B.E. CIVIL ENGINEERING CURRICULUM & SYLLABI 2023 (REGULAR PROGRAMME)

Department of Civil Engineering

FACULTY OF ENGINEERING



KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act, 1956)

Pollachi Main Road, Eachanari Post,

Coimbatore- 641 021, India.



KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University Established under Section 3 of UGC Act 1956) Eachanari, Coimbatore-641 021, INDIA.

FACULTY OF ENGINEERING DEGREE OF BACHELOR OF ENGINEERