22CET41	Design of RC Elements	3	1	0	4	40	60	100	PC
22CET42	Structural Analysis	3	1	0	4	40	60	100	PC
Practical / Employability Enhancement									
22CEL41	Computer Aided Building Information Modelling Laboratory	0	0	2	1	60	40	100	PC
22CEL42	Computer Aided Structural Design Laboratory - I	0	0	2	1	60	40	100	PC
22GCL41/ 22GCI41	Professional Skills Training I / Industrial Training I*	--	--	--	2	100	0	100	EC
Total Credits to be earned					22				

***80 Hours of Training**

B.E. CIVIL ENGINEERING CURRICULUM – R2022
(For the candidates admitted in the academic year 2022-23)

SEMESTER – V									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22CEC51	Transportation Engineering	2	0	2	3	50	50	100	PC
22CET51	Geotechnical Engineering-II	3	0	0	3	40	60	100	PC
22CET52	Water Resources and Irrigation Engineering	3	0	0	3	40	60	100	PC
22CET53	Design of Steel Structures	3	1	0	4	40	60	100	PC
	Professional Elective-I	3	0	0	3	40	60	100	PE
	Open Elective-I	3	1/0	0/2	4	40/ 50	60/ 50	100	OE
Practical / Employability Enhancement									
22CEL51	Computer Aided Structural Design Laboratory-II	0	0	2	1	60	40	100	PC
22CEL52	Computational Laboratory for Construction Management	0	0	2	1	60	40	100	PC
22GCL51/ 22GCI 51	Professional Skills Training II / Industrial Training II *	--	--	--	2	100	0	100	EC
Total Credits to be earned						24			

*80 Hours of Training

SEMESTER – VI									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22CET61	Estimation and Quantity Surveying	3	0	0	3	40	60	100	PC
22CET62	Pre-Engineered Buildings	3	0	0	3	40	60	100	PC
	Professional Elective-II	3	0	0	3	40	60	100	PE
	Open Elective-II	3	1/0	0/2	4	40/ 50	60/ 50	100	OE
22GET31	Universal Human Values	2	0	0	2	100	0	100	HS
Practical / Employability Enhancement									
22CEL61	Structural Engineering Laboratory	0	0	2	1	60	40	100	PC
22CEL62	Computer Aided Structural Detailing Laboratory	0	0	2	1	60	40	100	PC
22GEP61	Comprehensive Test and Viva	---	---	---	2	100	0	100	EC
22CEP61	Project Work-I	---	---	8	4	50	50	100	EC
Total Credits to be earned						23			

B.E. CIVIL ENGINEERING CURRICULUM – R2022
(For the candidates admitted in the academic year 2022-23)

SEMESTER – VII									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
	Theory/Theory with Practical								
22GCT71	Engineering Economics and Management	3	0	0	3	40	60	100	HS
	Professional Elective-III	3	0	0	3	40	60	100	PE
	Professional Elective-IV	3	0	0	3	40	60	100	PE
	Professional Elective-V	3	0	0	3	40	60	100	PE
	Open Elective - III	3	0	0	3	40	60	100	OE
	Practical / Employability Enhancement								
22CEP71	Project Work-II Phase-I	0	0	10	5	50	50	100	EC
Total Credits to be earned						20			

SEMESTER – VIII									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
	Theory/Theory with Practical								
	Professional Elective-VI	3	0	0	3	40	60	100	PE
	Open Elective-IV	3	0	0	3	40	60	100	OE
	Practical / Employability Enhancement								
22CEP81	Project Work-II Phase-II	0	0	8	4	50	50	100	EC
Total Credits to be earned						10			

Total Credits: 168

LIST OF PROFESSIONAL ELECTIVES
(For the candidates admitted in the academic year 2022-23)

Course Code	Course Title	Hours/Week			Credit	Domain/Stream			
		L	T	P					
Semester 5									
Elective I									
22CEE01	Design of Prestressed Concrete Structures	3	0	0	3	SE			
22CEE02	Operations Research	3	0	0	3	CEM			
22CEE03	Solid and Hazardous Waste Management	3	0	0	3	EE			
22CEE04	Railway, Airport and Harbor Engineering	3	0	0	3	TE			
22CEE05	Ground Improvement Techniques	3	0	0	3	GE			
22CEE06	Remote Sensing and Geographical Information System	3	0	0	3	BG			
Semester 6									
Elective II									
22CEE07	Advanced Structural Analysis	3	0	0	3	SE			
22CEE08	Contract Management	3	0	0	3	CEM			
22CEE09	Environmental Impact Assessment	3	0	0	3	EE			
22CEE10	Traffic Engineering and Management	3	0	0	3	TE			
22CEE11	Environmental Geo-technology	3	0	0	3	GE			
22CEE12	Engineering Geology	3	0	0	3	BG			
Semester 7									
Elective III									
22CEE13	Advanced Steel Design	3	0	0	3	SE			
22CEE14	Architecture and Town Planning	3	0	0	3	CEM			
22CEE15	Air and Noise Pollution Control Engineering	3	0	0	3	EE			
22CEE16	Urban Transportation Planning	3	0	0	3	TE			
22CEE17	Rock Mechanics	3	0	0	3	GE			
22CEE18	Finite Element Methods	3	0	0	3	BG			
22GEE02	Total Quality Management	3	0	0	3	BG			
Elective IV									
22CEE19	Earthquake Engineering and Design	3	0	0	3	SE			
22CEE20	Sustainable Engineering	3	0	0	3	CEM			
22CEE21	Industrial Waste Management	3	0	0	3	EE			
22CEE22	Public Transportation Systems	3	0	0	3	TE			
22CEE23	Site Investigation and Soil Exploration	3	0	0	3	GE			
22CEE24	Green Building	3	0	0	3	BG			
22GEE01	Fundamentals of Research	3	0	0	3	BG			

Elective V						
22CEE25	Design of Prefabricated Structures	3	0	0	3	SE
22CEE26	Construction Equipment and Management	3	0	0	3	CEM
22CEE27	Surface Hydrology	3	0	0	3	WRE
22CEE28	Intelligent Transport System	3	0	0	3	TE
22CEE29	Reinforced Soil Structures	3	0	0	3	GE
22CEE30	Safety in Construction Practices	3	0	0	3	BG
Semester 8						
Elective VI						
22CEE31	Basics of Bridge Engineering	3	0	0	3	SE
22CEE32	Advanced Reinforced Concrete Design	3	0	0	3	SE
22CEE33	Distress Monitoring and Rehabilitation of Structures	3	0	0	3	CEM
22CEE34	Water Power Engineering	3	0	0	3	WRE
22CEE35	Transportation Economics	3	0	0	3	TE
22CEE36	Geotechnical Earthquake Engineering	3	0	0	3	GE
22CEE37	Disaster Preparedness and Planning	3	0	0	3	BG

Domain/Stream Abbreviations: SE - Structural Engineering, CEM - Construction Engineering & Management, EE - Environmental Engineering, WRE - Water Resources Engineering, TE - Transportation Engineering, GE - Geotechnical Engineering, BG – Branch General

B.E. CIVIL ENGINEERING CURRICULUM – R2022
(For the candidates admitted in the academic year 2023-24)

SEMESTER – I										
Course Code	Course Title	Hours/ Week			Credit	Maximum Marks			Category	
		L	T	P		CA	ESE	Total		
	Theory/Theory with Practical									
22EGT11	Communication Skills I	3	0	0	3	40	60	100	HS	
22MAC11	Matrices and Ordinary Differential Equations	3	1*	2*	4	50	50	100	BS	
22PHT11	Physics for Civil Engineering	3	0	0	3	40	60	100	BS	
22CSC11	Problem Solving and Programming in C	3	0	2	4	100	0	100	ES	
22MET11	Engineering Drawing	2	1	0	3	40	60	100	ES	
22TAM01	Heritage of Tamils	1	0	0	1	100	0	100	HS	
Practical/ Employability Enhancement										
22GCL12	Foundation Laboratory – Electrical, IoT and Web Technologies	0	0	6	3	100	0	100	ES	
22PHL11	Physics Laboratory for Civil Engineering	0	0	2	1	60	40	100	BS	
22VEC11	Yoga and Values for Holistic Development	1	0	1	1	100	0	100	HS	
22MNT11	Student Induction Program	-	-	-	0	100	0	100	MC	
	Total				23					

SEMESTER – II										
Course Code	Course Title	Hours/ Week			Credit	Maximum Marks			Category	
		L	T	P		CA	ESE	Total		
	Theory/ Theory with Practical									
22EGT21	Communication Skills II	3	0	0	3	40	60	100	HS	
22MAC21	Multivariable Calculus and Complex Analysis	3	1*	2*	4	50	50	100	BS	
22CYT21	Chemistry for Civil Engineering	3	0	0	3	40	60	100	BS	
22CSC21	Fundamentals of Data Structures	3	0	2	4	50	50	100	ES	
22CET21	Engineering Mechanics	3	0	0	3	40	60	100	PC	
22TAM02	Tamils and Technology	1	0	0	1	100	0	100	HS	
Practical/ Employability Enhancement										
22GCL11	Foundation Laboratory – Manufacturing, Design and Robotics	0	0	6	3	100	0	100	ES	
22CYL21	Chemistry Laboratory for Civil Engineering	0	0	2	1	60	40	100	BS	
	Total				22					

L – Lecture, T – Tutorial, P – Practical, C – Credits, CA – Continuous Assessment, ESE – End Semester Examination,

B.E. CIVIL ENGINEERING CURRICULUM – R2022
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SEMESTER – III									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22ITC32	Introduction to Python	3	0	2	4	100	0	100	ES
22CEC21	Surveying and Geomatics	3	0	2	4	50	50	100	PC
22CEC31	Concrete Technology	3	0	2	4	50	50	100	PC
22CET31	Mechanics of Materials	3	1	0	4	40	60	100	ES
22CET32	Fluid Mechanics and Hydraulics Engineering	3	0	0	3	40	60	100	PC
22MNT31	Environmental Science	2	0	0	0	100	0	100	MC
Practical / Employability Enhancement									
22CEL31	Strength of Materials Laboratory	0	0	2	1	60	40	100	PC
22CEL32	Fluid Mechanics and Hydraulics Engineering Laboratory	0	0	2	1	60	40	100	PC
22EGL31	Communication Skills Development Laboratory	0	0	2	1	60	40	100	HS
Total Credits to be earned						22			

SEMESTER – IV									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22MAT41	Numerical Methods for Engineers	3	1	0	4	40	60	100	BS
22CET41	Design of RC Elements	3	1	0	4	40	60	100	PC
22CEC41	Geotechnical Engineering-I	2	0	2	3	50	50	100	PC
22CEC42	Environmental Engineering	2	0	2	3	50	50	100	PC
22CET42	Structural Analysis	3	1	0	4	40	60	100	PC
Practical / Employability Enhancement									
22CEL21	Computer Aided Building Drawing Laboratory	0	0	2	1	60	40	100	PC
22CEL42	Computer Aided Structural Design Laboratory-I	0	0	2	1	60	40	100	PC
22GCL41/ 22GCI41	Professional Skills Training I / Industrial Training I*	--	--	--	2	100	0	100	EC
Total Credits to be earned						22			

*80 Hours of Training

B.E. CIVIL ENGINEERING CURRICULUM – R2022
(For the candidates admitted in the academic year 2023-24)

SEMESTER – V									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22CET33	Construction Engineering and Management	3	0	0	3	40	60	100	PC
22CET51	Geotechnical Engineering-II	3	0	0	3	40	60	100	PC
22CEC51	Transportation Engineering	2	0	2	3	50	50	100	PC
22CET52	Water Resources and Irrigation Engineering	3	0	0	3	40	60	100	PC
	Professional Elective-I	3	0	0	3	40	60	100	PE
	Open Elective-I	3	1/0	0/2	4	40/ 50	60/ 50	100	OE
Practical / Employability Enhancement									
22CEL41	Computer Aided Building Information Modelling Laboratory	0	0	2	1	60	40	100	PC
22CEL51	Computer Aided Structural Design Laboratory-II	0	0	2	1	60	40	100	PC
22GCL51/ 22GCI51	Professional Skills Training II / Industrial Training II*	0	0	0	2	100	0	100	EC
Total Credits to be earned					23				

SEMESTER – VI									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22CET53	Design of Steel Structures	3	1	0	4	40	60	100	PC
22CET61	Estimation and Quantity Surveying	3	0	0	3	40	60	100	PC
	Professional Elective-II	3	0	0	3	40	60	100	PE
	Open Elective-II	3	1/0	0/2	4	40/ 50	60/ 50	100	OE
22GET31	Universal Human Values	2	0	0	2	100	0	100	HS
Practical / Employability Enhancement									
22CEL61	Structural Engineering Laboratory	0	0	2	1	60	40	100	PC
22CEL62	Computer Aided Structural Detailing Laboratory	0	0	2	1	60	40	100	PC
22GEP61	Comprehensive Test and Viva	---	---	---	2	100	0	100	EC
22CEP62	Project Work-I	---	---	10	5	50	50	100	EC
Total Credits to be earned					25				

B.E. CIVIL ENGINEERING CURRICULUM – R2022
(For the candidates admitted in the academic year 2023-24)

SEMESTER – VII									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
22CET62	Pre-Engineered Buildings	3	0	0	3	40	60	100	PC
22GCT71	Engineering Economics and Management	3	0	0	3	40	60	100	HS
	Professional Elective-III	3	0	0	3	40	60	100	PE
	Professional Elective-IV	3	0	0	3	40	60	100	PE
	Open Elective - III	3	0	0	3	40	60	100	OE
Practical / Employability Enhancement									
22CEP72	Project Work-II Phase-I	0	0	12	6	50	50	100	EC
Total Credits to be earned					21				

SEMESTER – VIII									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
	Professional Elective-V	3	0	0	3	40	60	100	PE
	Open Elective-IV	3	0	0	3	40	60	100	OE
Practical / Employability Enhancement									
22CEP81	Project Work-II Phase-II	0	0	8	4	50	50	100	EC
Total Credits to be earned					10				

Total Credits: 168

LIST OF PROFESSIONAL ELECTIVES
(For the candidates admitted in the academic year 2023-24)

Course Code	Course Title	Hours/Week			Credit	Domain/ Stream			
		L	T	P					
Semester 5									
Elective I									
22CEE01	Design of Prestressed Concrete Structures	3	0	0	3	SE			
22CEE02	Operations Research	3	0	0	3	CEM			
22CEE03	Solid and Hazardous Waste Management	3	0	0	3	EE			
22CEE04	Railway, Airport and Harbor Engineering	3	0	0	3	TE			
22CEE05	Ground Improvement Techniques	3	0	0	3	GE			
22CEE06	Remote Sensing and Geographical Information System	3	0	0	3	BG			
Semester 6									
Elective II									
22CEE07	Advanced Structural Analysis	3	0	0	3	SE			
22CEE08	Contract Management	3	0	0	3	CEM			
22CEE09	Environmental Impact Assessment	3	0	0	3	EE			
22CEE10	Traffic Engineering and Management	3	0	0	3	TE			
22CEE11	Environmental Geo-technology	3	0	0	3	GE			
22CEE12	Engineering Geology	3	0	0	3	BG			
Semester 7									
Elective III									
22CEE13	Advanced Steel Design	3	0	0	3	SE			
22CEE14	Architecture and Town Planning	3	0	0	3	CEM			
22CEE15	Air and Noise Pollution Control Engineering	3	0	0	3	EE			
22CEE16	Urban Transportation Planning	3	0	0	3	TE			
22CEE17	Rock Mechanics	3	0	0	3	GE			
22CEE18	Finite Element Methods	3	0	0	3	BG			
22GEE02	Total Quality Management	3	0	0	3	BG			
Elective IV									
22CEE19	Earthquake Engineering and Design	3	0	0	3	SE			
22CEE20	Sustainable Engineering	3	0	0	3	CEM			
22CEE21	Industrial Waste Management	3	0	0	3	EE			
22CEE22	Public Transportation Systems	3	0	0	3	TE			
22CEE23	Site Investigation and Soil Exploration	3	0	0	3	GE			
22CEE24	Green Building	3	0	0	3	BG			
22GEE01	Fundamentals of Research	3	0	0	3	BG			
22CEE25	Design of Prefabricated Structures	3	0	0	3	SE			
22CEE26	Construction Equipment and Management	3	0	0	3	CEM			

22CEE27	Surface Hydrology	3	0	0	3	WRE
22CEE28	Intelligent Transport System	3	0	0	3	TE
22CEE29	Reinforced Soil Structures	3	0	0	3	GE
22CEE30	Safety in Construction Practices	3	0	0	3	BG

Semester 8

Elective V

22CEE31	Basics of Bridge Engineering	3	0	0	3	SE
22CEE32	Advanced Reinforced Concrete Design	3	0	0	3	SE
22CEE33	Distress Monitoring and Rehabilitation of Structures	3	0	0	3	CEM
22CEE34	Water Power Engineering	3	0	0	3	WRE
22CEE35	Transportation Economics	3	0	0	3	TE
22CEE36	Geotechnical Earthquake Engineering	3	0	0	3	GE
22CEE37	Disaster Preparedness and Planning	3	0	0	3	BG

Domain/Stream Abbreviations: SE - Structural Engineering, CEM - Construction Engineering & Management, EE - Environmental Engineering, WRE - Water Resources Engineering, TE - Transportation Engineering, GE - Geotechnical Engineering, BG – Branch General

OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS (OE)
(Offered by Department of Civil Engineering)

S. No.	Course Code	Course Name	L	T	P	C	Sem
1.	22CEX01	Remote Sensing and its Applications	3	0	2	4	5
2.	22CEO01	Disaster Management	3	1	0	4	6
3.	22CEO02	Introduction to Smart Cities	3	0	0	3	7
4.	22CEO03	Environmental Health and Safety	3	0	0	3	7
5.	22CEO04	Infrastructure Planning and Management	3	0	0	3	8
6.	22CEO05	Environmental Laws and Policy	3	0	0	3	8

OPEN ELECTIVE COURSES OFFERED BY OTHER DEPARTMENTS (OE)

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
1.	22MEX01	Renewable Energy Sources	3	0	2	4	MECH	V
2.	22MEX02	Design of Experiments	3	0	2	4	MECH	VI
3.	22MEO01	Fundamentals of Ergonomics	3	0	0	3	MECH	VII
4.	22MEO02	Principles of Management and Industrial Psychology	3	0	0	3	MECH	VII
5.	22MEO03	Waste Heat Recovery System and Storage	3	0	0	3	MECH	VII
6.	22MEO04	Safety Measures for Engineers	3	0	0	3	MECH	VIII
7.	22MEO05	Energy Conservation in Thermal Equipments	3	0	0	3	MECH	VIII
8.	22MEO06	Climate Change and New Energy Technology	3	0	0	3	MECH	VIII
9.	22MTO01	Design of Mechatronics Systems	3	1	0	4	MTS	V
10.	22MTX01	Data Acquisition and Virtual Instrumentation	3	0	2	4	MTS	V
11.	22MTX02	Factory Automation	3	0	2	4	MTS	V
12.	22MTO02	Robotics	3	1	0	4	MTS	VI
13.	22MTO03	3D Printing and Design	3	1	0	4	MTS	VI
14.	22MTO04	Drone System Technology	3	0	0	3	MTS	VII
15.	22MTO05	Micro and Nano Electromechanical Systems	3	0	0	3	MTS	VIII
16.	22AUX01	Automotive Engineering	3	0	2	4	AUTO	V
17.	22AUO01	Automotive Electronics	3	1	0	4	AUTO	VI
18.	22AUO02	Vehicle Maintenance	3	0	0	3	AUTO	VII
19.	22AUO03	Public Transport Management	3	0	0	3	AUTO	VII
20.	22AUO04	Autonomous Vehicles	3	0	0	3	AUTO	VIII

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
21.	22ECX01	Basics of Electronics in Automation Appliances	3	0	2	4	ECE	V
22.	22ECX02	Image Processing	3	0	2	4	ECE	V
23.	22ECX03	PCB Design and Fabrication	3	0	2	4	ECE	VI
24.	22ECO01	Wearable Devices	3	0	0	3	ECE	VII
25.	22ECX04	Electronic Hardware and Troubleshooting	2	0	2	3	ECE	VII
26.	22ECO02	Optical Engineering	3	0	0	3	ECE	VIII
27.	22EEO01	Solar and Wind Energy Systems	3	1	0	4	EEE	V
28.	22EEO02	Electrical Wiring and Lighting	3	1	0	4	EEE	V
29.	22EEO03	Programmable Logic Controller and SCADA	3	1	0	4	EEE	V
30.	22EEO04	Analog and Digital Electronics	3	1	0	4	EEE	V
31.	22EEO05	Power Electronics and Drives	3	1	0	4	EEE	V
32.	22EEO06	Introduction to Sensors and Actuators	3	1	0	4	EEE	V
33.	22EEO07	Energy Conservation and Management	3	1	0	4	EEE	VI
34.	22EEO08	Microprocessors and Microcontrollers Interfacing	3	1	0	4	EEE	VI
35.	22EEO09	Electrical Safety	3	1	0	4	EEE	VI
36.	22EEO10	VLSI System Design	3	1	0	4	EEE	VI
37.	22EEO11	Automation for Industrial Applications	3	1	0	4	EEE	VI
38.	22EEO12	Electric Vehicle	3	0	0	3	EEE	VII
39.	22EEO13	E-Waste Management	3	0	0	3	EEE	VII
40.	22EEO14	Embedded Systems and IOT	3	0	0	3	EEE	VII
41.	22EEO15	Energy Storage Systems and Controllers	3	0	0	3	EEE	VII
42.	22EEO16	AI Techniques in Engineering Applications	3	0	0	3	EEE	VII
43.	22EEO17	Smart Grid Technologies	3	0	0	3	EEE	VIII
44.	22EEO18	Biomass Energy Systems	3	0	0	3	EEE	VIII
45.	22EIO01	Measurements and Instrumentation	3	1	0	4	EIE	V
46.	22EIO02	Biomedical Instrumentation and Applications	3	1	0	4	EIE	V
47.	22EIO03	Industrial Automation	3	1	0	4	EIE	V
48.	22EIO04	PLC Programming with High Level Languages	3	1	0	4	EIE	VI
49.	22EIO05	Virtual Instrumentation	3	1	0	4	EIE	VI
50.	22EIO06	Introduction to Distributed Control Systems	3	0	0	3	EIE	VII
51.	22EIO07	Instrumentation in Aircraft Navigation and Control	3	0	0	3	EIE	VII
52.	22EIO08	Industry 4.0 with Industrial IoT	3	0	0	3	EIE	VII

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
53.	22EIO09	Industrial Data Communication	3	0	0	3	EIE	VII
54.	22EIO10	Wireless Instrumentation	3	0	0	3	EIE	VII
55.	22EIO11	Instrumentation Techniques in Agriculture	3	0	0	3	EIE	VII
56.	22EIO12	Environmental Sensors	3	0	0	3	EIE	VIII
57.	22EIO13	Pollution Control and Management	3	0	0	3	EIE	VIII
58.	22CSX01	Fundamentals of Database	3	0	2	4	CSE	V
59.	22CSX02	Data Science for Engineers	3	0	2	4	CSE	V
60.	22CSX03	Enterprise Application Development Using Java	3	0	2	4	CSE	V
61.	22CSO01	Computational Science for Engineers	3	1	0	4	CSE	V
62.	22CSO02	Formal Languages and Automata Theory	3	1	0	4	CSE	V
63.	22CSX04	Foundations of Machine Learning	3	0	2	4	CSE	VI
64.	22CSX05	Web Engineering	3	0	2	4	CSE	VI
65.	22CSO03	Nature Inspired Optimization Techniques	3	0	0	3	CSE	VII
66.	22CSO04	Machine Translation	3	0	0	3	CSE	VIII
67.	22CSO05	Fundamentals of Blockchain	3	0	0	3	CSE	VIII
68.	22ITO01	Artificial Intelligence	3	1	0	4	IT	V
69.	22ITX01	Next Generation Databases	3	0	2	4	IT	V
70.	22ITX02	Advanced Java Programming	3	0	2	4	IT	V / VI
71.	22ITX03	Java Programming	3	0	2	4	IT	V
72.	22ITO02	Internet of Things	3	1	0	4	IT	VI
73.	22ITO03	Fundamentals of Software Development	3	1	0	4	IT	VI
74.	22ITO04	Mobile Application Development	3	1	0	4	IT	VI
75.	22ITO05	Fundamentals of Cloud Computing	3	0	0	3	IT	VII
76.	22ITO06	Introduction to Ethical Hacking	3	0	0	3	IT	VII
77.	22ITO07	Business Continuity Planning	3	0	0	3	IT	VIII
78.	22CDO01	Fundamentals of User Experience Design	3	1	0	4	CSD	V
79.	22CDX01	Fundamentals of User Interactive Design	3	0	2	4	CSD	VI
80.	22CDO02	Introduction to Mobile Game Design	3	0	0	3	CSD	VII
81.	22CDO03	Introduction to Graphics Design	3	0	0	3	CSD	VII
82.	22CDO04	Virtual Reality and Augmented Reality	3	0	0	3	CSD	VIII
83.	22ADO01	Data Warehousing and Data Mining	3	1	0	4	AD	V
84.	22ADX01	Data Visualization	3	0	2	4	AD	VI

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
85.	22ADO02	Neural Networks and Deep Learning	3	0	0	3	AD	VII
86.	22ADO03	Business Analytics	3	0	0	3	AD	VIII
87.	22ALO01	Business Intelligence	3	1	0	4	AIML	V
88.	22ALX01	Data Exploration and Visualization Techniques	3	0	2	4	AIML	VI
89.	22ALO02	Industrial Machine Learning	3	0	0	3	AIML	VII
90.	22ALO03	Machine Learning for Smart Cities	3	0	0	3	AIML	VIII
91.	22CHO01	Industrial Enzymology	3	1	0	4	CHEM	V
92.	22CHO02	Waste to Energy Conversion	3	1	0	4	CHEM	V
93.	22CHO03	Applied Nanotechnology	3	1	0	4	CHEM	V
94.	22CHO04	Air Pollution Monitoring and Control	3	1	0	4	CHEM	VI
95.	22CHO05	Paints and Coatings	3	1	0	4	CHEM	VI
96.	22CHO06	Powder Technology	3	1	0	4	CHEM	VI
97.	22CHO07	Hydrogen Energy	3	0	0	3	CHEM	VII
98.	22CHO08	Rubber Technology	3	0	0	3	CHEM	VII
99.	22CHO09	Industrial Accident Prevention and Management	3	0	0	3	CHEM	VIII
100.	22CHO10	Electrochemical Engineering	3	0	0	3	CHEM	VIII
101.	22CHO11	Smart and Functional Materials	3	0	0	3	CHEM	VIII
102.	22FTX01	Baking Technology	3	0	2	4	FT	V
103.	22FTO01	Food Processing Technology	3	1	0	4	FT	V
104.	22FTX02	Processing of milk and milk products	3	0	2	4	FT	VI
105.	22FTX03	Processing of Fruits and Vegetables	3	0	2	4	FT	VI
106.	22FTO02	Principles of Food safety	3	0	0	3	FT	VII
107.	22FTO03	Fundamentals of Food Packaging and Storage	3	0	0	3	FT	VII
108.	22FTO04	Food Ingredients	3	0	0	3	FT	VIII
109.	22FTO05	Food and Nutrition	3	0	0	3	FT	VIII
110.	22MAO01	Mathematical Foundations of Machine Learning	3	1	0	4	Maths	V
111.	22MAO02	Numerical Computing	3	1	0	4	Maths	V
112.	22MAO03	Stochastic Processes and Queuing Theory	3	1	0	4	Maths	V
113.	22MAO04	Statistics for Engineers and Data Scientists	3	1	0	4	Maths	V
114.	22MAO05	Graph Theory and its Applications	3	1	0	4	Maths	VI
115.	22MAX01	Data Analytics Using R Programming	3	0	2	4	Maths	VI
116.	22MAO06	Operations Research	3	1	0	4	Maths	VI

S.No	Course Code	Course Title	L	T	P	C	Offering Dept.	Sem.
117.	22MAO07	Number Theory and Cryptography	3	1	0	4	Maths	VI
118.	22MAO08	Non-Linear Optimization	3	0	0	3	Maths	VII
119.	22MAO09	Optimization for Engineers	3	0	0	3	Maths	VII
120.	22PHO01	Thin Film Technology	3	1	0	4	Physics	V
121.	22PHO02	High Energy Storage Devices	3	1	0	4	Physics	V
122.	22PHO03	Structural and optical Characterization of Materials	3	1	0	4	Physics	V
123.	22PHO04	Synthesis, Characterization And Biological Applications Of Nanomaterial	3	1	0	4	Physics	VI
124.	22PHO05	Techniques of Crystal Growth	3	1	0	4	Physics	VI
125.	22CYO01	Instrumental Methods of Analysis	3	1	0	4	Chemistry	V
126.	22CYO02	Chemistry Concepts for Competitive Examinations	3	1	0	4	Chemistry	V
127.	22CYO03	Organic Chemistry for Industry	3	1	0	4	Chemistry	V
128.	22CYO04	Corrosion Science and Engineering	3	1	0	4	Chemistry	VI
129.	22CYO05	Chemistry of Cosmetics in Daily Life	3	1	0	4	Chemistry	VI
130.	22CYO06	Nano composite Materials	3	1	0	4	Chemistry	VI
131.	22CYO07	Waste and Hazardous Waste Management	3	0	0	3	Chemistry	VII
132.	22CYO08	Chemistry in Everyday Life	3	0	0	3	Chemistry	VII
133.	22CYO09	Chemistry of Nutrition for Women Health	3	0	0	3	Chemistry	VIII

GENERAL OPEN ELECTIVE
(Common to All BE/BTech branches)

SNo	Course Code	Course Title	L	T	P	C	Offering Department	Semester
1.	22GEO01	German Language Level 1	4	0	0	4	ECE	ALL
2.	22GEO02	Japanese Language Level 1	4	0	0	4	ECE	ALL
3.	22GEO03	Design Thinking for Engineers	3	1	0	4	CSE	5
4.	22GEO04	Innovation and Business Model Development	3	1	0	4	MTS	6
5.	22GEO05	German Language Level 2	4	0	0	4	ECE	ALL
6.	22GEO06	German Language Level 3	3	0	0	3	ECE	ALL
7.	22GEO07	German Language Level 4	3	0	0	3	ECE	ALL
8.	22GEO08	Japanese Language Level 2	4	0	0	4	ECE	ALL
9.	22GEO09	Japanese Language Level 3	3	0	0	3	ECE	ALL
10.	22GEO10	Japanese Language Level 4	3	0	0	3	ECE	ALL
11.	22GEO11	French Language Level 1	4	0	0	4	ECE	ALL
12.	22GEO12	French Language Level 2	4	0	0	4	ECE	ALL
13.	22GEO13	French Language Level 3	3	0	0	3	ECE	ALL
14.	22GEO14	Spanish Language Level 1	4	0	0	4	ECE	ALL
15.	22GEO15	Spanish Language Level 2	4	0	0	4	ECE	ALL
16.	22GEO16	Spanish Language Level 3	3	0	0	3	ECE	ALL
17.	22GEO17	Entrepreneurship Development	3	0	0	3	MTS	7
18.	22GEO18	Fundamentals of Hindi Language	4	0	0	4	ENG	5
19.	22GEX01	NCC Studies (Army Wing) - I	3	0	2	4	EEE	5 / 6
20.	22GEX02	NCC Studies (Air Wing) - 1	3	0	2	4	IT	5 / 6
21.	22MBO01	Cost Accounting for Engineers	3	1	0	4	MBA	5
22.	22MBO02	Economic Analysis for Decision Making	3	1	0	4	MBA	6
23.	22MBO03	Marketing Analytics	3	1	0	4	MBA	7

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	use language effectively by acquiring vocabulary and syntax in context	Applying (K3)
CO2	listen and comprehend different spoken discourses from a variety of situations	Applying (K3)
CO3	speak confidently in different professional contexts and with peers	Creating (K6)
CO4	comprehend different genres of texts by adopting various reading strategies	Understanding (K2)
CO5	write legibly and flawlessly at varied professional contexts proficiently with appropriate choice of words and structures	Creating (K6)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						2			1	3	1	1
CO2									2	3		1
CO3									2	3		2
CO4						1				3	1	1
CO5										3		2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		37	30			33	100
CAT2		30	30			40	100
CAT3		33	34			33	
ESE		17	63			20	100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

3.	Duraisamy C., Vengataasalam S., Arun Prakash K. and Suresh M., "Engineering Mathematics - I", 2 nd Edition, Pearson India Education, New Delhi, 2018.
4.	Grewal B.S., "Higher Engineering Mathematics" 44th Edition, Khanna Publishers, New Delhi, 2018.
5.	Matrices and Ordinary Differential Equations Laboratory Manual.

COURSE OUTCOMES:

On completion of the course, the students will be able to

**BT Mapped
(Highest Level)**

CO1	solve engineering problems which needs matrix computations.	Applying (K3), Manipulation (S2)
CO2	identify the appropriate method for solving first order ordinary differential equations.	Applying (K3), Manipulation (S2)
CO3	solve higher order linear differential equations with constant and variable coefficients.	Applying (K3), Manipulation (S2)
CO4	apply the concept of ordinary differential equations for modeling and finding solutions to engineering problems.	Applying (K3), Manipulation (S2)
CO5	apply Laplace Transform to find solutions of Linear Ordinary Differential Equations	Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2		3									
CO2	3	3	2		3									
CO3	3	3	2		3									
CO4	3	3	2		3									
CO5	3	3	3		3									

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	20	70				100
CAT2	10	20	70				100
CAT3	10	20	70				100
ESE	10	20	70				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

22PHT11 - PHYSICS FOR CIVIL ENGINEERING

Programme & Branch	BE- Civil Engineering	Sem.	Category	L	T	P	Credit	
Prerequisites	Nil	1	BS	3	0	0	3	
Preamble	This course aims to impart knowledge on oscillations & waves, acoustics, ultrasonics, laser, fiber optics, smart materials and select materials characterization techniques. It also describes the applications of aforementioned topics in civil engineering.							
Unit – I	Oscillations and Waves:							9
Periodic motion – Oscillations – Simple harmonic motion – Differential equation of simple harmonic motion – Forced oscillations – Damped oscillations – Application of simple harmonic motion in torsional pendulum, cantilever and LC circuit – Resonance – Waves – Equation of plane progressive wave – Types of progressive waves – Reflection and transmission of waves at a boundary (qualitative) – Energy transport of progressive waves.								
Unit – II	Acoustics and Ultrasonics:							9
Classification of sound – Characteristics of sound – Reverberation and reverberation time – Growth and decay of sound – Sabine's formula for reverberation time – Determination of sound absorption coefficient – Factors affecting acoustics of buildings and the remedies – Ultrasonics – Properties of ultrasonic waves – Generation of ultrasonic waves – Magnetostrictive generator and Piezoelectric generator – Non-destructive testing – Flaw detection.								
Unit – III	Laser and Fiber optics:							9
Stimulated absorption – Spontaneous emission – Stimulated emission – Einstein's coefficients and their relations – Population inversion – Pumping – CO ₂ laser – Holography – Fiber optics – Numerical aperture and acceptance angle – Classification of optical fibers based on refractive index, modes and materials – Fiber optics communication system (qualitative) –Temperature and displacement sensors.								
Unit – IV	Smart Materials:							9
Metallic glasses: Properties, preparation and applications – Shape memory alloys: Characteristics and applications – Nanostructure – Surface to volume ratio – Quantum confinement – Nanomaterials synthesis: Top-down and bottom-up approaches – Electron beam lithography – Physical vapour deposition – Carbon nanotubes: Structures, properties, synthesis by laser ablation method – Applications.								
Unit – V	Materials Characterization:							9
Importance of materials characterization – X-ray diffraction (powder method) – Scanning electron microscope - Transmission electron microscope (qualitative) – Raman spectroscopy – Thermo gravimetric analysis.								
Total:45								
TEXT BOOK:								
1.	Avadhanulu M.N., Kshirsagar P.G. and Arun Murthy T.V.S., "A Textbook of Engineering Physics", 11 th Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2019. (Units I,II,III,IV)							
2.	Sam Zhang, Lin Li and Ashok Kumar, "Materials Characterization Techniques", 1 st Edition, CRC Press, Boca Raton, 2008. (Unit V)							
REFERENCES:								
1.	Hitendra K. Malik and A.K. Singh, "Engineering Physics", 2 nd Edition McGraw-Hill Education , New Delhi, 2018							
2.	Pandey B.K.and Chaturvedi S., "Engineering Physics" 2 nd Edition, Cengage, New Delhi, 2022.							
3.	Gaur R.K. and Gupta S.L., "Engineering Physics", 8 th Edition, Dhanpat Rai and Sons, New Delhi, 2009.							
4.	Tamilarasan K. and Prabu K., "Materials Science", 1 st Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2019.							

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	make use of the concepts of oscillatory and wave motion to comprehend the phenomena related to the propagation of elastic waves.												Applying (K3)
CO2	apply the concepts of growth and decay of sound energy in a hall to compute Sabine's formula and to recognize the requirements of acoustically good buildings and also to describe the production of ultrasonic wave and the testing materials by non-destructive method.												Applying (K3)
CO3	apply the concepts of stimulated emission of radiation to explain the working and the applications of laser in engineering and technology. To apply the principle of propagation of light through optical fiber to compute acceptance angle and numerical aperture and to comprehend the loss in optical fiber and also to explain fiber optic communication system and the working of fiber optic sensors.												Applying (K3)
CO4	utilize appropriate methods to prepare metallic glasses, shape memory alloys, nanomaterials and carbon nano tubes and also to comprehend their properties and applications.												Applying (K3)
CO5	apply the concepts of X-ray diffraction, matter waves, Raman effect and thermogram to describe the principle and working of select material characterization techniques.												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2						2	2			2	2
CO2	3	2	2						2	2			2	2
CO3	3	2	2						2	2			2	2
CO4	3	2	2						2	2			2	2
CO5	3	2	2						2	2			2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	50	40				100
CAT2	10	50	40				100
CAT3	20	50	30				100
ESE	10	55	35				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	identify the role of bricks, stones, cement and rocks in construction											Understanding (K2)
CO2	infer the properties of concrete and steel as construction materials											Applying (K3)
CO3	identify the usage of plastics and other modern materials used in buildings											Understanding (K2)
CO4	classify and compare the types of foundations and masonry structures in buildings											Applying (K3)
CO5	interpret the various construction practices and techniques adopted in building construction											Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					2	3					3	3	2
CO2	2					2						3	3	2
CO3	2					2	3					3	3	2
CO4	2					2						3	3	2
CO5	2					2	3					3	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	40	30				100
CAT2	30	40	30				100
CAT3	20	40	40				100
ESE	20	40	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

REFERENCES/ MANUAL / SOFTWARE:														
1.	Yashavant Kanetkar, "Let us C", 16th Edition, BPB Publications, 2018.													
2.	Sumitabha Das, "Computer Fundamentals and C Programming", 1st Edition, McGraw Hill, 2018.													
3.	Balagurusamy E., "Programming in ANSI C", 7th Edition, McGraw Hill Education, 2017.													
4.	Behrouz A. Forouzan & Richard F. Gilberg, "Computer Science A Structured Programming Approach Using C", 3 rd Edition, Cengage, 2017.													
5.	https://www.cprogramming.com/tutorial/c-tutorial.html													
COURSE OUTCOMES: On completion of the course, the students will be able to														
CO1	develop simple programs using input/output statements and operators												BT Mapped (Highest Level)	
CO2	identify the appropriate looping and control statements in C and develop applications using these statements												Applying (K3), Precision (S3)	
CO3	develop simple C programs using the concepts of arrays and modular programming												Applying (K3), Precision (S3)	
CO4	apply the concepts of pointers and develop C programs using strings and pointers												Applying (K3), Precision (S3)	
CO5	make use of user-defined data types and file concepts to solve given problems												Applying (K3), Precision (S3)	
Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1				1	1		1		
CO2	3	2	2	2	1				1	1		1		
CO3	3	2	2	2	1				1	1		1		
CO4	3	2	2	2	1				1	1		1		
CO5	3	2	2	2	1				1	1		1		
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														
ASSESSMENT PATTERN - THEORY														
Test / Bloom's Category*	Remembering (K1) %		Understanding (K2) %		Applying (K3) %		Analyzing (K4) %		Evaluating (K5) %		Creating (K6) %		Total %	
CAT1	10		30		60								100	
CAT2	10		30		60								100	
CAT3	10		30		60								100	
ESE	10		30		60								100	

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	interpret international standards of drawings and sketch the projections of points, lines and planes											Applying (K3)
CO2	draw the projections of 3D primitive objects like prisms, pyramids, cylinders and cones											Applying (K3)
CO3	construct the various sectional views of solids like prisms, pyramids, cylinders and cones											Applying (K3)
CO4	develop the lateral surfaces of simple and truncated solids											Applying (K3)
CO5	sketch the isometric projections of simple and truncated solids and convert isometric drawing into orthographic projection											Applying (K3)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2					3		2		
CO2	3	2	1		2					3		2		
CO3	3	2	1		2					3		2		
CO4	3	2	1		2					3		2		
CO5	3	2	1		2					3		2		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	6	9	85				100
CAT2	6	9	85				100
CAT3	6	9	85				100
ESE	10	10	80				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

22MEL11 - ENGINEERING PRACTICES LABORATORY																										
(Common to All Engineering and Technology Branches)																										
Programme & Branch		All BE/BTech Branches				Sem.	Category	L	T	P	Credit															
Prerequisites		Nil				1 / 2	ES	0	0	2	1															
Preamble	This course is designed to provide a hands-on experience in basic of mechanical and electrical engineering practices.																									
LIST OF EXPERIMENTS / EXERCISES:																										
	PART A – MECHANICAL ENGINEERING																									
1.	Prepare a Square / Rectangular / V-Shape Projection with its Counterpart for Mating and Perform the Drilling, Tapping, and Assembling Tasks from the given Square / Rectangular MS Plates using Modern Power Tools.																									
2.	Prepare T / L / Lap Joint from given Wooden Work Piece and Make a Box / Tray out of Plywood using Modern Power Tools.																									
3.	Perform the Thread Formation on a GI/PVC Pipe and Prepare a Water Line from the Overhead Tank that is Leak-Proof.																									
4.	Make a Butt / Lap / Tee Joint of MS Plate using Arc Welding Process and Welding Simulator.																									
5.	Activity: Prepare an Innovative Model with the Knowledge from Fitting / Carpentry / Plumbing / Welding Involving Modern Power Tools.																									
	PART B – ELECTRICAL AND ELECTRONICS ENGINEERING																									
6.	Wiring circuit for fluorescent lamp and Stair case wiring																									
7.	Wiring Circuit of Incandescent lamp using Impulse Relay																									
8.	Measurement of Earth Resistance																									
9.	Soldering of Simple Circuits and trouble shooting																									
10.	Implementation of half wave and full wave Rectifier using diodes																									
Total:30																										
REFERENCES/ MANUAL /SOFTWARE:																										
1.	Engineering Practices Laboratory Manual.																									
COURSE OUTCOMES: On completion of the course, the students will be able to																										
CO1	plan the sequence of operations for effective completion of the planned models / innovative articles										BT Mapped (Highest Level)															
CO2	identify and use appropriate modern power tools and complete the exercises/models accurately										Creating (K6) Manipulation (S2)															
CO3	perform house wiring and realize the importance of earthing										Applying (K3), Manipulation (S2)															
CO4	soldering with simple electronics circuits										Applying (K3), Manipulation (S2)															
CO5	trouble shoot the electrical and electronic circuits										Applying (K3), Manipulation (S2)															
Mapping of COs with POs and PSOs																										
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2												
CO1	3		3	1	3	1			3	3			3													
CO2	3		3	1	3				3	3			3													
CO3	3		3	2	1				2	2			3	2												
CO4	3		2	1	1				2	3			3	2												
CO5	3		3	2	1				2	2			3	2												

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

22PHL11 - PHYSICS LABORATORY FOR CIVIL ENGINEERING																								
Programme & Branch		BE - Civil Engineering					Sem.	Category	L	T	P	Credit												
Prerequisites		Nil					1	BS	0	0	2	1												
Preamble		This course aims to impart hands on training in the determination of parameters such as rigidity modulus, AC frequency, velocity of ultrasonic waves, compressibility of a liquid, particle size, wavelength of a laser, acceptance angle and numerical aperture of an optical fiber, specific resistance, thermal conductivity, thickness of a thin film, hall coefficient, Young's modulus and knowledge on the working of LCR circuit, and also to impart skills on writing coding / developing project / product related to societal requirement.																						
LIST OF EXPERIMENTS / EXERCISES:																								
1.	Determination of the rigidity modulus of a metallic wire using torsional pendulum / Studying the variation of current and voltage in a series LCR circuit.																							
2.	Determination of the frequency of alternating current using electrically vibrating tuning fork (Melde's apparatus).																							
3.	Determination of the velocity of ultrasonic waves in a liquid and the compressibility of the liquid using ultrasonic interferometer.																							
4.	Determination of the particle size of the given powder using laser.																							
5.	Determination of (i) the wavelength of a semiconductor laser and (ii) the acceptance angle and the numerical aperture of a given optical fiber.																							
6.	Determination of the specific resistance of a metallic wire using Carey-Foster's bridge.																							
7.	Determination of the thermal conductivity of a bad conductor using Lee's disc.																							
8.	Determination of the thickness of a thin film using air-wedge arrangement.																							
9.	Determination of the Hall coefficient of a material using Hall effect arrangement / Determination of the Young's modulus of the material of a given beam using uniform bending method.																							
10.	Writing coding for any one of the above experiments / developing a project / a product.																							
Total:30																								
REFERENCES/ MANUAL /SOFTWARE:																								
1.	Physics Laboratory Manual / Record, Department of Physics, 1 st Edition, 2020.																							
COURSE OUTCOMES:																								
On completion of the course, the students will be able to																								
CO1	determine the rigidity modulus of a wire or the variation of current and voltage in a series LCR circuit, the velocity of ultrasound in a liquid and the frequency of an alternating current.										BT Mapped (Highest Level)													
CO2	determine the particle size of a powder material, the wavelength of a semiconductor laser, the acceptance angle and the numerical aperture of an optical fiber.										Applying (K3), Precision (S3)													
CO3	determine the specific resistance of a metallic wire, thermal conductivity of a bad conductor, the thickness of a thin film, the Hall coefficient of a material or the Young's modulus of a material and develop a coding / project / product.										Applying (K3), Precision (S3)													
Mapping of COs with POs and PSOs																								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2										
CO1	3	2	2	3					2	2		2	2											
CO2	3	2	2	3					2	2		2	2											
CO3	3	2	2	3					2	2		2	2											

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)
CO1	realize the importance of yoga in physical health.										
CO2	realize the importance of yoga in mental health.										
CO3	realize the role of yoga in personality development and diet.										
CO4	do the loosening practices, Asanas and realize its benefits.										
CO5	do the practice of Pranayama, meditation and realize its benefits										

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3		2	1			
CO2						3		2				
CO3						3		3				
CO4						3		2	3			
CO5						3		3				

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	-	-	-	-	-	-
CAT2	-	-	-	-	-	-	-
CAT3	20	30	50	-	-	-	100
ESE	-	-	-	-	-	-	-

* ±3% may be varied (CAT3 – 100 marks)

COURSE OUTCOMES: படிப்பை முடித்தவுடன், மாணவர்கள்			BT Mapped (Highest Level)
CO1	தமிழ் மொழி மற்றும் இலக்கியத்தில் மதிப்புமிக்க கருத்துக்களை விளக்க முடியும்.		Understanding (K2)
CO2	தமிழர்களின் சிற்பம் மற்றும் அவர்களின் ஓவியங்கள் பற்றி விளக்க முடியும்.		Understanding (K2)
CO3	தமிழர்களின் நாட்டுப்புற மற்றும் தற்காப்புக் கலைகளைப் பற்றி சுருக்கமாகக் கூற முடியும்.		Understanding (K2)
CO4	தமிழர்களின் திணைக் கோட்பாடுகளைப் பற்றி விளக்க முடியும்.		Understanding (K2)
CO5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு பற்றி விளக்க முடியும்.		Understanding (K2)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3		3	2	2			3	
CO2						3		3	2	2			3	
CO3						3		3	2	2			3	
CO4						3		3	2	2			3	
CO5						3		3	2	2			3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE	NA						

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain valuable concepts in language and literature of tamils.												Understanding (K2)
CO2	illustrate about the tamils sculpture and their paintings.												Understanding (K2)
CO3	summarize about the tamils folk and martial arts.												Understanding (K2)
CO4	explain the thinai concept of tamils.												Understanding (K2)
CO5	explain the contribution of Tamils to the Indian National Movement and Indian culture.												Understanding (K2)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3		3	2	2			3	
CO2						3		3	2	2			3	
CO3						3		3	2	2			3	
CO4						3		3	2	2			3	
CO5						3		3	2	2			3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE	NA						

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks)

6.	The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Published by International Institute of Tamil Studies).
7.	Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
8.	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
9.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)
10.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OUTCOMES:

படிப்பை முடித்தவுடன், மாணவர்கள்

BT Mapped
(Highest Level)

CO1	தமிழ் கலாச்சாரம் மற்றும் தமிழ் சமூகத்தினுடைய நெசவு மற்றும் பானை தொழில்நுட்பம் பற்றி விளக்க முடியும்.	Understanding (K2)
CO2	தமிழர்களின் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்ப ஆற்றல் பற்றி விளக்க முடியும்.	Understanding (K2)
CO3	தமிழர்களின் உற்பத்தித் தொழில்நுட்பம் பற்றி சுருக்கமாகக் கூற முடியும்.	Understanding (K2)
CO4	தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் பற்றி விளக்க முடியும்.	Understanding (K2)
CO5	தமிழர்களின் அறிவியல் தமிழ் மற்றும் கணினித்தமிழ் பற்றி விளக்க முடியும்.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3		3	2	2		3		
CO2						3		3	2	2		3		
CO3						3		3	2	2		3		
CO4						3		3	2	2		3		
CO5						3		3	2	2		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE	NA						

* ±3% may be varied (CAT 1,2,3 – 50 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain weaving and ceramic technology in tamil culture and tamil society.												Understanding (K2)
CO2	Illustrate about the design and construction technology.												Understanding (K2)
CO3	summarize about the manufacturing technology.												Understanding (K2)
CO4	explain the agriculture and irrigation technology.												Understanding (K2)
CO5	explain the significance of tamil in scientific and computing.												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3		3	2	2		3		
CO2						3		3	2	2		3		
CO3						3		3	2	2		3		
CO4						3		3	2	2		3		
CO5						3		3	2	2		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE	NA						

* ±3% may be varied (CAT 1,2,3 – 50 marks)

22GCL11 – FOUNDATION LABORATORY – MANUFACTURING, DESIGN AND ROBOTICS

(Common to All BE/BTech branches)

Programme& Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1 / 2	ES	0	0	6	3
Preamble	This course is designed to provide foundational knowledge on engineering with hands-on experience on developing a prototype model with the basic knowledge of Computer-aided Design, Manufacturing Processes, 3D Printing Technology, Robotics and Embedded Control.						
LIST OF EXPERIMENTS / EXERCISES:							
PART A – Manufacturing (30 Hours)							
1.	Selection of product, free hand sketching and detailing						
2.	Construction of model using Arc/TIG/MIG/Gas/Spot welding operations						
3.	Enhancing the model with sheet metal						
4.	Creating the parts of the model using lathe						
5.	Creating the parts of the model using milling and drilling machines						
PART B – Product Design and Development (30 Hours)							
1.	Free hand sketching and detailing of the component						
2.	3D part modelling of the component using CAD software						
3.	Engineering Analysis of the component model						
4.	Generate the component using 3D printer						
5.	Value addition to the produced component using CNC milling machine, CNC laser cutting machine and CNC router						
PART C – Robotics (30 Hours)							
1.	Design of electronic circuit and its debugging						
2.	Interfacing of sensors, actuators and wireless communion modules with microcontroller						
3.	Assembly of Tracker Robot with accessories						
4.	Development of control strategies for motion control, path planning and obstacle avoidance						
5.	Demonstration and testing of Robot in static environment						
Total:90							
REFERENCES/ MANUAL /SOFTWARE:							
1.	Laboratory Manual						
2.	AutoCAD 2020 and SOLID WORKS 2018 Software						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)		
CO1	develop the prototype model using mechanical operations like welding, forming and machining processes												Applying (K3), Precision (S3)	
CO2	sketch 3D model and enhance the prototype using modern machines like 3D printer, CNC milling machine, CNC Laser cutter and CNC Router												Applying (K3), Precision (S3)	
CO3	design and develop the autonomous robot for real-time applications												Applying (K3), Precision (S3)	
Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3		2				3	2		2		
CO2	3	3	3		3				3	2		2		
CO3	3	3	3		2				3	2		2		

22GCL12 – FOUNDATION LABORATORY – ELECTRICAL, IOT AND WEB TECHNOLOGIES

(Common to all BE/BTech branches)

Programme& Branch	All BE/BTech branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	1 /2	ES	0	0	6	3

Preamble	This course is designed to provide a foundational knowledge on engineering with hands-on experience on the house wiring, Internet of Things and Web Technologies.
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LIST OF EXPERIMENTS / EXERCISES:

PART A – Electrical Installation (30 Hours)

1.	Develop wiring diagrams using software tools.
2.	Identify and select suitable components for Energy Measurement and Circuit Protection
3.	Design a wiring circuit integrating Energy Meter, MCB and RCCB
4.	Develop a wiring circuit for incandescent lamp and fluorescent lamp
5.	Develop and Investigate Simple and Staircase Wiring for Residential Applications
6.	Design the Wiring Circuits for Calling Bell System and Dimmable Light
7.	Create wiring circuits for power loads
8.	Measurement of Earth Resistance and its connections.

PART B – Internet of Things (30 Hours)

1.	Design a Single layer PCB layout designing
2.	Fabricate Single layer PCB printing
3.	Assembling, soldering and desoldering practice on single layer PCB
4.	GPIO programming in ESP8266
5.	Sensor and actuator interfacing with internet enabled microcontroller device
6.	Sensor and actuator calibration
7.	Integration of microcontroller based system with Cloud platform

PART C – Web Technologies (30 Hours)

1.	Design a website for an application using HTML and CSS.
2.	Convert the designed website into responsive website using Bootstrap.
3.	Add dynamism to the website by using JavaScript and embed the Social Media components to the website.
4.	Incorporate database interaction to the website.
5.	Deploy the developed website in the server.

Total:90

REFERENCES/ MANUAL /SOFTWARE:

1.	Laboratory Manual
2.	Eric T.Freeman,Elisabeth Robson, "Head First JavaScript Programming A Brain-Friendly Guide", 1st Edition, O'Reilly , 2014.
3.	Eric T.Freeman,Elisabeth Robson, "Head First HTML and CSS",2nd Edition, O'Reilly , 2012
4.	Lynn Beighley,"Head First SQL",1st Editin, O'Reilly,2007.

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	design electrical wiring circuits for buildings based on their requirement												Applying(K3), Precision (S3)
CO2	develop IoT based solutions and PCB for real world use cases.												Applying (K3), Precision (S3)
CO3	design and host an interactive dynamic website.												Applying(K3), Precision (S3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1					1					
CO2	3	2	2	1					1					
CO3	3	2	2	1					1					

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	use functional grammar for improving communication skills	Applying (K3)
CO2	listen and comprehend different accents and infer implied meanings	Applying (K3)
CO3	speak clearly, initiate and sustain a discussion and negotiate using appropriate communicative strategies	Creating (K6)
CO4	read different genres of texts, infer implied meanings and critically analyze and evaluate them	Understanding (K2)
CO5	produce different types of narrative, descriptive expository texts and understand creative, critical, analytical and evaluative writing	Creating (K6)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						2			1	3	1	1
CO2									2	3		1
CO3									2	3		2
CO4						1				3	1	1
CO5										3		2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		37	30			33	100
CAT2		7	50			43	100
CAT3		17	50			33	100
ESE		15	45			40	100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

5.	Multivariable Calculus and Complex Analysis Laboratory Manual.
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COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	compute the total derivatives and extreme values of multivariable functions.	Applying (K3), Manipulation (S2)
CO2	evaluate multiple integrals and apply them to compute the area and volume of the regions.	Applying (K3), Manipulation (S2)
CO3	apply the concepts of derivatives and line integrals of vector functions in engineering problems.	Applying (K3), Manipulation (S2)
CO4	construct analytic functions and bilinear transformations and determine the image of given region under the given conformal mapping.	Applying (K3), Manipulation (S2)
CO5	apply the techniques of complex integration to evaluate real and complex integrals over suitable closed curves.	Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2		3									
CO2	3	3	2		3									
CO3	3	3			3									
CO4	3	3			2									
CO5	3	3	3		2									

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	30	60				100
CAT2	10	30	60				100
CAT3	10	30	60				100
ESE	10	30	60				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

*Alternate week

22CYT21 – CHEMISTRY FOR CIVIL ENGINEERING

Programme & Branch	B.E & Civil Engineering	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	2	BS	3	0	0	3
Preamble	This course aims to impart a sound chemistry knowledge on cement, polymeric, composite and engineering materials and also impart the fundamental knowledge of electrochemistry and control of corrosion of steel in concrete towards applications in civil engineering.						
Unit – I	CEMENT AND SUSTAINABLE BUILDING MATERIALS						9
Introduction-types-constituents – functions- Bogue's compound- chemical reactions- hydration of cement- setting and hardening of cement –chemistry of 81evellin cement manufacturing- structural modification of clinker-clinker formation –CaO-SiO ₂ system-lime saturation factor-silica-alumina ratio-sustainable building materials- green building concept in India – certification systems – Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED).							
Unit – II	POLYMER AND COMPOSITE MATERIALS						9
Polymers: Introduction – terminology – structure and property relationship of polymers (mechanical, thermal) –rubbers (elastomers) – natural rubber- processing of latex- vulcanization of rubber – synthetic rubber- preparation, properties and applications of polyurethane-polymethyl methacrylate (PMMA) – conducting polymer–biodegradable polymer- synthesis, properties and applications of polylactic acid. Composites: Introduction-types- polymer composites – synthesis, properties and applications of 81evell fibre- fibre reinforced plastics (FRP) – properties and uses.							
Unit – III	CHEMISTRY OF ENGINEERING MATERIALS						9
Refractory Bricks: Introduction –criteria of a good refractory material-classification (according to chemical nature and refractoriness)-properties-general method of manufacturing of refractories – causes for the failure of a refractory material. Ceramics: Introduction –components of ceramics – classification of ceramic materials –general methods of fabricating ceramic wares-applications of ceramics. Abrasives: Introduction-properties of abrasives – types of abrasives: i) natural abrasives – diamond, corundum and quartz ii) synthetic abrasives – silicon carbide, boron carbide – industrial applications of abrasives. Adhesives: Introduction-requisites of a good adhesive-advantages and disadvantages of adhesive bonding- adhesive action-classification of adhesives-industrial applications of adhesives.							
Unit – IV	ELECTROCHEMISTRY AND CORROSION						9
Electrochemistry: Introduction – cells – types – representation of galvanic cell – electrode potential – Nernst equation (derivation of cell EMF) – Calculation of cell EMF from single electrode potential – reference electrode- construction, working and applications of standard hydrogen electrode – potentiometric titrations (redox) – conductometric titrations – mixture of weak and strong acid vs strong base. Corrosion: Introduction – chemical corrosion – Pilling-Bedworth rule – electrochemical corrosion and it's types – galvanic corrosion – differential aeration corrosion with examples – galvanic series – factors influencing rate of corrosion – measurement of corrosion (wt. loss method only).							
Unit – V	CORROSION OF STEEL IN CONCRETE						9
Introduction- reinforced cement concrete- carbon emission and its impacts on environment – deterioration of concrete – corrosion mechanism in concrete – causes of corrosion: due to carbonation, chlorination and sulphonation – ettringite formation – delayed ettringite formation – corrosion assessment method: half cell potential measurement – preventive measures for corrosion of steel in concrete-corrosion control by inhibitors.							
Total:45							
TEXT BOOK:							
1.	Wiley Editorial Board, "Wiley Engineering Chemistry", 2 nd Edition, Wiley India Pvt. Ltd, New Delhi, Reprint 2019, for Unit-II, III, IV, V.						
2.	Palanisamy P.N., Manikandan P., Geetha A., Manjula Rani K., Kowshalya V.N., "Chemistry for Civil Engineering", Pearson Education, New Delhi, Revised Edition 2019, for Unit- I, II, III, V.						
REFERENCES:							
1.	Jain and Jain, "Engineering Chemistry", 17 th Edition, Dhanpat Rai Publishing Company, New Delhi, 2019.						
2.	S. S. Dara, "A Text book of Engineering Chemistry", S. Chand & Co Ltd., New Delhi, 20 th B.TECH. (BCL) Page 16 Edition, 2013.						
3.	ArnonBentur, "Steel Corrosion in Concrete: Fundamentals and civil engineering practice: 1 (Modern Concrete Technology)", CRC Press, 1 edition (Reprint), 2019.						

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	apply the knowledge of cement chemistry and sustainable materials in construction										Applying (K3)	
CO2	categorize and utilize the polymer and composite materials for various applications										Applying (K3)	
CO3	make use of the chemical concepts in refractory bricks, ceramics, abrasive and adhesives										Applying (K3)	
CO4	apply the principle of electrochemistry and corrosion for various applications										Applying (K3)	
CO5	apply suitable corrosion control measures to prevent corrosion of steel in concrete										Applying (K3)	

Mapping of Cos with POs and PSOs

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2		2	2			2		2		
CO2	3	2	2	2		2	2			2		2		
CO3	3	2	2	2		2	2			2		2		
CO4	3	2	2	2		2	2			2		2		
CO5	3	2	2	2		2	2			2		2		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	carry out the chain and compass surveying												Applying (K3), Manipulation
CO2	compute the levels and to calculate the area and volume												Applying (K3), Manipulation (S2)
CO3	carry out the adjustments of closed traverse for errors and setting out the simple curves												Applying (K3), Manipulation (S2)
CO4	execute the tacheometric and triangulation Survey												Applying (K3), Manipulation (S2)
CO5	apply the principles, concepts and applications of digital surveying												Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		3				3			3	3
CO2	3	3	3	3		2				3	3		3	3
CO3	3	3	3	3		3				3	3		3	3
CO4	3	3	3	3		2				3	3		3	3
CO5	3	3	3	3	3	3				3	3		3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)
CO1	apply List ADT for solving the given problems											
CO2	make use of arrays and linked lists to create Stack and Queue ADTs.											
CO3	utilize Tree ADT to develop simple application											
CO4	make use of Graph ADT for standard problems											
CO5	illustrate the use of standard sorting and Hashing Techniques											

Mapping of Cos with POs and PSOs

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1										
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2	1	1										
CO5	3	2	1	1										

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	60	30				100
CAT2	5	35	60				100
CAT3	5	35	60				100
ESE	5	35	60				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)
CO1	represent the forces in vector components (both 2D and 3D) and apply equilibrium conditions											Applying (K3)
CO2	calculate the moment produced by various force systems and conclude the static equilibrium equations for rigid body system											Analyzing (K4)
CO3	compute the centroid, centre of gravity and moment of inertia of geometrical shapes and solids respectively											Analyzing (K4)
CO4	manipulate the effect of dry friction and its applications											Applying (K3)
CO5	apply the different principles to study the motion of a body and analyse their constitutive equations											Analyzing (K4)

Mapping of Cos with POs and PSOs

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2								3	3	3
CO2	3	3	2	2								3	3	3
CO3	3	3	2	2								3	3	3
CO4	3	3	2	2								3	3	3
CO5	3	3	2	2								3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	20	20	50			100
CAT2	10	20	20	50			100
CAT3	10	20	20	50			100
ESE	10	20	20	50			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

Total:30

REFERENCES/ MANUAL /SOFTWARE:

1.	Reference manual for AutoCAD
2.	Sikka V.B., "A course in Civil Engineering Drawing", 4th Edition, S.K.Kataria and Sons, 2015.
3.	Bhavikatti, S.S and Chitawadagi, M.V., "Building Planning and Drawing", I.K. International Publishing House Pvt. Ltd. New Delhi,2019

COURSE OUTCOMES:

On completion of the course, the students will be able to

**BT Mapped
(Highest Level)**

CO1	plan buildings based on NBC specifications and building bye-laws	Applying(K3), Manipulation (S2)
CO2	prepare plan, section & elevation for different types of buildings	Analyzing (K4), Manipulation (S2)
CO3	prepare approval plan for buildings	Analyzing (K4), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		3	3				3	3			3	3
CO2	3	2	2	3	3				3	3			3	3
CO3	3	3	3	3	3	3			3	3			3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

22CYL21 – CHEMISTRY LABORATORY FOR CIVIL ENGINEERING																								
Programme & Branch		B.E-Civil Engineering				Sem.	Category	L	T	P	Credit													
Prerequisites		Nil				2	BS	0	0	2	1													
Preamble		This course aims to impart the basic concepts of volumetric, conductometric, potentiometric, viscometry, spectrophotometric and pH metry experiments for the estimation of given samples and thereby, to improve the analytical skills. It also aims to impart the significance of Ca, Mg, Fe, Cl ⁻ , alkalinity & DO in water which is used for construction.																						
LIST OF EXPERIMENTS / EXERCISES:																								
1.	Complexometric analysis of calcium content in cement solution.																							
2.	Determination of molecular weight of a polymer / liquid by Ostwald viscometer.																							
3.	Electrometric method for determination of pH of soil using pH meter.																							
4.	Analysis and comparison of the strength of acids in the given mixture using conductivity meter.																							
5.	Potentiometric approach using a Pt electrode for the estimation of iron in the given sample.																							
6.	Spectrophotometric method for the determination of Iron in steel.																							
7.	Estimation of chloride ion in the given water sample using Argentometric method.																							
8.	Estimation of alkalinity of river and borewell water collected from different places.																							
9.	Determination of dissolved oxygen in the given wastewater sample.																							
10.	Assessment of the given water sample for the suitability of drinking / industrial purpose by estimating the calcium, magnesium and total hardness by EDTA method.																							
11.	Electroplating process (Demonstration).																							
12.	Prepare a report based on the water quality parameters and suggest the suitability of water for domestic / industrial use (Demonstration).																							
Total:30																								
REFERENCES/ MANUAL /SOFTWARE:																								
1.	Palanisamy P.N., Manikandan P., Geetha A. and Manjula Rani K., "Chemistry Laboratory Manual", 1 st Edition, Rajaganapathy Publishers, Erode, 2022.																							
COURSE OUTCOMES:																								
On completion of the course, the students will be able to																								
CO1	estimate the amount of calcium, chloride and iron in the given solution.										BT Mapped (Highest Level)													
CO2	determine the amount of water quality parameter like hardness, alkalinity, dissolved oxygen for the given water sample and demonstrate the viscometer for the determination of molecular weight of a polymer.										Applying (K3), Precision (S3)													
CO3	estimate the strength of acids using conductivity meter, the amount of iron using Pt electrode for the given solution and pH of soil using pH meter.										Applying (K3), Precision (S3)													
Mapping of Cos with POs and PSOs																								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2										
CO1	3	2	2	3			3		2	2														
CO2	3	2	2	3			3		2	2														
CO3	3	2	2	3			3		2	2														

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

22ITC32 - INTRODUCTION TO PYTHON														
(Common to Civil, Mechanical, Mechatronics, Chemical & Automobile Engineering branches)														
Programme & Branch	BE- Civil, Mechanical, Mechatronics, Automobile & BTech – Chemical Engineering branches	Sem.	Category	L	T	P	Credit							
Prerequisites	Problem Solving and Programming in C	3/4*	ES	3	0	2	4							
Preamble	This course deals with core python programming. It gives a comprehensive introduction to problem solving using python constructs and libraries.													
Unit – I	Introduction: Problem solving strategies – program design tools – Types of errors – Testing and Debugging- Basics: Literals – variables and identifiers – data types – input operation – comments – reserved words – indentation – Operators and Expressions – Decision Control Statements: Introduction – conditional statement – iterative statements – Nested Loops – break, continue and pass statements – else in loops.													
Unit – II	Lists, Tuples and Dictionary: Lists: Access, update, nested, cloning, operations, methods , comprehensions, looping – Tuple: Create, utility, access, update, delete, operations, assignments, returning multiple values, nested tuples, index and count method – Dictionary: Create, access, add and modify, delete, sort, looping, nested, built-in methods – list vs tuple vs dictionary.													
Unit – III	Strings and Regular Expressions: Strings: Concatenation , append, multiply on strings – Immutable – formatting operator – Built-in string methods and functions – slice operation – functions – operators – comparing – iterating – string module – Regular Expressions – match, search, sub, findall and finditer functions – flag options.													
Unit – IV	Functions and Modules: Functions: Introduction – definition – call – variable scope and lifetime – return statement – function arguments – lambda function – documentation strings – programming practices recursive function- Modules: Modules – packages – standard library methods – function redefinition.													
Unit – V	Object Orientation: Class and Objects: Class and objects – class methods and self – constructor – class and object variables – destructor – public and private data member. NumPy : NumPy Arrays – Computation on NumPy Arrays. Matplotlib : Line plots – Scatter Plots													
LIST OF EXPERIMENTS / EXERCISES:														
1.	Programs using conditional and looping statements													
2.	Implementation of list and tuple operations													
3.	Implementation of dictionary operations													
4.	Perform various string operations													
5.	Use regular expressions for validating inputs													
6.	Demonstration of different types of functions and parameter passing													
7.	Develop programs using classes and objects													
8.	Perform computation on Numpy arrays													
9.	Draw different types of plots using Matplotlib													
Lecture:45, Practical:30, Total:75														
TEXT BOOK:														
1.	Reema Thareja., "Python Programming using problem solving approach", 3 rd impression, Oxford University Press., New Delhi, 2017.													
REFERENCES/ MANUAL / SOFTWARE:														
1.	Nageswara Rao, "Core Python Programming", 2 nd Edition, DreamTech Press, New Delhi, 2018.													
2.	Jake Vander Plas, " Python Data Science Handbook Essential Tools for Working with Data", O'Reilly Publishers, 1 st Edition, 2016.													

* 4th sem - Automobile

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)		
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1									2	1
CO2	3	2	1	1									2	1
CO3	3	2	1	1									2	1
CO4	3	2	1	1									2	1
CO5	3	2	1	1									2	1

Mapping of COs with POs and PSOs

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		25	75				100
CAT2		25	75				100
CAT3		25	75				100
ESE		25	75				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

22CEC31 – CONCRETE TECHNOLOGY
(IS 456-2000 and IS 10262-2019 code books are permitted)

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Construction Materials and Practices	3	PC	3	0	2	4
Preamble	This course imparts knowledge about the various ingredients and properties of materials used for concrete and mix design for concrete.						
Unit – I	Ingredients of Concrete:						
Cement – ASTM classification of cement – Chemical composition – Heat of hydration – Field and laboratory tests for cement. Aggregates: - Coarse and Fine Aggregates – IS Specifications – Classification of aggregates- Importance of grading –Standard Grading Curve – Interfacial Transition Zone. Water: Quality of water for use in concrete – Use of sea water and its effects in concrete.							
Unit – II	Concrete Mix Design:						
Concrete Mix Proportioning – Methods – Statistical Quality Control of Concrete- IS concrete mix proportion guidelines for normal concrete and High Strength Concrete – Sampling and Acceptance Criteria.							
Unit – III	Fresh and Hardened Concrete Properties:						
Workability – Tests for workability of concrete – Determination of density, air content and temperature of fresh concrete – Segregation and Bleeding. Strength Properties of Hardened concrete – Elasticity – Creep, Shrinkage and temperature effects – Gain of strength with age – Stress and Strain characteristics of concrete- Non Destructive Tests for concrete.							
Unit – IV	Durability Properties of Concrete:						
Durability of concrete – Tests for durability – Strength and durability relationship – Factors affecting durability of concrete- Permeability- RCPT- Sorptivity – Alkali Aggregate Reaction – Chemical attack – Corrosion tests- Cracks in Concrete- Performance based durability design.							
Unit – V	Special Concretes:						
Light weight concrete – Foam concrete – Self compacting concrete – Vacuum concrete – Bacterial concrete – Fiber reinforced concrete – Ferrocement – HVFA concrete – SIFCON – Basalt fiber Concrete – Ready mix concrete – Reactive Powder Concrete– Polymer concrete – Geopolymer Concrete – Pumped concrete – Roller compacted concrete – Smart Concrete-Stamped concrete- Transparent concrete – Permeable concrete.							

LIST OF EXPERIMENTS / EXERCISES:

1.	Specific gravity of Cement and Aggregates
2.	Fineness Modulus of Aggregates – Sieve Analysis
3.	Fineness and Soundness test on cement
4.	Consistency, Initial and Final setting time of cement
5.	Workability of fresh concrete –Slump Value, Compaction factor and Vee-Bee Consistometer
6.	Compressive Strength of Concrete
7.	Split Tensile Strength of Concrete
8.	Flexural Strength of Concrete
9.	NDT on Concrete (Rebound Hammer and UPV test)
10.	Durability on Concrete – Permeability and RCPT (Demo only)

Lecture:45, Practical:30, Total:75

TEXT BOOK:

1.	Shetty M.S., "Concrete Technology Theory and Practice", 8 th Edition, S.Chand& Company Ltd., New Delhi, 2019.
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REFERENCES/ MANUAL / SOFTWARE:

1.	Neville A.M, "Concrete Technology", 27 th Edition, Pearson India Education Services, 2020.
2.	Santhakumar A.R., "Concrete Technology", 2 nd Edition, Oxford University Press India, 2021.

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	explain and assess the properties of the ingredients of concrete											Applying (K3), Manipulation (S2)
CO2	design mix proportions for concrete with and without admixtures											Applying (K3), Manipulation (S2)
CO3	determine the fresh and hardened properties of concrete											Applying (K3), Manipulation (S2)
CO4	explain and assess the durability performance of concrete											Applying (K3), Manipulation (S2)
CO5	infer the types of special concrete with its characteristics and applications											Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	2			3		2			3	3			3	3	2
CO2	3	2	3			3							3	3	2
CO3	3	2	3	3		3			3	3			3	3	2
CO4	3	2	3	3	3	2			3	3			3	3	2
CO5	2			3		2	3		3	3			3	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CET31 - MECHANICS OF MATERIALS

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Engineering Mechanics	3	PC	3	1	0	4
Preamble	This course imparts knowledge about stresses, strains, shear force, bending moment, slope and deflection in beams, concept of torsion in circular shaft and theory of columns.						
Unit – I	Stresses and Strain:						
Introduction – Types of loads – Stability - Stresses and strains – Stress and strain diagram for steel – Elastic limit - Hooke's law – Poisson's ratio – Elastic constants – Young's modulus – Shear modulus – Bulk modulus - Thermal stresses – Compound stresses - Factor of Safety - Deformation of simple and compound bars.							
Unit – II	Shear Force and Bending Moments in Beams:						
Types of beams – Types of supports and loads – Plane bending – Oblique bending – Bending moment and Shear force – Sign conventions - Point of contraflexure – Clockwise and anti-clockwise moments – Shear force and bending moment diagrams for concentrated load, uniformly distributed load, uniformly varying load and Couples.							
Unit – III	Stresses in Beams:						
Simple Bending - Bending stress – Assumptions – Theory of simple bending and bending equation – Complementary shear – Load Carrying capacity — Applications of bending equation - Shear stress distribution in beam.							
Unit – IV	Deflection of Beams and Torsion:						
Beam Deflection – Slope - Sign conventions - Double integration method – Macaulay's Method - Moment area method – Mohr's Theorems - Conjugate beam theorems - Conjugate beam method. Simple torsion – Torsional loads – Torsion equation for circular shafts and hollow circular shafts – Assumptions - Torsional rigidity - Power transmission – Modulus of rupture.							
Unit – V	Theory of column:						
Column and strut – Classification of columns - Slenderness ratio – Buckling load and factor - Effective length – Various end conditions - Euler's theory, assumptions, formula and limitations - Rankine's formula – Crippling load and Safe load.							
Lecture:45, Tutorial:15, Total:60							
TEXT BOOK:							
1.	Rajput R.K., Strength of Materials, 7 th Edition, S. Chand & Company Ltd, New Delhi, 2018.						
REFERENCES:							
1.	Subramanian R., Strength of Materials, 3 nd Edition, Oxford University Press, 2016.						
2.	Popov E P, Mechanics of Materials, 4 th Edition, Prentice Hall of India, 2016.						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	determine the various types of stresses and strain												Applying (K3)
CO2	draw the shear force and bending moment diagram for beams under various loading conditions												Applying (K3)
CO3	analyze the bending and shear stresses in beams												Analyzing (K4)
CO4	assess the slope and deflection in beams												Analyzing (K4)
CO5	analyze the torsional behavior and compute the critical load on columns												Analyzing (K4)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										3	3
CO2	3	3	2										3	3
CO3	3	3	2										3	3
CO4	3	3	2										3	3
CO5	3	3	2										3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		10	90				100
CAT2		10	50	40			100
CAT3		10	50	40			100
ESE		10	50	40			100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	predict the properties and characteristics of fluids													Applying (K3)
CO2	calculate the velocity and discharge of flow													Applying (K3)
CO3	calculate the characteristics of pipe flow													Applying (K3)
CO4	design the most economical channel sections													Applying (K3)
CO5	solve complex fluid problems													Applying (K4)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	2				3	3	2					2	3	3
CO2	3	2				3	3	2					2	3	3
CO3	3	2				3	3	2					2	3	3
CO4	3	3	2			3	3	2					2	3	3
CO5	3	3				3	2	2					2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		30	70				100
CAT2		30	70				100
CAT3		20	20	60			100
ESE		10	70	20			100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES:												BT Mapped (Highest Level)	
On completion of the course, the students will be able to													
CO1	articulate the importance of planning and scheduling in construction projects												Applying (K3)
CO2	estimate the resource requirement for construction projects												Applying (K3)
CO3	infer the various quality elements and its importance for construction materials												Understanding (K2)
CO4	prepare schedule and budgeted cost associated with construction activities												Applying(K3)
CO5	apply the safety codes and standards to improvise the safety culture at job site												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1			3				1	1		3	2
CO2	3	2	1			3					2	1	3	3
CO3	3	2	1			3					2	1	3	3
CO4	3	2	1			3					2	1	3	3
CO5	3	2	1			3					2	1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEL31 - STRENGTH OF MATERIALS LABORATORY																																	
Programme & Branch		B.E. & CIVIL ENGINEERING							Sem.	Category	L	T	P	Credit																			
Prerequisites		Nil							3	ES	0	0	2	1																			
Preamble	Engineering Mechanics																																
LIST OF EXPERIMENTS / EXERCISES:																																	
1.	Tension test on metal specimens.																																
2.	Compression test on wooden specimen.																																
3.	Shear test on metal specimens																																
4.	Torsion test on metal specimen																																
5.	Impact tests on metal specimens																																
6.	Hardness tests on metal specimens																																
7.	Bending test -I –Verification of Maxwell's reciprocal theorem																																
8.	Bending test -II – Determination of young's modulus and flexural rigidity																																
9.	Test on open coil helical springs																																
10.	Test on closed coil helical springs																																
11.	Study on mechanical and electrical strain gauges																																
12.	Study on fatigue test																																
Total:30																																	
REFERENCES/ MANUAL /SOFTWARE:																																	
1.	Rajput, R.K., "Strength of Materials", 7 th Edition, S Chand & Company Limited, New Delhi, 2018.																																
2.	Laboratory Manual																																
3.	Experimental Videos Developed by Faculty																																
4.	IS 8728-2015 (Part-1), IS883-1961, IS5242-1979, IS1598-1977, IS1757-1988, IS1499-1977, IS1586-2012, IS7906-2004 code books																																
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)																							
CO1	inspect the behavior of various materials under tension, compression, shear and torsion										Applying (K3) Manipulation (S2)																						
CO2	analyze the Impact strength and hardness strength of the material										Analyzing(K4) Manipulation (S2)																						
CO3	investigate strength of materials under stiffness and strain										Analyzing(K4) Manipulation (S2)																						
Mapping of COs with POs and PSOs																																	
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2																			
CO1	3	3	2	3	2				3	3			3	3																			
CO2	3	3	2	3	2				3	3			3	3																			
CO3	3	3	2	2	3				3	3			3	3																			

22CEL32 - FLUID MECHANICS AND HYDRAULICS ENGINEERING LABORATORY

Programme & Branch	B.E. & CIVIL ENGINEERING						Sem.	Category	L	T	P	Credit		
Prerequisites	Physics for Civil Engineering						3	PC	0	0	2	1		
Preamble	This course helps the students to determine the various flow and the characteristics of various hydraulic machines													
LIST OF EXPERIMENTS / EXERCISES:														
1.	Determination of co-efficient of discharge through orifice and mouthpiece													
2.	Determination of co-efficient of discharge of rectangular and triangular notches													
3.	Determination of co-efficient of discharge of venturimeter through Bernoulli's equation													
4.	Determination of co-efficient of discharge of orificemeter through Bernoulli's equation													
5.	Impact of jet on vanes - Efficiency determination													
6.	Determination of friction loss in pipes													
7.	Determination of various types of minor losses in pipes													
8.	Evaluation of the performance characteristics of Pelton turbine													
9.	Evaluation of the performance characteristics of Francis turbine													
10.	Evaluation of the performance characteristics of centrifugal pump													
11.	Evaluation of the performance characteristics of reciprocating pump													
12.	Evaluation of the performance characteristics of submersible pump													
Total:30														
REFERENCES/ MANUAL /SOFTWARE:														
1.	Laboratory Manual													
2.	Bansal. R.K. "A Text Book of Fluid Mechanics and Hydraulics Engineering", 10 th Edition, Laxmi Publications, New Delhi, 2019.													
3.	Modi P.N. and Seth, S.M., "Hydraulics and Fluid Mechanics including Hydraulic Machines", Rajsors Publications Pvt. Ltd., 21 st Edition, 2017.													
COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)		
CO1	determine the rate of flow under different flow characteristics											Applying(K3) Manipulation (S2)		
CO2	compute the major and minor losses in pipe flow											Applying (K3) Manipulation (S2)		
CO3	determine the performance characteristic of pumps and turbines											Analyzing (K4) Manipulation (S2)		
Mapping of Cos with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2		3			1			2	3	3
CO2	3	2	1	2		3			1			2	3	3
CO3	3	3	2	2		3			1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

22MNT31 - ENVIRONMENTAL SCIENCE																								
(Common to All Engineering and Technology Branches)																								
Programme & Branch	All B.E/B.Tech Branches							Sem.	Category	L	T	P	Credit											
Prerequisites	Nil							3 / 6	MC	2	0	0	0											
Preamble	This course provides an approach to understand the various natural resources, ecosystem, bio-diversity, pollution control & monitoring methods for sustainable life and also to provide knowledge and to create awareness for engineering students on biological sciences.																							
Unit – I	Environmental Studies and Natural Resources																							
Introduction to Environmental Science – uses, over-exploitation and conservation of forest, water, mineral, food, energy and land resources–case studies																								
Unit – II	Ecosystem and Biodiversity																							
Ecosystems: concept and components of an ecosystem -structural and functional features – Functional attributes (Food chain and Food web only). Biodiversity: Introduction – Classification – Bio geographical classification of India- Values of biodiversity – Threats and Conservation of biodiversity - case studies.																								
Unit – III	Environmental Pollution																							
Environmental Pollution: Definition – causes, effects and control measures of: (a) Air pollution - Climate change, global warming, acid rain, ozone layer depletion (b) Water pollution (c) Soil pollution - Role of an individual in prevention of pollution - case studies.																								
Unit – IV	Environmental Monitoring																							
Sustainability -three pillars of sustainability- factors affecting environmental sustainability-approaches for sustainable development - Introduction to EIA - objectives of EIA - environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act.																								
Unit – V	Introduction to Biological Science																							
Functions of Carbohydrates, lipids, proteins and nucleic acids - Cells and its organelles - plasma membrane, mitochondria and nucleus- Heredity and DNA - organization of DNA in cells - Genes and chromosomes- Cell division -Types of cell division- mitosis & meiosis - Cell cycle and molecules that control cell cycle.																								
Total:25																								
TEXT BOOK:																								
1.	Anubha Kaushik, and Kaushik C.P., "Environmental Science and Engineering", 6th Multicolour Edition, New Age International Pvt. Ltd., New Delhi, 2018, for Unit-I, II, III, IV.																							
2.	Rastogi.SC, "Cells and Molecular Biology", 2 nd Edition, reprint, New Age International (P) Limited Publishers, New Delhi, 2008, for Unit-V.																							
REFERENCES:																								
1.	Palanisamy P.N., Manikandan P., Geetha A., Manjula Rani K., Kowshalya V.N., "Environmental Science", Pearson Education, New Delhi, Revised Edition 2019.																							
2.	Mukhtar Ahmad, "Text book of modern biochemistry", Volume I & II, Oxford & IBH Publishing Co. Pvt. LTD, Delhi, 1995.																							
COURSE OUTCOMES:																								
On completion of the course, the students will be able to																								
BT Mapped (Highest Level)																								
CO1	illustrate the various natural resources and role of individual for its conservation										Understanding (K2)													
CO2	elaborate the features of ecosystem and biodiversity to find the need for conservation.										Understanding (K2)													
CO3	manipulate the sources, effects and control methods of various environmental pollution.										Applying (K3)													
CO4	make use of the knowledge of EIA and environmental legislation laws towards sustainability.										Applying (K3)													
CO5	explain the functions of carbohydrates, lipids, proteins, nucleic acids, Cells and its organelles										Understanding (K2)													
Mapping of COs with POs and PSOs																								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2										
CO1	2	1					3																	
CO2	2	1					3																	

CO3	3	2	1				3									
CO4	3	2	1					3								
CO5	3	1														

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	NA						
ESE	NA						

* ±3% may be varied (CAT 1, 2 – 50 marks)

22EGL31 - COMMUNICATION SKILLS DEVELOPMENT LABORATORY

(Common to All Engineering and Technology Branches)

Programme & Branch	All B.E./B.Tech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	3 / 4	HS	0	0	2	1

Preamble	This course is designed to impart necessary skills to listen, speak, read and write in order to obtain better professional communication skills.
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LIST OF EXPERIMENTS / EXERCISES:

1. Self Introduction & Mock Interview
2. Job Application letter with Resume
3. Presentation: A Technical topic / Project report & a Case study
4. Situational Dialogues / Telephonic Conversations
5. Group Discussion
6. Reading Aloud
7. Listening Comprehension
8. Writing Company Profiles
9. Preparing reviews of a book/product/movie
10. Pronunciation Test

Total:30

REFERENCES/ MANUAL /SOFTWARE:

1. Lab Manual
2. Orell Digital Language Lab Software

COURSE OUTCOMES:

On completion of the course, the students will be able to

**BT Mapped
(Highest Level)**

CO1	enhance effective listening and reading skills	Understanding (K2), Imitation (S1)
CO2	acquire professional skills required for workplace/higher education	Applying (K3), Naturalization (S5)
CO3	use English language skills effectively in various situations	Applying (K3), Articulation (S4)

Mapping of Cos with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									2	3		3
CO2									2	2		2
CO3									2	2		2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply various numerical techniques to solve algebraic and transcendental equations.												Applying (K3)
CO2	perform interpolation on given data using standard numerical techniques.												Applying (K3)
CO3	understand the concepts of numerical differentiation and integration												Applying (K3)
CO4	compute the solution of first order ordinary differential equations by numerical techniques..												Applying (K3)
CO5	apply various numerical techniques for solving partial differential equations.												Applying (K3)

Mapping of Cos with POs and PSOs

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1											
CO2	3	2	2											
CO3	3	3	2											
CO4	3	2	1											
CO5	3	3	3											

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	10	80	-	-	-	100
CAT2	10	10	80	-	-	-	100
CAT3	10	10	80	-	-	-	100
ESE	10	10	80	-	-	-	100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	determine the index properties of soil and solve problems related to three phase system												Applying (K3), Manipulation (S2)
CO2	determine permeability characteristics and solve the problems related to effective stress and seepage												Applying (K3), Manipulation (S2)
CO3	compute vertical stress distribution and settlement in soil												Applying (K3), Manipulation (S2)
CO4	calculate the settlement of soil												Applying (K3), Manipulation (S2)
CO5	explain shear strength parameters for various soil conditions												Understanding (K2), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	3	3	3		3			3	3			3	3	2
CO2	3	3	3	3		3			3	3			3	3	3
CO3	3	3	2	1		3							3	3	3
CO4	3	3	2	1		3			3	3			3	3	3
CO5	3	3	2	1		3			3	3			3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEC42 – ENVIRONMENTAL ENGINEERING

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Chemistry for Civil Engineering	4	PC	2	0	2	3
Preamble	The course aims to impart knowledge on water and sewage occurrence, distribution, treatment and disposal techniques.						
Unit – I	Water Supply, Source and Conveyance:						
Objectives and Factors influencing Public Water Supply systems – Sources of water – Population Forecasts – Water quality parameters and standards – Intake Structures – Laying, Jointing and Testing of pipelines – Pipe Appurtenances.							
Unit – II	Principles of Treatment:						
Basic principles of water treatment – Unit processes and operations – Screens –Grit chamber – Design of sedimentation tanks – Design of Filters – Disinfection methods – Water Softening Methods.							
Unit – III	Collection and Conveyance of Sewage:						
Sources and characteristics of wastewater – Quantity – Storm runoff estimation – Minimum and Maximum velocity – Laying, jointing and testing of sewers – Layout of Sewage treatment plant – Sewer appurtenances.							
Unit – IV	Principles of Sewage Treatment:						
Basic principles of biological treatment – Principles and operation of Trickling filter– Activated sludge process and its Modifications – Aeration process and types – Oxidation Ditch – Waste stabilization ponds – Principles and Design of Septic tanks.							
Unit – V	Sewage Disposal and Rural Sanitation:						
Objectives of sludge treatment – Properties of sludge –Sludge Digestion – Oxygen sag curve – Sanitary fixtures – One pipe and Two pipes systems – Rural sanitation system – Environmental Protection Acts.							
LIST OF EXPERIMENTS / EXERCISES:							
1.	Sampling and preservation methods of water and wastewater						
2.	Determination of i) Ph and turbidity ii) Hardness						
3.	Determination of Acidity & Alkalinity						
4.	Determination of Chlorides						
5.	Determination of Sulphates						
6.	Determination of Optimum Coagulant Dosage						
7.	Determination of dissolved oxygen						
8.	Determination of Total Dissolved Solids and Suspended Solids						
9.	Determination of B.O.D						
10.	Determination of C.O.D						
Lecture:30, Practical:30, Total:60							
TEXT BOOK:							
1.	Garg S.K., "Environmental Engineering- Vol. I & II", 33 rd & 39 th Edition, Khanna Publishers, New Delhi, 2010 & 2019.						
REFERENCES/ MANUAL / SOFTWARE:							
1.	Metcalf and Eddy, " Waste Water Engineering: Treatment and Reuse", 4 th Edition, McGraw-Hill, New Delhi, 2017.						
2.	Laboratory Manual						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	estimate the population, analyse the water demand and properties of water												Applying (K3), Manipulation (S2)
CO2	classify the water purification methods and analyse the oxygen demand												Applying (K3), Manipulation (S2)
CO3	calculate the quantity of waste water generated from various sources												Applying (K3), Manipulation (S2)
CO4	design the principal components of sewage treatment plant												Applying (K3), Manipulation (S2)
CO5	suggest appropriate sludge treatment methods and sanitary fixtures												Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		3	3		3	3		3	3	3
CO2	3	3	3	3		3	3		3	3		3	3	3
CO3	3	3	3	2		3	3					3	3	3
CO4	3	3	3	3		3	3		3	3		3	3	3
CO5	3	3	2	2		3	3					3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the basic concept of design philosophies												Understanding (K2)
CO2	design beams for flexure, shear & torsion												Applying (K3)
CO3	design different types of slabs and dog-legged staircase												Applying (K3)
CO4	categorize the column and apply the appropriate design procedure												Applying (K3)
CO5	design axially and eccentrically loaded isolated footing												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			3				2			3	3
CO2	3	3	2			3				2			3	3
CO3	3	3	2			3				2			3	3
CO4	3	3	2			3				2			3	3
CO5	3	3	2			3				2			3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		60	40				100
CAT2		20	80				100
CAT3		20	80				100
ESE		20	80				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CET42 - STRUCTURAL ANALYSIS

Programme& Branch	B.E. & Civil Engineering	Sem.	Category	L	T	P	Credit
Prerequisites	Mechanics of Materials	4	PC	3	1	0	4
Preamble	This course offers the various methods for the analysis of determinate and indeterminate structures. It aims at the determination of end moments and constructing shear force and bending moment diagrams for the continuous beams and portal frames. It also involves the analysis of structures for moving loads.						
Unit – I	Slope Deflection Method:						
Introduction to displacement method of analysis – Sign Conventions – Development of slope deflection equations – Analysis of continuous beams – Analysis of continuous beams with support settlement – Analysis of non-sway frames –Analysis of sway frames.							
Unit – II	Moment Distribution Method:						
Introduction to moment distribution method – Stiffness factor – Carryover factor and distribution Factor –Analysis of continuous beams –Sinking of supports – Analysis of non-sway frames – Analysis of sway frames.							
Unit – III	Flexibility Matrix Method:						
Introduction – Static and kinematic indeterminacy – Equilibrium and compatibility conditions – Primary structure– Element and global flexibility matrix – Applications – Analysis of indeterminate beams, frames and trusses (Redundancy restricted to two).							
Unit – IV	Stiffness Matrix Method:						
Introduction to matrix methods of analysis – Displacement and force transformation matrices – Element and global stiffness matrix – Applications – Analysis of indeterminate beams – Analysis of portal frames – Analysis of trusses (Redundancy restricted to two).							
Unit – V	Moving Loads and Influence Lines:						
Influence lines for reactions in statically determinate structures – Influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Muller Breslau's principle –Influence lines for continuous beams (2-degree redundant structures)							
Lecture:45, Tutorial:15, Total:60							
TEXT BOOK:							
1.	Devdas Menon, Structural Analysis, 2 nd Edition, Narosa Publishing House, New Delhi, 2018.						
REFERENCES:							
1.	Hibbeler, R.C, Structural Analysis, 10 th Edition, Pearson India, Bengaluru, 2018.						
2.	Punmia.B.C, Ashok K.Jain, ArunK.Jain, Theory of Structures, 13 th Edition, Laxmi Publications, New Delhi, 2017						
3.	Bhavaikatti, S.S, "Structural Analysis – Volume 1 & Volume 2", 5 th Edition, Vikas Publishing Pvt Ltd., New Delhi, 2021.						

COURSE OUTCOMES:												BT Mapped (Highest Level)	
On completion of the course, the students will be able to													
CO1	evaluate shear force and bending moment for beams and rigid frames using slope deflection method												Analyzing (K4)
CO2	determine the bending moment of beams and rigid frames using moment distribution method												Analyzing (K4)
CO3	determine the bending moment using flexibility matrix methods												Analyzing (K4)
CO4	determine the bending moment using stiffness matrix method												Analyzing (K4)
CO5	analyse the beams subjected to moving loads												Analyzing (K4)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2			2						3	3	3
CO2	3	3	2			2						3	3	3
CO3	3	3	2			2						3	3	3
CO4	3	3	2			2						3	3	3
CO5	3	3	2			2						3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		10	40	50			100
CAT2		10	40	50			100
CAT3		10	40	50			100
ESE		10	40	50			100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEL41 - COMPUTER AIDED BUILDING INFORMATION MODELLING LABORATORY

Programme & Branch	B.E. & CIVIL ENGINEERING				Sem.	Category	L	T	P	Credit				
Prerequisites	Computer Aided Building Drawing Laboratory				4 / 5	PC	0	0	2	1				
Preamble	This course facilitates efficient design, documentation, better coordination, simulation and visualization of a building through modelling process.													
LIST OF EXPERIMENTS / EXERCISES:														
1.	Modeling of Building Components – Walls, Doors, windows													
2.	Modeling of Building Components – Floor, Roof, Staircase													
3.	Modeling of Building Components – Beam, Column & Foundation													
4.	Create Plan, Section and elevation of a single storey Residential building													
5.	Create Plan, Section and elevation of a multi storey Residential building													
6.	Create Plan, Section and elevation of an Industrial building													
7.	Create walkthrough for a simple residential building													
8.	Documentation and quantity take off for a building													
9.	Detailing and bar bending schedule of beam													
10.	Detailing and bar bending schedule of column													
11.	Detailing and bar bending schedule of slab													
12.	Detailing and bar bending schedule of staircase													
Total:30														
REFERENCES/ MANUAL /SOFTWARE:														
1.	Revit Architecture Software													
2.	Primavera													
3.	Laboratory Manual													
COURSE OUTCOMES:											BT Mapped (Highest Level)			
On completion of the course, the students will be able to														
CO1	apply the BIM concept civil projects										Applying (K3), Manipulation (S2)			
CO2	visualize and document of building components										Applying (K3), Manipulation (S2)			
CO3	take quantity of various material used in the building										Applying (K3), Manipulation (S2)			
Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3				3	3	3	3	3	3
CO2	3	2	3	3	3				3	3	3	3	3	3
CO3	3	2	3	3	3				3	3	3	3	3	3

22CEL42 - COMPUTER AIDED STRUCTURAL DESIGN LABORATORY – I (IS 456:2000, IS 3370:2009, SP 16, IS 800:2007, SP 06, IS 875 and SP 38 are permitted)																												
Programme & Branch		B.E. & CIVIL ENGINEERING				Sem.	Category	L	T	P	Credit																	
Prerequisites		Mechanics of Materials				4	PC	0	0	2	1																	
Preamble	This course gives knowledge about how to analyze and design the various components of the different types of the structure using ETABS software																											
LIST OF EXPERIMENTS / EXERCISES:																												
1.	Introduction & Modelling of different types of elements																											
2.	Load and load combinations																											
3.	Analysis and design of beams																											
4.	Analysis of single storied frame																											
5.	Design of single storied frame structural elements																											
6.	Analysis of multi- storied frame																											
7.	Design of multi- storied frame structural elements (Design of slabs & beams)																											
8.	Design of multi- storied frame structural elements (Design of columns & footings)																											
9.	Analysis of plane truss																											
10.	Analysis of space truss																											
Total:30																												
REFERENCES/ MANUAL /SOFTWARE:																												
1.	ETABS Software																											
2.	Lab Manual																											
3.	S.N.Sinha, Reinforced Concrete Design, Tata Mcgraw Hill Education, 4 th Edition, 2018																											
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)																		
CO1	analyze the different types of structures									Analyzing (K4), Manipulation (S2)																		
CO2	analyze and design of reinforced concrete elements									Analyzing (K4), Manipulation (S2)																		
CO3	analyze the steel structures									Analyzing (K4), Manipulation (S2)																		
Mapping of COs with POs and PSOs																												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2														
CO1	3	3	2	3	3	2			3	3		3	3	3														
CO2	3	3	2	3	3	2			3	3		3	3	3														
CO3	3	3	2	3	3	2			3	3		3	3	3														

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	develop the soft skills of learners to support them work efficiently in an organization as an individual and as a team												Applying (K3), Precision (S3)
CO2	solve real time problems using numerical ability and logical reasoning												Applying (K3), Precision (S3)
CO3	apply English language skills for various academic and professional purposes												Applying (K3), Precision (S3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				3	3		3		3	2		
CO2	3	2				3	3		3		3	2		
CO3		2					3	3		3	3	3	2	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	50	30				100
CAT2		50	50				100
CAT3		50	50				100
Assessment Test		50	50				100

* ±3% may be varied (CAT 1,2,3 - 50 marks & Assessment Test – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Infer the knowledge of highway planning and testing of materials												Understanding (K2) Manipulation (S2)
CO2	analyze the geometric design elements of highway												Applying (K3) Manipulation (S2)
CO3	apply the design procedure of flexible and rigid pavement												Applying (K3) Manipulation (S2)
CO4	analyze the characteristics of traffic and accident data												Applying (K3) Manipulation (S2)
CO5	design traffic signals and elaborate intersections with traffic control												Applying (K3) Manipulation (S2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	3				3							3	3
CO3	3	2				3							3	3
CO4	3	3				3							3	3
CO5	3	2				3							3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the process of site investigation and select geotechnical design parameters and type of foundation												Understanding (K2)
CO2	determine bearing capacity and settlement of shallow foundations												Applying (K3)
CO3	design combined footings and raft foundations, its component or process as per the needs and specifications												Applying (K3)
CO4	calculate the load carrying capacity and settlement of pile foundation												Applying (K3)
CO5	estimate the pressures on the earth retaining structures												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	2				2				1			2	3	3
CO2	3	2	2			3							2	3	3
CO3	3	2	2			3							2	3	3
CO4	3	2	2			3							2	3	3
CO5	3	3	2			3							2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	identify the components of water storage structures along with its functions											Applying (K3)
CO2	infer the importance of water resource management											Applying (K3)
CO3	compute the delta, duty relationship and irrigation efficiency											Applying (K3)
CO4	identify the types of canal irrigation and analyze the functions of diversion head works											Applying (K3)
CO5	apply participatory irrigation management and infer the types of irrigation methods											Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO 1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO11	PO1 2	PSO1	PSO2
CO1	3	2	2			3						2	3	3
CO2	2	1				3							3	2
CO3	3	2	2			3						2	3	3
CO4	3	2	2			3						2	3	3
CO5	3	2	2			3						2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	discriminate the various connection methods												Analyzing (K4)
CO2	analyse and design the various profiles of tension members												Analyzing (K4)
CO3	analyse and design compression members												Analyzing (K4)
CO4	discriminate and design the flexural members												Analyzing (K4)
CO5	examine and design the roof truss												Analyzing (K4)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	3	2			3				1			2	3	3
CO2	3	3	2			3				1			2	3	3
CO3	3	3	2			3				1			2	3	3
CO4	3	3	2			3				1			2	3	3
CO5	3	3	2			3				1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		20	40	40			100
CAT2		20	40	40			100
CAT3		20	40	40			100
ESE		20	40	40			100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEL51 - COMPUTER AIDED STRUCTURAL DESIGN LABORATORY-II (Use of IS 456:2000, IS 3370:2009, SP 16, SP 34, IS 800:2007, IS1893-2002, IS13920-2016, Steel Tables, IS 875 and SP 38 code books are permitted)

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Structural Analysis, Design of RC elements & Design of steel structures	5	PC	0	0	2	1
Preamble	This course gives knowledge about how to design and detailing the various components of the different types of the structure using STAAD Pro software						
LIST OF EXPERIMENTS / EXERCISES:							
1.	Analysis and design of continuous beam with various loading						
2.	Analysis of single storey RCC building						
3.	Design of single- storey RCC building elements						
4.	Analysis of multi- storey RCC building						
5.	Design of multi- storey RCC building elements						
6.	Wind load analysis of RCC buildings						
7.	Earthquake analysis of RCC structure						
8.	Analysis and design of shear wall						
9.	Analysis and design of RCC rectangular elevated water tank						
10.	Analysis and design of an industrial building (Steel Structure)						
11.	Analysis and design of transmission line tower						
12.	Mini Project						

Total:30

REFERENCES/ MANUAL /SOFTWARE:	
1.	STAAD. Pro V8i
2.	Lab Manual
3.	Punmia B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Comprehensive Design of Steel Structures, 2 nd Edition, Laxmi Publications Pvt. Ltd., 2012.

COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)
CO1	analyze the RCC structures for various loading									
CO2	analyze and design the RCC elements as per IS code									
CO3	analyze and design the steel structures									

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3		3		1	1			2	3	3
CO2	3	3	2	3		3		1	1			2	3	3
CO3	3	3	2	3		3		1	1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

22CEL52 - COMPUTATIONAL LABORATORY FOR CONSTRUCTION MANAGEMENT																																			
Programme& Branch		B.E. & CIVIL ENGINEERING					Sem.	Category	L	T	P	Credit																							
Prerequisites		Nil					5	PC	0	0	2	1																							
Preamble		To impart knowledge about modelling software in construction																																	
LIST OF EXPERIMENTS / EXERCISES:																																			
1.	Introduction to Project Management tools for construction Projects																																		
2.	Assigning Calendars to Project and its Activities																																		
3.	Prepare Network diagram for a Construction Project using CPM																																		
4.	Prepare Network diagram for a Construction Project using PERT																																		
5.	Assigning and Allocation of Resources																																		
6.	Levelling and smoothing of allocated resources																																		
7.	Cost analysis of a Construction Project																																		
8.	Tracking of a Construction Project (Include the application of BIM in construction Management)																																		
9.	3D and 4D applications of BIM in Construction Projects																																		
10.	Management of Multiple projects in Construction																																		
Total:30																																			
REFERENCES/ MANUAL /SOFTWARE:																																			
1.	Carl S Chatfield and Timothy D Johnson, "Microsoft Project 2016 Step by Step", 1st Edition, Pearson Publication, 2016.																																		
2.	Laboratory Manual																																		
3.	Microsoft Project																																		
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)																									
CO1	prepare network diagram for a Construction project using CPM & PERT									Applying (K3), Manipulation (S2)																									
CO2	allocate and smoothening of resources in construction projects									Applying (K3), Manipulation (S2)																									
CO3	apply the BIM dimensions in Construction Projects									Applying (K3), Manipulation (S2)																									
Mapping of COs with POs and PSOs																																			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2																					
CO1	3	2	1	3	1	3			1	2		2	3	3																					
CO2	3	3	2	3	2	3			1	2		2	3	3																					
CO3	3	3	2	3	2	3			1	2		2	3	3																					

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	compute quantities of various items for load bearing and framed structures											Applying (K3)
CO2	calculate the quantities of various items for other structures											Applying (K3)
CO3	analyse the rates for various items of works											Analyzing (K4)
CO4	carry out valuation of plots and buildings											Applying (K3)
CO5	prepare tenders, contract documents and reports as per norms											Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	2	1			3			2				2	3	2
CO2	3	2	1			3	2	1	2		2		3	3	2
CO3	3	3	2			3			2				2	3	2
CO4	3	3	1			3	2		2		2		2	3	2
CO5	3	3	1			3		1	2		2		2	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		50	50				100
CAT2		30	40	20			100
CAT3		40	60				100
ESE		30	50	20			100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CET62 - PRE-ENGINEERED BUILDINGS

Programme& Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Design of steel structures	6 / 7	PC	3	0	0	3
Preamble	This course offers the design of pre-engineered buildings as per limit state method. It aims at determination of safe as well as economical steel section for various industrial and framed structures						
Unit – I	Basics of Metal Building Systems						9
Introduction to metal building systems – Origin - Advantages and disadvantages – Industry groups – MBMA – AISI – MBCEA – NAIMA – MCA – NRCA – LGSI – CCFSS – Structural loads – Loads and load combinations – Structural behavior – Structural system selection criteria.							
Unit – II	Primary Framing						9
Available systems – Tapered beams – Single span rigid frame – Multi span rigid frame –Single span and continuous trusses – Framing systems - Lean to framing – Role of frame bracing – End wall framing							
Unit – III	Secondary Framing						9
Girts and Purlins – Types of purlins for metal building systems - Design of cold-formed framing – Cold-formed steel purlins - Purlin bracings – Cold-formed steel girts – Hot rolled steel girts - Eave struts							
Unit – IV	Metal roofing and Wall Materials						9
Types of metal roofs – Seam configurations – Through fastened Roofing – Structural standing-seam roof – Insulated structural panels – Architectural metal roofing – Panel finishes – Site-formed metal panels - Wind uplift ratings of metal roofs – Roofing selection and construction. Wall Materials - Metal panels – Hard walls – Single-Wythe Masonry – Brick veneer walls – Combination walls – Concrete Materials – selection of wall system							
Unit – V	Foundation for Metal Building Systems						9
Soil investigation program – Difference between conventional foundation and foundation for metal building system – Estimation of column reaction –Methods of resisting lateral reactions – Anchor bolt and base plates – Design of slabs on grade							
Total:45							
TEXT BOOK:							
1.	Alexander Newman, "Metal Building Systems", 3 rd Edition, McGraw Hill, 2014.						
REFERENCES:							
1.	Subramanian N., "Design of Steel Structures Limit States Method", 2nd Edition, Oxford University Press, New Delhi, 2016.						
2.	Bhavikatti S.S., "Design of Steel Structures", 5th Edition, I.K. International Publishing House Pvt. Ltd., New Delhi, 2017.						
3.	Duggal S., "Design of Steel Structures", 3rd Edition, McGraw Hill Education, 2017.						

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	identify and explain the components of metal building system												Applying (K3)
CO2	select the primary framing system												Applying (K3)
CO3	choose secondary framing system												Applying (K3)
CO4	explain the metal roofing and wall materials for PEB structures												Understanding (K2)
CO5	select a suitable foundation for a PEB structure												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1										3	3
CO2	3	2	1										3	3
CO3	3	2	1										3	3
CO4	3	2	1										3	3
CO5	3	2	1										3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEL61 - STRUCTURAL ENGINEERING LABORATORY																																			
Programme& Branch		B.E. & CIVIL ENGINEERING					Sem.	Category	L	T	P	Credit																							
Prerequisites		Nil					6	PC	0	0	2	1																							
Preamble		This course demonstrates the test methods to study the behaviour of concrete with different proportions of ingredients and behaviour of beams under different loaded and environment conditions.																																	
LIST OF EXPERIMENTS / EXERCISES:																																			
1.	Determine the workability of Self-Compacting Concrete																																		
2.	Determine the effect of water/cement ratio on workability and strength of concrete																																		
3.	Determine the effect of fine aggregate-coarse aggregate ratio on strength of concrete																																		
4.	Determine the stress - strain relationship for concrete																																		
5.	Determine the correlation between cube strength& cylinder strength																																		
6.	Determine the rate of corrosion of steel in concrete																																		
7.	Determine the behaviour of steel beam under flexure																																		
8.	Determine the behaviour of reinforced concrete beam under flexure																																		
9.	Study on behaviour of beams under shear																																		
10.	Study on behaviour of under reinforced and over reinforced beams																																		
Total:30																																			
REFERENCES/ MANUAL /SOFTWARE:																																			
1.	Laboratory Manual																																		
COURSE OUTCOMES:																																			
On completion of the course, the students will be able to																																			
CO1	determine the fresh and hardened properties of concrete										BT Mapped (Highest Level)																								
CO2	relate the strength parameters of concrete										Analyzing (K4), Manipulation (S2)																								
CO3	analyse the behaviour of beams under flexure and shear										Analyzing (K4), Manipulation (S2)																								
Mapping of COs with POs and PSOs																																			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2																					
CO1	3	2	1	3	1	3		1	1			2	3	3																					
CO2	3	2	1	3	1	3		1	1			2	3	3																					
CO3	3	3	2	3	2	3		1	1			2	3	3																					

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

22CEL62 - COMPUTER AIDED STRUCTURAL DETAILING LABORATORY (Use of IS 456:2000, SP 16, SP 34, IS 800:2007, and SP 38 code books are permitted)																								
Programme& Branch	B.E. & CIVIL ENGINEERING						Sem.	Category	L	T	P	Credit												
Prerequisites	Design of RC elements & Design of Steel Structures						6	PC	0	0	2	1												
Preamble	This course gives knowledge about how to be detailing the various components of the structure using Tekla Structures software																							
LIST OF EXPERIMENTS / EXERCISES:																								
1.	Detailing of one-way slab																							
2.	Detailing of two-way slab																							
3.	Detailing of beams & columns																							
4.	Detailing of isolated footing																							
5.	Detailing of steel beam to beam connection																							
6.	Detailing of steel beam to column connection																							
7.	Detailing of steel column base																							
8.	Detailing of steel seated connection																							
9.	Detailing of steel truss connection																							
10.	Detailing of pre-engineered building																							
Total:30																								
REFERENCES/ MANUAL /SOFTWARE:																								
1.	Tekla structures software																							
2.	Lab Manual																							
3.	Krishna Raju N., Structural Design and Drawing - Reinforced Concrete and Steel, 4th Edition, University Press (India) Ltd., Hyderabad, 2020.																							
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)														
CO1	carry out the detailing for flexural members										Analyzing (K4), Manipulation (S2)													
CO2	carry out detailing for column and footings										Analyzing (K4), Manipulation (S2)													
CO3	Carry out detailing for various steel connections and pre-engineered building										Analyzing (K4), Manipulation (S2)													
Mapping of COs with POs and PSOs																								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2										
CO1	3	3	2	3		3		1	1			2	3	3										
CO2	3	3	2	3		3		1	1			2	3	3										
CO3	3	3	2	3		3		1	1			2	3	3										

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

22CEP61 – PROJECT WORK - I																			
Programme& Branch		B.E. & CIVIL ENGINEERING						Sem.	Category	L	T	P	Credit						
Prerequisites		Nil						6	EC	-	-	8	4						
													Total:120						
COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)							
CO1	prepare plan, section and elevation of a civil engineering structure as per NBC											Creating (K6)							
CO2	analysing the structure in accordance with relevant IS codes											Analyzing (K4)							
CO3	design the structure in accordance with relevant IS codes											Applying (K3)							
CO4	calculate quantity and rate for the civil engineering structure as per PWD schedule of rates											Applying (K3)							
CO5	prepare and present the project report											Applying (K3)							
Mapping of COs with POs and PSOs																			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2					
CO1	3	2	1	2	1	3	2	3	3	3	3	3	3	3					
CO2	2	2	2	2		3		1	1	3	2	3	3	3					
CO3	2	2	2	2	1	3		3	3	3	3	3	3	3					
CO4	2	2	2	3	3	3	3	3	3	3	3	3	3	3					
CO5	2	2	2	2	2	3		1	1	2	2	3	3	3					

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	restate the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society												Applying (K3)
CO2	distinguish between the Self and the Body, understand the meaning of Harmony in the Self, the Co-existence of Self and Body												Applying (K3)
CO3	infer 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												Applying (K3)
CO4	transform themselves to co-exist with nature by realising interconnectedness and four order of nature												Applying (K3)
CO5	distinguish between ethical and unethical practices, and extend ethical and moral practices for a better living												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1										
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2	1	1										
CO5	3	2	1	1										

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	75					100
CAT2	25	75					100
ESE	NA						100

* ±3% may be varied (CAT 1&2 – 60 marks & ESE – 100 marks)

22CEP62 – PROJECT WORK - I

Programme& Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	6	EC	-	-	10	5

Total:150

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	prepare plan, section and elevation of a civil engineering structure as per NBC	Creating (K6)
CO2	analysing the structure in accordance with relevant IS codes	Analyzing (K4)
CO3	design the structure in accordance with relevant IS codes	Applying (K3)
CO4	calculate quantity and rate for the civil engineering structure as per PWD schedule of rates	Applying (K3)
CO5	prepare and present the project report	Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	3	2	3	3	3	3	3	3	3
CO2	2	2	2	2		3		1	1	3	2	3	3	3
CO3	2	2	2	2	1	3		3	3	3	3	3	3	3
CO4	2	2	2	3	3	3	3	3	3	3	3	3	3	3
CO5	2	2	2	2	2	3		1	1	2	2	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	identify market equilibrium and interpret national income calculations and inflation issues											Applying (K3)	
CO2	choose a suitable business ownership for their enterprise and illustrate managerial functions											Applying (K3)	
CO3	infer marketing management decisions											Understanding (K2)	
CO4	apply appropriate operation management concept in business situations											Applying (K3)	
CO5	interpret financial and accounting statements and evaluate new proposals											Applying (K3)	

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2			3		2	2	2	3	2		
CO2		1	2			2	2	2	2	2	3	2		
CO3	1	2	1			2		2	2	2	3	2		
CO4	1	2	1			2		2	2	2	3	2		
CO5	2	2				2		2	2	2	3	2		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	40	40				100
CAT2	20	40	40				100
CAT3	20	40	40				100
ESE	20	40	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

22CEP71 – PROJECT WORK - II PHASE - I																			
Programme & Branch		B.E. & CIVIL ENGINEERING						Sem.	Category	L	T	P	Credit						
Prerequisites		Nil						7	EC	0	0	10	5						
Total:150																			
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)									
CO1	identify the problem and formulate a problem statement										Applying (K3)								
CO2	summarize the literature review										Understanding (K2)								
CO3	develop a suitable methodology										Applying (K3)								
CO4	carry out experimental and/or theoretical work as per the specified methodology / design and prepare detailed drawing for various structural components using computer software										Creating (K6)								
CO5	prepare and present the project report										Applying (K3)								
Mapping of COs with POs and PSOs																			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2					
CO1	3	2	1	2	1	3	2	3	3	3	3	3	3	3					
CO2	2	2	2	2		3		1	1	3	2	3	3	3					
CO3	2	2	2	2	1	3		3	3	3	3	3	3	3					
CO4	2	2	2	3	3	3	3	3	3	3	3	3	3	3					
CO5	2	2	2	2	2	3		1	1	2	2	3	3	3					

22CEP81 – PROJECT WORK - II PHASE - II

Programme& Branch		B.E. & CIVIL ENGINEERING						Sem.	Category	L	T	P	Credit						
Prerequisites		Nil						8	EC	0	0	8	4						
Total:120																			
COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)							
CO1	identify the problem and formulate a problem statement											Applying (K3)							
CO2	summarize the literature review											Understanding (K2)							
CO3	develop a suitable methodology											Applying (K3)							
CO4	carry out experimental and/or theoretical work as per the specified methodology / design and prepare detailed drawing for various structural components using computer software											Creating (K6)							
CO5	prepare and present the project report											Applying (K3)							
Mapping of COs with POs and PSOs																			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2					
CO1	3	2	1	2	1	3	2	3	3	3	3	3	3	3					
CO2	2	2	2	2		3		1	1	3	2	3	3	3					
CO3	2	2	2	2	1	3		3	3	3	3	3	3	3					
CO4	2	2	2	3	3	3	3	3	3	3	3	3	3	3					
CO5	2	2	2	2	2	3		1	1	2	2	3	3	3					

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

COURSE OUTCOMES:												BT Mapped (Highest Level)	
On completion of the course, the students will be able to													
CO1	Concepts of prestressing and methods												Applying (K3)
CO2	Calculate Prestressed Concrete BeamsLoss of Prestress and Deflection												Applying (K3)
CO3	design the prestressed concrete structural elements												Applying (K3)
CO4	design the shear connectors												Applying (K3)
CO5	design the prestressed circular tanks and concrete poles												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	3	2			3				1			2	3	3
CO2	3	3	2			3				1			2	3	3
CO3	3	3	2			3				1			2	3	3
CO4	3	3	2			3				1			2	3	3
CO5	3	3	2			3				1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply the operation research principles for solving linear programming												Applying(K3)
CO2	assign right people at right time to right job												Applying(K3)
CO3	maintain economy in ordering materials												Applying(K3)
CO4	apply cash flow techniques for better financial management												Applying(K3)
CO5	implement the decision theory and principles for taking wise decisions												Applying(K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2				2							3	2
CO2	2	2				2							3	2
CO3	2	2				2							3	2
CO4	3	2	1			3						2	3	3
CO5	3	2	1			3						2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	describe the sources, types and characteristics of solid waste												Understanding (K2)
CO2	illustrate on-site and offsite processing methods												Applying (K3)
CO3	elucidate the collection and conveyance approaches available in solid waste sector												Applying (K3)
CO4	interpret the causes and effects of hazardous wastes with treatment techniques												Applying (K3)
CO5	recommend appropriate disposal method for solid and hazardous wastes												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3									3	2
CO2	3	2	2	2									3	3
CO3	3	3	3	3									3	3
CO4	3	3	3	3									3	3
CO5	3	3	3	3									3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the concepts of railway planning and the components and functions												Understanding (K2)
CO2	infer the modern facilities of the railway infrastructure and explain the material requirement, construction and maintenance works												Understanding (K2)
CO3	report the suitable criteria in planning and site selection of airport planning and design												Applying (K3)
CO4	analyze and design the elements for orientation of runway and passenger facility system												Applying (K3)
CO5	demonstrate the various features in harbour and port, their construction, coastal protection works and coastal regulations to be adopted												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3							3	3
CO2	2	1				3							3	3
CO3	3	2	1			3							3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3							3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	identify the geotechnical problems in various soil deposits												Applying (K3)
CO2	design and select suitable technique of dewatering												Applying (K3)
CO3	suggest suitable in-situ treatment for cohesive and cohesionless soils												Applying (K3)
CO4	recommend different soil reinforcement materials based on their application												Applying (K3)
CO5	select different types of grouting methods and stabilization techniques												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	2	1			3							1	3	3
CO2	3	2	1			3							1	3	3
CO3	3	2	1			3							1	3	3
CO4	3	2	1			3							1	3	3
CO5	3	2	1			3							1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	interpret the earth features in an satellite imagery and the sensor properties for various applications of remote sensing												Applying (K3)
CO2	recommend suitable GIS elements for storing and analyzing different remote sensing datasets												Applying (K3)
CO3	modify suitable GIS database for different remote sensing imageries using preprocessing techniques												Applying (K3)
CO4	relate the raster and vector data analyses on different remote sensing images												Applying (K3)
CO5	compute the fields of applications of remote sensing and GIS with the recent advancement techniques												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3		1	1	1			2	3
CO2	3	2	1			3		1	1	1			2	3
CO3	3	2	1			3		1	1	1			2	3
CO4	3	2	1			3	2	1	1				2	3
CO5	3	2	1			3	2						3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	determine the plastic moment capacity of structures												Analyzing (K4)
CO2	analyse the structural elements using force method												Analyzing (K4)
CO3	determine the bending moment using flexibility matrix method												Analyzing (K4)
CO4	determine the forces acting in cable structures and analyse the behaviour of various types of arches												Analyzing (K4)
CO5	analyse the behaviour of dome and shell structures												Analyzing (K4)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	3	2			2				1			2	3	3
CO2	3	3	2			2				1			2	3	3
CO3	3	3	2			2				1			2	3	3
CO4	3	3	2			2				1			2	3	3
CO5	3	3	2			2				1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		15	20	65			100
CAT2		15	20	65			100
CAT3		15	20	65			100
ESE		15	20	65			100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	design contract documents including standard and international norms.												Applying (K3)
CO2	infer about the procedures of bidding and accepting of tenders.												Understanding (K2)
CO3	summarize the duties and powers of arbitrators.												Understanding (K2)
CO4	sort out the different types of property rights and patents												Applying (K3)
CO5	apply the laws related to labour legislation in construction industry												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					2					2	2	2	2
CO2		2				2		2			2	2	2	2
CO3											2		2	2
CO4		2									2	2	2	2
CO5	2					2			3	3	2	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEE09 - ENVIRONMENTAL IMPACT ASSESSMENT

Programme& Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Environmental Engineering	6	PE	3	0	0	3

Preamble	This course imparts knowledge on EIA and to identify the impact of environmental attributes for sustainable development.
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Unit – I	Introduction:	9
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Definition – Concept of environment - Hierarchy in EIA-Initial environmental examination (IEE)- Environmental impact statement (EIS) – Environmental impact analysis – Significant environmental impacts – Stages of environmental impact analysis – Environmental impacts and stages of development - Need for EIA studies-Advantages and limitation of EIA.

Unit – II	Measurement of Environmental Impacts	9
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Measurement of physical environmental variables – Measuring social variables – Measuring of economic variables – Environmental indices – Various environmental impact assessment methods - Terms of Reference (ToR) - RIA Matrix.

Unit – III	Assessment and Mitigation Measures	9
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Definition and concepts – Water quality indicators and standards – Water impact factors – Water quality impact analysis – Mitigation measures – Aesthetic environmental impacts – Framework for visual impact assessment - Mitigation Measures and monitoring – Public participation in EIA.

Unit – IV	Legislation:	9
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The environmental protection Act-The water act- The Air (Prevention & Control of pollution Act)-EIA notification 1994 and 2006 -Wild life Act- Case studies and preparation of environmental impact assessment statement for various Industries.

Unit – V	Sectoral Analysis of Environmental Impacts	9
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Introduction – Rural sector – Urban sector – Energy sector – Industrial sector – Transportation sector – Case study and impacts on the environment by various sectors.

Total:45

TEXT BOOK:

1. Barthwal R.R., "Environmental Impact Assessment", 2nd Edition, New Age International Publishers, New Delhi, 2019.

REFERENCES:

1. Charles H. Eccleston., "Environmental Impact Assessment: A Guide to Best professional practices", 1st Edition, CRC Press., United States, 2017
2. Y.Anjaneyulu and ValliManikam, "Environmental Impact Assessment Methodologies", 2nd Edition, B.S Publications., Hyderabad, 2020.

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Infer the concept of EIA framework with real world problems.												Applying (K3)
CO2	suggest the methodologies and measure the variables in EIA.												Applying (K3)
CO3	interpret the importance of public participation in EIA studies.												Applying (K3)
CO4	Analyse the key steps involved in the EIA legislations.												Analyze (K4)
CO5	illustrate the various sectorial analysis in EIA.												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3	3					2	3	2
CO2	2	1				3	3					2	3	2
CO3	3	2	1	3		3	3					3	3	3
CO4	3	2				3	3	2				3	3	3
CO5	3	1				3	3					2	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	infer the fundamental concepts of road user characteristics												Understanding (K2)
CO2	select a suitable survey for traffic parameters and highway capacity												Applying (K3)
CO3	develop channels, intersections, signals, roundabouts and parking arrangements												Applying (K3)
CO4	explain traffic signs, markings for road safety and environmental impacts.												Understanding (K2)
CO5	Implement the traffic planning and management systems												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2						1	3	2
CO2	3	2	1			3						2	3	3
CO3	3	2	1			3						2	3	3
CO4	3	1				2						1	3	2
CO5	3	2	1			3					3	2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	discuss the importance, applications and case histories of geo-environmental engineering												Understanding (K2)
CO2	Identify the various methods of generation of wastes and asses the waste characterization												Applying (K3)
CO3	select suitable treatment techniques based on waste containment system												Applying (K3)
CO4	design engineered land fill systems												Applying (K3)
CO5	choose suitable remediation techniques based on type of pollutant												Understanding (K2)

Mapping of COs with POs and PSOs

CO1	2	1			3							3	2
CO2	2	1			3							3	2
CO3	3	2	1		3						1	3	3
CO4	3	2	1		3						1	3	3
CO5	2	1			3							3	2
CO1	2	1			3							3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	Classify the different earth surface process													Applying (K3)
CO2	Identify the minerals with reference to their properties													Applying (K3)
CO3	distinguish the different types of rocks and their formation													Applying (K3)
CO4	identify the geological structures of rocks and suggest suitable site investigation methods													Applying (K3)
CO5	summarize the concepts of geo-tectonic movements													Understanding (K2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	2	1				2							3	2
CO3	3	3	2			3						2	3	3
CO4	3	2	1			3						1	3	3
CO5	2	1				2							3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEE13 - ADVANCED STEEL DESIGN															
(IS 800:2007, Steel Tables, IS 875 (Part-3), IS 801: 1975, IS811:1987, IS 6533:1989 (Part 1 & Part 2), IS 9178:1979 (Part 1 & Part 2) and SP 06 are permitted)															
Programme & Branch		Sem.							Category		L	T	P	Credit	
Prerequisites	Design of Steel Structures							7	PE		3	0	0	3	
COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)		
CO1	analyze and design various components of industrial building											Analyzing (K4)			
CO2	evaluate and design the forces of chimney and silo											Analyzing (K4)			
CO3	design the cold formed members and study about pre engineered buildings											Analyzing (K4)			
CO4	analyze and design weldedplate girders											Analyzing (K4)			
CO5	determine the design forces over a gantry girder and design the member											Analyzing (K4)			
Mapping of COs with POs and PSOs															
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	3	2			3				1		2	3	3	
CO2	3	3	2			3				1		2	3	3	
CO3	3	3	2			3				1		2	3	3	
CO4	3	3	2			3				1		2	3	3	
CO5	3	3	2			3				1		2	3	3	
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy															
ASSESSMENT PATTERN - THEORY															
Test / Bloom's Category*	Remembering (K1) %		Understanding (K2) %		Applying (K3) %		Analyzing (K4) %		Evaluating (K5) %		Creating (K6) %		Total %		
CAT1			10		30		60						100		
CAT2			10		30		60						100		
CAT3			10		30		60						100		
ESE			10		30		60						100		

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	Identify and design architectural elements in buildings by considering space standards													Applying(K3)
CO2	Identify the standards required for town planning													Applying(K3)
CO3	Classify the zoning along with required standards													Applying(K3)
CO4	Apply green building concepts in the planning of buildings													Applying(K3)
CO5	Prepare building plans as per standards and zoning regulations													Applying(K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	2	1				2							3	2
CO3	2	1				2							3	2
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3							1	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	identify the sources and impacts of air pollutants											Applying (K3)
CO2	elucidate about the dissolution of pollutants and plume behaviour											Applying (K3)
CO3	interpret appropriate air pollution control methods											Applying (K3)
CO4	paraphrase significant noise pollution control methods											Applying (K3)
CO5	enumerate air and noise quality standards											Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO 1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO11	PO1 2	PSO1	PSO2
CO1	3	2	2	2		2							2	2
CO2	3	2	3	2		2							2	2
CO3	3	3	2	3		2							3	2
CO4	3	3	2	2		2							3	2
CO5	3	2	2	2		2							2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain urban transport planning and its concepts												Understanding (K2)
CO2	apply the transportation survey, trip attraction, generation and distribution												Applying(K3)
CO3	summarize the modal choice and the transportation network												Understanding(K2)
CO4	apply the characteristics, problems and management of urban goods movement												Applying(K3)
CO5	explain the advancement in urban transportation												Understanding(K2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	2	1	1			2							1	3	2
CO2	3	2	1			3							1	3	3
CO3	2	1	1			2							1	3	2
CO4	3	2	1			3							1	3	3
CO5	2	1	1			2							1	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	classify the rocks and explain the index properties of rock systems												Understanding (K2)
CO2	Interpret the modes of rock failure and the stress-strain characteristics												Applying (K3)
CO3	calculate the stresses in rocks												Applying (K3)
CO4	apply the methods to improve the stability of rocks												Applying (K3)
CO5	apply suitable method for rock stabilization												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	2	1	1			2						1	3	3
CO4	3	2	1			3						1	3	3
CO5	2	1	1			2						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	explain basic concept of Finite Element Method													Applying (K3)
CO2	form the shape function and stiffness matrix for 1D &2D elements													Applying (K3)
CO3	solve one dimensional problems													Applying (K3)
CO4	apply FEM concept in two and three dimensional solid element													Applying (K3)
CO5	analyse the beam, truss, plane frame & space frame													Analyse (K4)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	2	1	1			2						1	3	3
CO4	3	2	1			3						1	3	3
CO5	2	1				2							3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	demonstrate the evolution of TQM principles												Understanding (K2)
CO2	illustrate the principles and strategies of TQM												Understanding (K2)
CO3	use control charts and identify process capability of a process												Applying (K3)
CO4	apply various quality tools and techniques in both manufacturing and service industry												Applying (K3)
CO5	choose appropriate quality standards and implement them in the respective industry												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2				1						1		3
CO2	2	2				1						1		3
CO3	2	2				1						1		3
CO4	2	2				1						1		3
CO5	1	1				1						1		3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	45	30				100
CAT2	20	40	40				100
CAT3	25	45	30				100
ESE	20	40	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain various elements of seismology with some case studies												Understanding (K2)
CO2	interpret the causes and effects of vibration under earthquakes												Applying (K3)
CO3	design the earthquake resistant RCC structures												Understanding (K2)
CO4	interpret response spectrum presented in various formats												Applying (K3)
CO5	explain the concept of vibrational control techniques												Understanding (K2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2							3	2
CO2	3	2	2			3						2	3	3
CO3	3	2	2			2						2	3	3
CO4	3	2				2							3	2
CO5	3	2				2							3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the concept of sustainability for future												Understanding (K2)
CO2	predict the local and global environmental issues to overcome the challenges in implementing sustainability												Applying (K3)
CO3	identify sustainable tools for construction												Understanding (K2)
CO4	apply green building practices in a building												Applying (K3)
CO5	illustrate sustainable industrialization and urbanization process												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1			2							3	2
CO2	3	2	1			3						1	3	3
CO3	2	1	1			2							3	2
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	Interpret the sources and effects of industrial contaminants with water sources.											Applying (K3)
CO2	illustrate rigid preventive measures to overcome environmental pollution											Applying (K3)
CO3	identify the causes and effects of pollution from various industries											Applying (K3)
CO4	suggest appropriate industrial waste treatment methods											Applying (K3)
CO5	recommend effective residue management technique											Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO 1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO11	PO1 2	PSO1	PSO2
CO1	3	2	2			3							3	2
CO2	3	3	3			3							3	3
CO3	3	3	2			3							3	3
CO4	3	2	3			3							3	3
CO5	3	3	3			3							3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	summarize different modes of public transport and its characteristics												Understanding (K2)
CO2	identify the types of rail transit system and its development in India												Applying (K3)
CO3	illustrate rail transit planning system, routing and scheduling												Applying (K3)
CO4	infer the transit management techniques and finance												Understanding (K2)
CO5	interpret the coordination of public transport system and financing												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3				2							3	2
CO2	2	3				2							3	2
CO3	3	2	1			3						1	3	3
CO4	2	2				3							3	2
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the importance, features and stages of geotechnical investigation												Understanding (K2)
CO2	select suitable exploration technique based on type of subsoil												Applying (K3)
CO3	choose appropriate soil and rock samplers for testing												Applying (K3)
CO4	outline in-situ testing of soil and rock												Understanding (K2)
CO5	Explain the geotechnical instrumentation												Understanding (K2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	2	1	2			2							1	3	2
CO2	3	2	2			3							1	3	3
CO3	3	2	2			3							1	3	3
CO4	2	1	2			2							1	3	2
CO5	2	1	2			2							1	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	summarize the concepts of green building												Understanding (K2)
CO2	interpret the existing green building rating systems												Applying (K3)
CO3	identify alternate construction materials and methods												Applying (K3)
CO4	rate the green building materials												Applying (K3)
CO5	explain the codes for certification of green construction.												Understanding (K2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					2	2				1	2	2	2
CO2	1					1	2				1	2	2	2
CO3	2					3	3				2	2	2	2
CO4	2					1	2				1	2	2	2
CO5	1				3	3	2				1	2	2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	list the various stages in research and categorize the quality of journals												Applying (K3)
CO2	formulate a research problem from published literature/journal papers												Evaluating (K5)
CO3	write, present a journal paper/ project report in proper format												Creating (K6)
CO4	select suitable journal and submit a research paper												Applying (K3)
CO5	compile a research report and the presentation												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	1	3	3	1	1	3	3	3
CO2	3	3	3	3	2	1	1	3	3	3	3	3	3	3
CO3	3	3	3	3	3	1	1	3	3	3	1	3	3	3
CO4	3	2	1	1	2	1	1	3	2	1	1	3	3	3
CO5	3	3	2	2	3	1	1	3	3	3	1	3	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	50	10			100
CAT2		30	50	10	10		100
CAT3		20	30	30	10	10	100
ESE		40	40	10	10		100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the principles, manufacturing and erection of prefabricated components												Understanding (K2)
CO2	suggest and explain the production, erection and loading process												Applying (K3)
CO3	analyse the behaviour of the components of prefabricated structures and different joints												Applying (K3)
CO4	apply the design procedure to prefabricated beams												Applying (K3)
CO5	apply the design procedure to the prefabricated slab and column												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	2	1				2							3	2
CO3	2	1				2							3	2
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	select suitable equipment required for building construction												Applying (K3)
CO2	identify the best earthwork equipment for different earth conditions												Applying (K3)
CO3	infer equipment required for screening and transporting												Applying (K3)
CO4	choose the best and effective equipment needed for concreting												Applying (K3)
CO5	select modern equipments needed for surveying												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2		3	2			2	3			3	2
CO2	2	2	2		3	2			2	3			3	3
CO3	1	2	2		3	2			2	3			3	3
CO4	2	2	2		3	2			2	3			3	3
CO5	2	2	2		3	2			3	3			3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	illustrate the concept of hydrological cycle and types of rain gauges											Applying (K3)
CO2	calculate the amount of precipitation and infiltration											Applying (K3)
CO3	calculate the evaporation losses											Applying (K3)
CO4	calculate the flood runoff and draw the hydrograph											Applying (K3)
CO5	determine the flood discharge using Gumbel's and Log Pearson method											Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO 1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO11	PO1 2	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	3	2			3						2	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	2	1				2							3	2
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the soil reinforcement interaction mechanism.												Understanding (K2)
CO2	suggest and summarize properties, testing methods of geosynthetics in earth reinforcement.												Applying (K3)
CO3	select suitable reinforcing material to suit the functional requirement												Applying (K3)
CO4	select suitable design criteria for use of geosynthetics in landfills, pavement												Applying (K3)
CO5	Apply geosynthetics in environmental geotechnics.												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	2	1				2							3	2
CO3	3	2	2			3						1	3	3
CO4	3	2	2			3						1	3	3
CO5	3	2	2			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Explain the role of safety in construction site												Understanding (K2)
CO2	Illustrate the causes and effects of construction accidents												Applying (K3)
CO3	Implement site safety programs in construction site												Applying (K3)
CO4	Identify the hazards in construction projects												Applying (K3)
CO5	Execute safety in construction site												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3			3			3				1	
CO2	2		2			3			3		3		1	
CO3	3		2			3							1	
CO4	3	3	2			3							1	2
CO5	3		2			3							1	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEE31 – BASICS OF BRIDGE ENGINEERING								
Programme & Branch	BE – Civil Engineering	Sem.	Category	L	T	P	Credit	
Prerequisites	Structural Analysis & Design of RC Elements	8	PE	3	0	0	3	
COURSE OUTCOMES: On completion of the course, the students will be able to							BT Mapped (Highest Level)	
CO1	classify the forces acting on bridges as per IRC loading standards						Applying (K3)	
CO2	explain the design principles of short span bridges						Understanding (K2)	
CO3	explain the design principles of long span bridges						Understanding (K2)	
CO4	determine the stability of the piers and abutments						Applying (K3)	
CO5	explain the design principles of balanced cantilever and rigid frame bridges						Understanding (K2)	

Mapping of COs with POs and PSOs

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	design the water tank with appropriate design procedure												Applying (K3)
CO2	design RC wall and shear wall under various loading conditions												Applying (K3)
CO3	design the retaining wall and perform the stability check												Applying (K3)
CO4	analyse and design different types of slabs												Applying (K3)
CO5	design the corbel and pile cap												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	2	1			3				1			2	3	3
CO2	3	2	1			3				1			2	3	3
CO3	3	2	1			3				1			2	3	3
CO4	3	2	1			3				1			2	3	3
CO5	3	2	1			3				1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	identify the causes and effects of distress in concrete structures													Applying (K3)
CO2	summarize the importance of maintenance of structures, types and properties of repair materials.													Understanding (K2)
CO3	identify the damage of corroded structures													Applying (K3)
CO4	apply various repair techniques for cracked and corroded elements													Applying (K3)
CO5	apply various methods of strengthening the structural components													Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1			2						1	3	2
CO2	2	1	1			2						1	3	2
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEE34 - WATER POWER ENGINEERING

Programme& Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Environmental Engineering, Fluid Mechanics and Hydraulics	8	PE	3	0	0	3
Preamble	This course helps to understand the importance and function of Hydro power plants and the components, layouts needed to generate power in a powerhouse.						
Unit – I	Water power:						
Introduction - Sources of energy– Water power - development and use - Statistics of power - estimation of hydropower potential - Mini and pumped storage plant - cost and value of waterpower - Relation of waterpower and hydrology- Collection and analysis of stream flow data, mass curve, and flow duration curves.							
Unit – II	Hydro Power Plants and Machines:						
Classification of hydropower plants - General arrangements - Valley dam plants - Diversion canal plants - High head diversion plants - Storage and poundage - Unit Arrangements - Impact of Jets - Turbines - Basic Principles – Classifications - Pumps- Classifications – Centrifugal pumps- Problems on Efficiency.							
Unit – III	Water Conveyance:						
Penstock - Types - Design criteria - Anchor Blocks - Valves, Bends, and Manifolds- Intakes -Types - Losses - Aeration - Fore bays - Canals – Tunnels - Water Hammer - Surge tanks.							
Unit – IV	Tidal Power:						
Tidal Phenomenon - Tidal power - Basic principle - Location - Difficulties - Components -Modes of generation - Constructional aspects - Estimate of energy and power - Regulation of power output - Economic feasibility - Promising sites.							
Unit – V	Powerhouse and Equipment:						
Surface power stations - Powerhouse structure - Dimensions - Lighting and ventilations -Design variations. Underground power stations - Location - Types - Advantages -Components - Layout types - Limitations. Environmental impact of Hydroelectric power projects - Introduction to the economic analysis of Hydropower projects.							
Total:45							
TEXT BOOK:							
1.	Dandekar M.M. and Sharma K.N., - "Water Power Engineering", 2nd Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2009.						
REFERENCES:							
1.	Sharma R.K. and Sharma T.K., - "A Text Book of Water Power Engineering", 2nd Edition, S.Chand& Co. Ltd., New Delhi, 2012.						
2.	Duggal K.N. and Soni J.P., -"Elements of Water Resources Engineering", 1st Edition, New Age International Publishers, Chennai, 2001.						

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	interpret the source of energy with the stream flow data											Applying (K3)
CO2	solve the problems in the operation of pumps and turbines											Applying (K3)
CO3	calculate the losses in water conveyance in a hydro power plant											Applying (K3)
CO4	identify the economic feasibility of tidal power generation											Applying (K3)
CO5	Explore the various components of hydroelectric power stations											Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO 1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO 9	PO1 0	PO11	PO1 2	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	2	1				2							3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Identify the concepts of economic evaluation of urban transport projects												Applying (K3)
CO2	make use of vehicle operating cost for modelling												Applying (K3)
CO3	develop demand supply concept in metropolitan cities												Applying (K3)
CO4	explain the concepts of road pricing in public and private transportation												Understanding (K2)
CO5	illustrate various budgetary support in transportation projects												Understanding (K2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			3						1	3	3
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	2	1				2							3	2
CO5	2	1				2							3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES:												BT Mapped (Highest Level)	
On completion of the course, the students will be able to													
CO1	explain the intensity of earthquake and strong ground motion parameters from a recorded seismogram												Understanding (K2)
CO2	identify seismic hazard considering the different soil properties and site conditions												Applying (K3)
CO3	apply the principles of wave propagation through soil media to derive ground response analysis												Applying (K3)
CO4	determine factor of safety against liquefaction.												Applying (K3)
CO5	design earthquake resistant geotechnical structures												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	2	1			3						1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEE37 - DISASTER PREPAREDNESS AND PLANNING

Programme& Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	8	PE	3	0	0	3

Preamble This course imparts knowledge about various natural hazards like earthquakes, slope stability, floods, droughts, and Tsunami and the mitigation measures

Unit – I	Introduction to Disasters:	9
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Definition - Disaster, Hazard, Vulnerability, Resilience, Risks - Disasters: Types of disasters - Earthquake, Landslide, Flood, Drought, Fire, Forest Fire, Industrial and Technological disasters, Climate Change - Classification, Causes, Impacts - Do's and Don'ts during disaster - Global trends in disasters: Urban disasters, Pandemic, Complex emergencies, Climate change

Unit – II	Earthquakes and Tsunami:	9
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Earthquakes - Causes of earthquakes – Effects - Plate tectonics - Seismic waves - Measures of size of earthquakes - Earthquake resistant design concepts. Tsunami – Causes – Effects – Undersea earthquakes – Landslides – Volcanic eruptions – Impact of sea meteorite – Remedial measures – Precautions – Case studies.

Unit – III	Floods and Droughts:	9
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Climatic Hazards – Floods - Causes of flooding - Regional flood frequency analysis – Flood control measures - Flood routing - Flood forecasting - Warning systems. Droughts – Causes - Types of droughts - Effects of drought – Mitigation - Case studies.

Unit – IV	Landslides and Slope stability:	9
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Landslides - Causes - Principles of stability analysis – Remedial and corrective measures for slope stabilization – Mitigation – Case studies.

Unit – V	Disaster Preparedness and Management:	9
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Preparedness: Monitoring of phenomena triggering a disaster or hazard, Evaluation of Risk: Application of remote sensing, Data from meteorological and other agencies, Media Reports: Governmental and Community Preparedness. NDLA, National Disaster Management.

Total:45

TEXT BOOK:

- | | |
|----|--|
| 1. | Nishith, R. and Singh AK, "Disaster Management in India: Perspectives, issues and strategies, 1st Edition (Reprint), New Royal Book Company, 2021. |
|----|--|

REFERENCES:

- | | |
|----|--|
| 1. | Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi. |
| 2. | J Michael Duncan and Stephan G Wright, Soil Strength and Slope Stability, 2nd edition, John Wiley & Sons, Inc, 2005. |

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain different forms of disaster and their causes												Understanding (K2)
CO2	identify the causes, effects and precautionary measures of earthquakes and tsunami												Applying (K3)
CO3	articulate the causes and control measures of flood and droughts												Applying (K3)
CO4	choose suitable remedial measures for slope stabilization												Applying (K3)
CO5	develop a disaster management cycle with disaster risk reduction measures												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2							3	2
CO2	3	2	1			3	1					1	3	3
CO3	3	2	1			3	1					1	3	3
CO4	3	2	1			3	1					1	3	3
CO5	3	2	1			3	1					1	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	associate the principles of EM spectrum to categories the earth features in an image and the sensor properties for various applications of remote sensing											Understanding (K2) Precision (S3)
CO2	classify the usage about different types of satellites and their orbits											Understanding (K2) Precision (S3)
CO3	discuss the different types of remote sensors											Understanding (K2) Precision (S3)
CO4	demonstrate the concepts of interpretation of satellite imagery											Applying (K3) Precision (S3)
CO5	organize Remote Sensing procedure for Mapping of Urban Elements and their Processes											Applying (K3) Precision (S3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1		3		3			1			1		
CO2	2	1		3		3			1			1		
CO3	2	1		3		3			1			1		
CO4	3	2	1	3		3			1			1		
CO5	3	2	1	3		3			1			1		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEO01 - DISASTER MANAGEMENT

(OFFERED BY DEPARTMENT OF CIVIL ENGINEERING)

Programme& Branch	ALL B.E. / B.TECH PROGRAMMES EXCEPT CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	6	OE	3	1	0	4

Preamble To get idea about the various natural hazards like Earthquakes, slope stability, floods, droughts and Tsunami and the mitigation measures.

Unit – I **Introduction to Disasters:** **9+3**

Definition - Disaster, Hazard, Vulnerability, Resilience, Risks - Disasters: Types of disasters - Earthquake, Landslide, Flood, Drought, Fire, Forest Fire, Industrial and Technological Disasters, Climate Change- Classification, Causes, Impacts – Do's and Don'ts during disaster - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change.

Unit – II **Pre and Post Disaster Risk Reduction Strategies:** **9+3**

Disaster cycle - Phases of Disaster - Disaster Mapping - Predictability, forecasting and Warning - Disaster Preparedness Plan - Land-use Zoning for Disaster Management - Preparing Community through IEC - Disaster Mitigation - Disaster Relief: Search, Rescue and Evacuation - Shelter for Victims - Livestock and Relief Measures - Clearance of Debris and Disposal of the Dead - Control of Situation - Damage Assessment -Rehabilitation: Social and economic Aspects - Reconstruction and Rehabilitation as means of Development.

Unit – III **Inter-Relationship between Disasters and Development:** **9+3**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Landuse etc. - Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India.

Unit – IV **Disaster Management in India:** **9+3**

Disaster Management Act 2005 - Hazard and Vulnerability profile of India, Roles and responsibilities of community, Panchayat Raj Institutions/Urban Local Bodies (PRIs/ULBs), NGO's States, Centre - Disasters of India and Lesson learnt from it.

Unit – V **Applications of Science and Technology for Disaster Management:** **9+3**

Geo-informatics in Disaster Management (RS, GIS & GPS)- Early Warning and Its Dissemination-Land Use Planning and Development Regulations-Disaster Safe Designs and Constructions-Structural and Non Structural Mitigation of Disasters - Institutions for Disaster Management in India.

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Singhal J.P., "Disaster Management", 1st Edition, Laxmi Publications, India, 2007.

REFERENCES:

- | | |
|----|--|
| 1. | Gupta.M.C., "Manual on natural disaster management in India", NIDM, New Delhi, 2000. |
| 2. | "National Disaster Management Policy", Government of India, 2009. |

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	diagnose the different forms of disaster and their causes.												Understanding (K2)
CO2	construct a disaster management cycle with disaster risk reduction measures												Applying (K3)
CO3	interpret the various effects of development projects												Applying (K3)
CO4	identify the agencies involved to manage the disaster in india												Understanding (K2)
CO5	summarize the role of technology in disaster												Understanding (K2)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3	1						1	
CO2	3	2	1			3	1						1	
CO3	3	2	1			3	1						1	
CO4	2	1				3	1						1	
CO5	2	1				3	1						1	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

22CEO02 - INTRODUCTION TO SMART CITIES

(OFFERED BY DEPARTMENT OF CIVIL ENGINEERING)

Programme& Branch	ALL B.E. / B.TECH PROGRAMMES EXCEPT CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	NIL	7	OE	3	0	0	3
Preamble	To understand and explain national smart city mission of India, components, policies, challenges and future of smart city in India.						
Unit – I	Introduction:						
Definitions – Evolution – Features and strategies – Challenges – India 100 smart cities policy and mission, smart city planning and development, financing smart cities development. Governance of smart cities – case studies in India.							
Unit – II	Smart Urban Mobility and Smart Energy:						
Need for urban mobility – multiple perspectives – objectives – components – emerging concepts and strategies – ICT supported smart mobility systems – policy priorities. Introduction to smart energy – urban density and energy use – objectives – elements of smart energy management system – strategies – smart grid – challenges.							
Unit – III	Water and Waste Management:						
Smart water management – definitions – water resource and cycle – functions and objectives – steps in implementation – benefits – policy challenges. Smart waste management – approaches and implementation – existing systems – strategies – challenges and policies.							
Unit – IV	Smart Environment and Smart Buildings:						
Global background of environmental concerns – concept of environmental resources - basic environmental challenges – smart environment – stakeholders – ICT framework for environmental management. Intelligent buildings – objectives – components – systems of smart building – benefits, challenges.							
Unit – V	E- Governance and ICT:						
Governance challenges in new era – history of smart governance – functions and objectives – ICT in governance – system infrastructure – benefits, challenges and future vision. Taxonomy of layers of ICT architecture – major technology areas – components – emerging technologies in ICT – challenges and concerns in ICT.							

Total:45

TEXT BOOK:

- | | |
|----|--|
| 1. | Anilkumar P.P, "Introduction to Smart Cities", 1 st Edition, Pearson India Education Service Pvt Ltd, Noida,Uttar Pradesh, India, 2019. |
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REFERENCES:

- | | |
|----|---|
| 1. | Germaine R. Halegoua, "Smart Cities", 1 st Edition, The MIT Press Essential Knowledge Series, London, England, 2020. |
| 2. | Andy Pike, Andres Rodriguez-Pose & John Tomaney, "Handbook of Local and Regional Development", 3 rd Edition, Taylor & Francis, United Kingdom, 2010. |

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	discuss the importance, features and case histories of smart cities in India												Understanding (K2)
CO2	select suitable mobility and energy for a smart city												Applying (K3)
CO3	explain water and waste management techniques in smart city												Understanding (K2)
CO4	model smart environment and smart buildings												Applying (K3)
CO5	plan e-governance and ICT in smart city												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1		1										
CO2	2	1		1										
CO3	2	1		1	3									
CO4	3	2	1	1	3									
CO5	3	2	1	1	3									

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply the concept of EHS and their framework.												Applying (K3)
CO2	identify the monitoring principles in workplace systems.												Applying (K3)
CO3	choose the need of training and methods of EHS.												Applying (K3)
CO4	organize the safety auditing management systems and their prevention techniques.												Applying (K3)
CO5	identify the key steps involved in HSE legislations.												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1			2	3							
CO2	3	2	1			2	3							
CO3	3	2	1			2	3							
CO4	3	2	1			2	3							
CO5	3	2	1			2	3							

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the basic concepts related to Infrastructure												Understanding (K2)
CO2	demonstrate the various analysis techniques in infrastructure planning												Applying (K3)
CO3	explain the role of private sector in infrastructure growth												Understanding (K2)
CO4	explain the challenges in infrastructure planning and management												Understanding (K2)
CO5	carry out strategic planning for successful Infrastructure Project implementation.												Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1			1									
CO2	3	2	1		1									
CO3	2	1			1									
CO4	2	1			1									
CO5	3	2	1		1									

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	interpret the origin and behaviour of environmental protection acts.	Applying (K3)
CO2	illustrate the environmental protection mechanisms based on environmental indicators.	Understanding (K2)
CO3	describe the national environmental policies for enhanced ecology.	Understanding (K2)
CO4	classify the significance of federal and state environmental protection acts.	Applying (K3)
CO5	recommend the code of ethics given by pollution regulatory boards to safeguard the environment.	Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1			3									CO1
CO2	2	1			3									CO2
CO3	2	1			3									CO3
CO4	2	1			3									CO4
CO5	3	2			3									CO5

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		40	60				100
ESE		40	60				100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)

GENERAL OPEN ELECTIVE COURSES UNDER R2022
(COMMON TO ALL BE/BTECH DEPARTMENTS)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand structure of language and introducing each other												Remembering (K1)
CO2	understand vocabulary on seasons and basic verbs												Understanding (K2)
CO3	ask for directions in a new place and avail transport as required												Understanding (K2)
CO4	understand food habits of German and ask for appointments.												Understanding (K2)
CO5	learn to socialize in a German speaking country												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	
CO2								1	2	3			3	
CO3								1	2	3			3	
CO4								1	2	3			3	
CO5								1	2	3			3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	read and understand typical expression in Hiragana and Katakana	Remembering (K1)
CO2	greet and introduce oneself and other	Understanding (K2)
CO3	communicate day to day conversations – basic level	Understanding (K2)
CO4	understand the Kanjis in Japanese Script	Understanding (K2)
CO5	comprehend concept of numbers, days, months, time and counters	Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	2	3		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)		
CO1	Construct design challenge and reframe the design challenge into design opportunity.												Applying (K3)	
CO2	Interview the user, and know the feelings of users to foster deep user understanding and be able to uncover the deep user insights and needs.												Applying (K3)	
CO3	Develop ideas and prototypes by brain storming using the ideation tools.												Applying (K3)	
CO4	Organize the user walkthrough experience using ideal user experience journey.												Applying (K3)	
CO5	Develop smart strategies & implementation plan that will deliver/achieve the idea/solution deduced from earlier phases.												Applying (K3)	
Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1					3	2	1			
CO2	3	3	3	1					3	2	1			
CO3	3	3	3	1					3	2	1			
CO4	3	3	3	1					3	2	1			
CO5	3	3	3	1					3	3	1			
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

Special Assessment Pattern

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	understand innovation need and design thinking phases													Understanding (K2)
CO2	identify, screen and analyse ideas for new products based on customer needs													Analysing (K4)
CO3	develop and analyse the product concepts based on the customer needs and presents the overall architecture of the product.													Analysing (K4)
CO4	predict a structured business model for MVP													Applying (K3)
CO5	practice the procedures for protection of their ideas' IPR													Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			2			2							3	
CO2	3	3	3	3	2	2	2	2	3	3	3	3		
CO3	2	2	3	3	3	3	3	3	3	3	3	3		
CO4				3	2	2	2	3	3	3	3	3		
CO5					3	2	2		3	2	3	3	3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	30	40	10			100
CAT2	20	30	40	20			100
CAT3	30	30	40				100
ESE	20	30	30	20			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	understand letters and simple texts	Remembering (K1)
CO2	assimilate vocabulary on Accommodation and invitation	Understanding (K2)
CO3	comprehend concept of time, telephonic conversation and job-related information	Understanding (K2)
CO4	understand how to do shopping in a German store	Understanding (K2)
CO5	understand body parts and how to plan personal travel	Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	2	3		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand German food style, restaurant and be able express oneself.												Remembering (K1)
CO2	understand German school system and discuss about habits and provide City-Tipps												Understanding (K2)
CO3	analyze and compare media in everyday life.												Understanding (K2)
CO4	express feelings, describe a city and write blog entries.												Understanding (K2)
CO5	seek and provide information in a professional setup, give directions to others and talk about travel												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	
CO2								1	2	3			3	
CO3								1	2	3			3	
CO4								1	2	3			3	
CO5								1	2	3			3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	leverage learning in Workplace, understanding reports and make presentation.												Remembering (K1)
CO2	reciprocate to different situations, make appointment and understand texts.												Understanding (K2)
CO3	handle relationships and respond appropriately to exchange information												Understanding (K2)
CO4	familiarize to various channels of entertainment												Understanding (K2)
CO5	know about various cultural aspects, usage of proverbs and cliches.												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	
CO2								1	2	3			3	
CO3								1	2	3			3	
CO4								1	2	3			3	
CO5								1	2	3			3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	differentiate groups of verbs and its forms												Remembering (K1)
CO2	understand Polite form and Casual form of Japanese												Understanding (K2)
CO3	comprehend personal communication and express greetings												Understanding (K2)
CO4	understand the Kanjis in Japanese Script and If clause												Understanding (K2)
CO5	comprehend concept of “even if”, “when” and job-related information												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	
CO2								1	2	3			3	
CO3								1	2	3			3	
CO4								1	2	3			3	
CO5								1	2	3			3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	read and understand Basic Vocabularies.	Remembering (K1)
CO2	understand Conversations used in daily life.	Understanding (K2)
CO3	comprehend personal communication and express greetings.	Understanding (K2)
CO4	understand the Kanji's in Japanese Script.	Understanding (K2)
CO5	comprehend Coherent conversations in everyday situations.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	2	3		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	read and Understand Relationship of a Person.												Remembering (K1)
CO2	understand Conversations Used in Everyday Activities.												Understanding (K2)
CO3	comprehend Contents at Near Natural Speed.												Understanding (K2)
CO4	understand the Kanji's in Japanese Script..												Understanding (K2)
CO5	comprehend Orally Presented Materials.												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	
CO2								1	2	3			3	
CO3								1	2	3			3	
CO4								1	2	3			3	
CO5								1	2	3			3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Understand the grammatical structure of the language and introduce self to others.												Remembering (K1)
CO2	Understand basic verbs and appropriate vocabulary.												Understanding (K2)
CO3	Ask for directions and arrange for transportation, etc, as needed.												Understanding (K2)
CO4	Understand the food habits of France and ask for appointments												Understanding (K2)
CO5	Learn to socialize in French-speaking countries												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	2
CO2								1	2	3			3	2
CO3								1	2	3			3	2
CO4								1	2	3			3	2
CO5								1	2	3			3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Understand the French language in deep and its usage	Remembering (K1)
CO2	Preparation of their Favorite recipes, Know the Objects used in Kitchen and house.	Understanding (K2)
CO3	Converse about their vacation, their Favorite Destination	Understanding (K2)
CO4	Understand complex verbs and be able to communicate about their past experiences	Understanding (K2)
CO5	Know the difference between Past and Present and Compare them.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3		3		
CO2								1	2	3		3		
CO3								1	2	3		3		
CO4								1	2	3		3		
CO5								1	2	3		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to													BT Mapped (Highest Level)	
CO1	Learn on Future tense.													Remembering (K1)
CO2	Understand Permissions and Prohibitions.													Understanding (K2)
CO3	Knowing about Letter writing, Creating Ads, Expressing Desires, and Instructing Others.													Understanding (K2)
CO4	Understanding rules for travel and Enhancing communications.													Understanding (K2)
CO5	Expressing the feelings and emotions using advanced grammar													Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	2
CO2								1	2	3			3	2
CO3								1	2	3			3	2
CO4								1	2	3			3	2
CO5								1	2	3			3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand the grammatical structure of the language and introduce self to others.												Remembering (K1)
CO2	understand basic verbs and appropriate vocabulary.												Understanding (K2)
CO3	ask for directions and arrange for transportation, etc, as needed.												Understanding (K2)
CO4	understand the food habits of Spain and Latin countries and ask for appointments												Understanding (K2)
CO5	learn to socialize in Spanish speaking countries												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	2
CO2								1	2	3			3	2
CO3								1	2	3			3	2
CO4								1	2	3			3	2
CO5								1	2	3			3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand the Spanish language in deep and its usage												Remembering (K1)
CO2	prepare for their Favorite recipes, Know the Objects used in Kitchen and house.												Understanding (K2)
CO3	converse about their vacation, their Favorite Destination												Understanding (K2)
CO4	understand complex verbs and be able to communicate about their past experiences												Understanding (K2)
CO5	know the difference between Past and Present and Comparing them.												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								1	2	3			3	2
CO2								1	2	3			3	2
CO3								1	2	3			3	2
CO4								1	2	3			3	2
CO5								1	2	3			3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	learn on Future tense.												Remembering (K1)
CO2	understand about Permissions and Prohibitions.												Understanding (K2)
CO3	knowing about Letter writing, Creating Ads, Expressing Desires and Instructing Others.												Understanding (K2)
CO4	understanding rules for travel and Enhance communications.												Understanding (K2)
CO5	expressing the feelings and emotions using advanced grammar												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1								1	2	3			3		2
CO2									1	2	3		3		2
CO3									1	2	3		3		2
CO4										1	2	3		3	2
CO5										1	2	3		3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	75	25					100
CAT2	25	75					100
CAT3	25	75					100
ESE	25	75					100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand the importance of entrepreneurship and demonstrate the traits of an entrepreneur												Applying (K3)
CO2	identify suitable entrepreneurial ventures and business opportunity												Applying (K3)
CO3	assess the components of business plan												Analyzing (K4)
CO4	appraise the sources of finance and interpret accounting statements												Applying (K3)
CO5	interpret the causes of sickness of small scale enterprises and its remedies												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2	2	1	1		3	2		
CO2	1	2	2	2		2	2	1	1		3	2		
CO3	2	2	2	2	2	2	2	2	2	2	3	2		
CO4	1	1	2	1		2	1	1	1	2	3	2		
CO5	1	1	2	1		2	1	1	1	2	3	2		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	40	40				100
CAT2	20	30	30	20			100
CAT3	30	30	40				100
ESE	10	30	40	20			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)
CO1	understand the basics of Hindi language.											Understanding (K2)
CO2	read sentences and construct simple sentences in Hindi language.											Understanding (K2)
CO3	apply rules of Hindi grammar to write in Hindi language.											Applying (K3)
CO4	listen and express ideas using appropriate vocabulary in Hindi.											Applying (K3)
CO5	speak confidently in Hindi in different professional and real time contexts.											Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									1	3		1		
CO2									2	3		2		
CO3									2	3		2		
CO4									2	3		3		
CO5									2	3		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	50	50	-	-	-	100
CAT2	-	50	50	-	-	-	100
CAT3	-	33	67	-	-	-	100
ESE	-	47	53	-	-	-	100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	display sense of patriotism, secular values and shall be transformed into motivated youth who will contribute towards nation building through national unity and social cohesion.	Applying (K3)
CO2	demonstrate Health Exercises, the sense of discipline, improve bearing, smartness, turnout, develop the quality of immediate and implicit obedience of orders..	Applying (K3)
CO3	basic knowledge of weapons and their use and handling.	Applying (K3)
CO4	understanding about social evils and shall inculcate sense of whistle blowing against such evils and ways to eradicate such evils	Applying (K3)
CO5	acquaint, expose & provide knowledge about Army/Navy/ Air force and to acquire information about expansion of Armed Forces, service subjects and important battles.	Applying (K3)

Mapping of COs with POs and PSOs

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	build sense of patriotism, secular values and shall be transformed into motivated youth who will carry out nation building through national unity and social cohesion.	Applying (K3)
CO2	demonstrate the sense of discipline with smartness and have basic knowledge of weapons and their use and handling	Applying (K3)
CO3	illustrate various forces and moments acting on aircraft	Applying (K3)
CO4	outline the concepts of aircraft engine and rocket propulsion	Applying (K3)
CO5	design, build and fly chuck gliders/model air planes and display static models.	Applying (K3)

Mapping of COs with POs and PSOs

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	understand the conceptual frame work of cost accounting												Understanding (K2)
CO2	understand the basic concepts and process in determination of cost of product and services												Understanding (K2)
CO3	use the basic costing methods in different business situation												Applying (K3)
CO4	demonstrate the advanced costing methods in various decision making situation												Applying (K3)
CO5	prepare various types of budgets and determine variance in different situations.												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1										2	3	1		
CO2										2	3	1		
CO3										2	3	1		
CO4										2	3	1		
CO5										2	3	1		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	--	40	60	--	--	--	100
CAT2	--	40	60	--	--	--	100
CAT 3	--	40	60	--	--	--	100
ESE	--	20	80	--	--	--	100

* ±3% may be varied (CAT 1,2 & 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	Understand revenue, cost and profit relations and apply techniques to find best course of action.												Applying (K3)
CO2	Apply appropriate forecasting techniques for estimating sales, cost and revenue.												Applying (K3)
CO3	Understand the relation between inputs and output of production system and perform cost – volume – profit analysis												Applying (K3)
CO4	Apply market equilibrium concepts in monopoly and monopolistically competitive markets.												Applying (K3)
CO5	Understand game theory and apply in different strategic decisions												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									3	1				
CO2									3	1				
CO3									3	2				
CO4									3		2			
CO5									3		1			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	--	40	60	--	--	--	100
CAT2	--	40	60	--	--	--	100
CAT 3	--	50	50	--	--	--	100
ESE	--	20	80	--	--	--	100

* ±3% may be varied (CAT 1,2 & 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)
CO1	Understand the importance of Analytics in Marketing, size and segment the market											Understanding (K2)
CO2	Understand the Business, competition and its related decisions.											Understanding (K2)
CO3	Identify important features of a product and suitable pricing methods.											Applying (K3)
CO4	Assess Channel performance and Promotion Metrics.											Applying (K3)
CO5	Assess sales performance.											Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									3	1				
CO2									3	1				
CO3									3	2				
CO4									3		2			
CO5									3		1			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	--	40	60	--	--	--	100
CAT2	--	40	60	--	--	--	100
CAT 3	--	40	60	--	--	--	100
ESE	--	20	80	--	--	--	100

* ±3% may be varied (CAT 1,2 & 3 – 50 marks & ESE – 100 marks)

XXXXXX

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	illustrate the basics of spectroscopy to understand the instrumentation of various spectral techniques.	Understanding (K2)
CO2	apply the IR, Raman and NMR for quantitative analysis of the sample.	Applying (K3)
CO3	apply the various techniques for the better understanding of surface morphology.	Applying (K3)
CO4	explain the principle, instrumentation of mass spectroscopy for the analysis of organic sample.	Understanding (K2)
CO5	illustrate the thermal analysis for the identification of thermal stability of the compounds.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1												
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	1												
CO5	3	1												

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply the basic concept of periodic classification of elements to explain the periodic properties and reactivity series of s, p & d block elements.												Applying (K3)
CO2	utilize the concepts of chemical equation and bonding to solve the problems in balancing ionic equation and differentiate ionic and covalent compounds.												Applying (K3)
CO3	apply the concept of acid, base, salts and metallurgy to explain HSAB concepts, Importance of pH in everyday life, classification of salts and metallurgy of Al, Cu & Fe.												Applying (K3)
CO4	make use of the concept of carbon and its compounds to explain bonding and classification of carbon compounds.												Applying (K3)
CO5	utilize the important terms and concepts of thermodynamics to explain the first law and second law of thermodynamics with examples.												Applying (K3)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1											
CO2	3	2	1											
CO3	3	2	1											
CO4	3	2	1											
CO5	3	2	1											

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

22CYO03 – ORGANIC CHEMISTRY FOR INDUSTRY

Programme & Branch	All BE / BTech Branches	Sem.	Category	L	T	P	Credit
Prerequisites	Nil	5	OE	3	1	0	4
Preamble	Organic Chemistry for Industry aims to equip the students to have wide-range knowledge on organic chemistry in order to meet the industrial needs.						
Unit – I	Basic aspects of Organic Chemistry						9+3
Organic intermediates: carbocations, carbanions, free radicals, carbenes and nitrenes, their method of formation, stability and synthetic applications- Nucleophilic uni- and bimolecular reactions (SN1 and SN2)- Elimination reactions (E1 & E2; Hoffman & Saytzeff's rule).							
Unit – II	Molecular Rearrangements						9+3
Reactions involving electron deficient, carbon, nitrogen, oxygen centers, emphasis on synthetic utility of the rearrangements - Migration of carbon: Wagner-Meerwein, Pinacol-pinacolone, benzyl-benzilic acid rearrangement – Migration of nitrogen: Beckmann rearrangement, Hofmann, Curtius, Lossen rearrangements- Migration of oxygen: Bayer-Villiger oxidation.							
Unit – III	Synthetic Reagents & Applications						9+3
Lithium aluminium hydride- sodium borohydride- selenium-di-oxide- osmium tetroxide- phenyl isothiocyanate- N-bromosuccinamide (NBS)- lead tetraacetate - dicyclohexylcarbodiimide (DCC) – pyridinium chlorochromate (PCC) – Swern oxidation –p-toluenesulphonyl chloride – trifluoroacetic acid- lithium diisopropylamide (LDA) – 1,3- dithiane (reactive umpolung) - crown ethers-Trimethyl silyl iodide - dichlorodicyanobenzoquinone (DDQ) – Gilman reagent– phase transfer catalysts- Wilkinson's catalysts.							
Unit – IV	Unit Operations						9+3
Extraction: Liquid equilibria-extraction with reflux-extraction with agitation-counter current extraction. Filtration: Theory of filtration- pressure and vacuum filtration-centrifugal filtration.							
Distillation: Azeotropic and steam distillation. Evaporation: Types of evaporators-factors affecting evaporation. Crystallization: Crystallization from aqueous-non- aqueous solutions factors affecting crystallization-nucleation.							
Unit – V	Unit Processes						9+3
Nitration: Nitrating agents-aromatic nitration-kinetics and mechanism of aromatic nitration- process equipment for technical nitration-mixed acid for nitration.							
Halogenation: Kinetics of halogenations-types of halogenations-catalytic halogenations-Case study on industrial halogenation process.							
Fermentation: Aerobic and anaerobic fermentation. Production of Antibiotics: Penicillin and Streptomycin-Production of Vitamins: B2 and B12.							
Lecture: 45, Tutorial: 15, Total: 60							
TEXT BOOK:							
1.	P.S.Kalsi, "Organic Reactions and their Mechanisms", 5 th Edition, New Age International publishers, 2020, for Unit-I, II, III, V.						
2.	Arun Bahl, B.S.Bahl, "Advanced Organic Chemistry", 6 th Edition, S Chand, 2022, for Unit-IV, V.						
REFERENCES:							
1.	V.K.Ahluwalia, Rakesh Parashar, "Organic Reaction Mechanisms" Fourth Edition, 2011						
2.	Jonathan Clayden, Nick Greeves, Stuart Warren, "Organic Chemistry", 2 nd Edition, Oxford University Press, 2014.						
3.	Paula Yurkanis Bruice, "Organic Chemistry", 8 th Edition, Pearson, 2020.						

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	illustrate the basic concept of organic intermediates to explain the SN1, SN2, E1 and E2 reactions.	Understanding (K2)
CO2	utilize the concepts of molecular rearrangement to explain reactions involving electron deficient, carbon, nitrogen, oxygen centers, emphasis on synthetic utility of the rearrangements.	Applying (K3)
CO3	select the suitable synthetic reagents for various functional group conversions in organic synthesis.	Applying (K3)
CO4	make use of the concept of extraction, filtration, distillation, evaporation, crystallization for the purification of organic compounds.	Applying (K3)
CO5	apply the concept of nitration, halogenations and fermentation to explain the industrial unit process.	Applying (K3)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1												
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2	1	1										
CO5	3	2	1	1										

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	illustrate the mechanism, expression of rate of corrosion and importance of corrosion studies to familiarize for industrial needs.	Understanding (K2)
CO2	demonstrate the thermodynamics and kinetics of different models of corrosion with respect to the environment.	Applying (K3)
CO3	utilize the theories of corrosion to interpret with the real time applications.	Applying (K3)
CO4	organize the various types of corrosion to understand the corrosion problems.	Applying (K3)
CO5	summarize the corrosion prevention methods to avoid corrosion related issues.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1												
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2	1	1										
CO5	3	1												

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	outline the formulation of cosmetics products.	Understanding (K2)
CO2	identify the structuring materials and regulation involved in cosmetics development.	Applying (K3)
CO3	interpret the polymers and its role in cosmetics.	Understanding (K2)
CO4	develop knowledge about natural products and Fragrance in Cosmetics.	Applying (K3)
CO5	apply the knowledge of cosmetics to explain the characteristics, formulation, preparation and quality control of different cosmetic products used in day to day life.	Applying (K3)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1												
CO2	3	2	1											
CO3	3	1												
CO4	3	2	1											
CO5	3	2	1											

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	identify the knowledge of nanocomposites and to explain its structure.	Applying (K3)
CO2	apply the knowledge on various properties and features of nanocomposites.	Applying (K3)
CO3	choose the various concepts involving in the processing of nanocomposites.	Applying (K3)
CO4	apply the acquired knowledge on characterization of nanocomposites.	Applying (K3)
CO5	organize the applications of nanocomposites in various fields.	Applying (K3)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1										
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	2	1	1										
CO5	3	2	1	1										

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

22CYO07 - WASTE AND HAZARDOUS WASTE MANAGEMENT

Programme & Branch	All BE / BTech Branches	Sem.	Category	L	T	P	Credit	
Prerequisites	Nil	7	OE	3	0	0	3	
Preamble	Waste and Hazardous waste management aims to equip the students to have a wide-range of knowledge on waste management.							
Unit – I	Solid Waste Management							9
Solid wastes: definition, sources, types, composition of solid waste- Solid waste management system: collection, separation, processing and transformation of solid waste – combustion, aerobic composting, vermicomposting, pyrolysis, landfill-classification, types, methods and control of leachate in landfills - recycling of material found in municipal solid waste- recycling of paper and cardboard, recycling of plastics, recycling of glass.								
Unit – II	Hazardous Waste Management							9
Hazardous wastes: definition, nature and sources of hazardous waste, classification and characteristics of hazardous waste-chemical class of hazardous waste, generation, segregation, treatment and disposal: waste reduction, waste minimization, recycling - chemical treatment: acid base neutralization, chemical precipitation, oxidation/reduction, hydrolysis, electrolysis, chemical extraction and leaching, ion exchange, photolytic reaction- thermal treatment methods: incineration – biodegradation of hazardous waste: aerobic, anaerobic, reductive dehalogenations - land treatment and composting.								
Unit – III	E- Waste & Biomedical Waste Management							9
E-Waste Management: definition, sources, classification, collection, segregation, treatment and disposal.								
Biomedical Waste Management : Introduction-definition –components of biomedical waste-waste generation –waste identification and waste control-waste storage-labeling and color coding-handling and transportation-waste treatment and disposal-autoclave, hydroclave , microwave treatments- chemical disinfection – sanitary and secure landfill.								
Unit – IV	Pollution From Major Industries And Management							9
Introduction- sources and characteristics - waste treatment flow sheets for selected industries such as textiles, tanneries, pharmaceuticals, sugar, petroleum refinery, fertilizer and dairy industries.								
Unit – V	Solid Waste Management and Legislation							9
Solid waste management plan - solid waste (management and handling) rules - biomedical waste (management and handling) rules- plastic waste management rules - e-waste management rules - hazardous and other wastes (management and transboundary movement) rules - construction and demolition waste management rules.								
Total: 45								
TEXT BOOK:								
1.	George Tchobanoglou, Hillary Theisen, Samuel a Vigil, Integrated solid waste management (Engineering principle and management issues) McGraw hill Education (India) Pvt. Ltd., 2015, for Unit-I, II, V.							
2.	SC Bhatia, Handbook of Industrial pollution and control (Volume-1), CBS Publisher and Distributors, New Delhi, 2002, for Unit-II, III, IV, V.							
REFERENCES:								
1.	Manual on Municipal Solid Waste management, Central public Health and Environmental Engineering Organization (CPHEEO), Govt. of India, May 2000.							
2.	Michael D. LaGrega, Phillip L. Buckingham, Jeffrey C. Evans, Hazardous waste management, MEDTEC, 2015.							
3.	Majeti Narasimha Vara Prasad, Meththika Vithanage, Anwesha Borthakur, "Handbook of Electronic Waste Management: International Best Practices and Case Studies" 1 st Edition, Butterworth-Heinemann, 2019.							

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	apply the technical points that are required to set up a solid waste management system.	Applying (K3)
CO2	explain the various disposal and treatment methods of hazardous wastes.	Understanding (K2)
CO3	organize the appropriate method for managing e-waste and biomedical waste.	Applying (K3)
CO4	identify the hazards from various industries and apply the waste management techniques for its treatment.	Applying (K3)
CO5	relate the legal legislation to solid waste management.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1			3							
CO2	2	1					3							
CO3	3	2	1	1			3							
CO4	3	2	1	1			3							
CO5	2	1					3							

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

22CYO08 - CHEMISTRY IN EVERY DAY LIFE

Programme& Branch	All BE / BTech Branches	Sem.	Category	L	T	P	Credit							
Prerequisites	Nil	7	OE	3	0	0	3							
Preamble	This course aims to prepare the students to have the knowledge on oils, fats, sugar, adulterants in food, creams, milk powder, soil, fertilizer, pesticides, insecticides, fungicides and herbicides in order to know its chemistry in our everyday activities.													
Unit – I	Oils, Fats and Sugar													
Distinction between oils and fats – properties – classification – edible oils – vegetable oils –animal oils – manufacture of oils by solvent extraction – refining of crude vegetable oils – processing of animal fats – manufacture of cane sugar – manufacture of sucrose from beet root.														
Unit – II	Adulterants in food													
Food Adulteration and prevention – common food adulterants – food additives – food colorants– preservatives – flavourants – food poisoning – analysis of adulterants in edible oils, coffee powder, chilli powder, turmeric powder, meat , fish, ghee and milk – harmful effects of food adulterants														
Unit – III	Creans and Milk powder													
Creams: Composition-chemistry of creaming process- Factors influencing cream separation (Mention the factors only) - Estimation of fat in cream - Milk powder: Need for making powder-drying process- spraying, drum drying, jet drying and foam drying-principles involved in each.														
Unit – IV	Soil and Fertilizers													
Soil analysis: Composition of soil - Organic and Inorganic constituents-Soil acidity - buffering capacity of soils -Liming of soil - Fertilizers: primary nutrients –role of Nitrogen, potassium and phosphorous on plant growth –Complex fertilizers and mixed fertilizers and its composition - Secondary nutrients – micronutrients and their functions in plants -optimal addition of Fertilizers to obtain estimated yield.														
Unit – V	Pesticides, Insecticides, Fungicides and Herbicides													
Pesticides – Classification – general methods of application and toxicity, Safety measures when using pesticides-Insecticides: Inorganic pesticides – borates - Organic pesticides – D.D.T. and BHC-Plant derivatives: pyrethrin and Nicotine - Synthetic organic pesticides: Endrin and Aldrin (Chemical name - Structure- functions and uses)-Fungicides: Inorganic (Bordeaux mixture) and organic (dithiocarbamate) fungicides - Industrial fungicides: Creosote fractions - Herbicides: Selective and non-selective - 2, 4-dicholorophenoxyacetic acid and 2,4,5-tricholorophenoxyaceticacid (structure and function).														
Total: 45														
TEXT BOOK:														
1.	Sharma B K , Industrial Chemistry, Goel publishing house, New Delhi, 2011, for Units- I, II, IV													
2.	Alex V Ramani, Food Chemistry, MJP Publishers, Chennai, 2009, for Units -II, III, V.													
REFERENCES:														
1.	Dilip Kumar Das, Introductory Soil Science, 1st Edition, Kalyani Publishers, Reprint 2002.													
2.	K. Bagavathi Sundari– “Applied Chemistry”, MJP Publishers, Chennai, 2006.													
3.	Ashutosh Kar, Medicinal Chemistry, Wiley Eastern limited, New Delhi, 1993.													
COURSE OUTCOMES: On completion of the course, the students will be able to														
CO1		outline the importance of oils, fats and sugar.					BT Mapped (Highest Level)							
CO2		identify the harmful effects of adulterants in food.					Understanding (K2)							
							Applying (K3)							

CO3	develop the knowledge on creams and milk powder.	Applying (K3)
CO4	interpret the nature and composition of soil and fertilizers.	Understanding (K2)
CO5	illustrate the difference of pesticides, insecticides, fungicides and herbicides.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1												
CO2	3	2	1	1										
CO3	3	2	1	1										
CO4	3	1												
CO5	3	1												

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

CO3	develop knowledge about nutrition during lactation and for infants.	Applying (K3)
CO4	utilize the knowledge of physical fitness and nutrition towards good health.	Applying (K3)
CO5	interpret the various role of women in society.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1											
CO2	3	1												
CO3	3	2	1											
CO4	3	2	1											
CO5	3	1												

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	25	35	40				100
CAT2	25	35	40				100
CAT3	25	35	40				100
ESE	25	35	40				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE-638060

(AUTONOMOUS)

BOARD OF CIVIL ENGINEERING

DEGREE & PROGRAMME : BE CIVIL ENGINEERING

HONOURS DEGREE TITLE: CONSTRUCTION TECHNOLOGY

S.No	Course Code	Course Title	Credits	Prerequisites	Semester
1.	22CEH01	Sustainable Construction Methods	4	Nil	5
2.	22CEH02	Advanced Concrete Technology	3	Nil	5
3.	22CEH03	Construction Project Planning Systems	4	Nil	6
4.	22CEH04	Construction Cost Analysis	4	Nil	6
5.	22CEH05	Project Formulation and Appraisal	3	Nil	7

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	assimilate the concept of sustainability for future												Understanding (K2)
CO2	examine the environmental impact												Applying (K3)
CO3	use of green building technologies												Applying (K3)
CO4	implement sustainable construction techniques												Applying (K3)
CO5	carry out waste as a resource												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											2	2
CO2	3	2	1										2	2
CO3	3	2	1										2	2
CO4	3	2	1										2	2
CO5	3	2	1										2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	explain the microstructure and hardened properties of concrete												Understanding (K2)
CO2	outline the factors influencing the concrete at early age												Understanding (K2)
CO3	identify the factors affecting the durability of concrete												Applying (K3)
CO4	compare and contrast the various types of special concrete												Understanding (K2)
CO5	explain the various non-destructive testing techniques in concrete												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3							3	2
CO2	2	1				3							3	2
CO3	3	2	1			3							3	2
CO4	2	1				3							3	2
CO5	2	1				3							3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	identify the owners view on a project in consideration with entire life cycle of project.												Understanding (K2)
CO2	summarize the importance of planning												Understanding (K2)
CO3	determine the project time and cost												Applying (K3)
CO4	recognize the need of project control												Understanding (K2)
CO5	classify the database models and its applications in construction projects												Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											3	3
CO2	2	1											3	2
CO3	3	2	1										3	2
CO4	2	1											3	2
CO5	2	1											3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	infer the cost implications made to forms of construction												Understanding (K2)
CO2	calculate the serviceability cost of construction												Applying (K3)
CO3	analyse the different methods of cost during design and construction												Analysing (K4)
CO4	interpret the types of costs and budgets incurred for a construction project												Understanding (K2)
CO5	implement strategic planning for cost estimates and programming												Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											3	3
CO2	3	2	1										3	2
CO3	3	2	2										3	2
CO4	2	1											3	2
CO5	2	1											3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

COURSE OUTCOMES: On completion of the course, the students will be able to												BT Mapped (Highest Level)
CO1	plan for clearances required for a project											Applying (K3)
CO2	calculate the capital in-flow for a project											Understanding (K2)
CO3	infer the appraisal methods and risk analysis for a project											Applying (K3)
CO4	assimilate the funding patterns of financial Institutions for construction projects and the risks involved in it											Understanding (K2)
CO5	interpret the need for technology transfer											Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1										2	2
CO2	2	1											2	2
CO3	3	2	1										2	2
CO4	2	1											2	2
CO5	3	2	1										2	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		60	40				100
CAT2		60	40				100
CAT3		60	40				100
ESE		60	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)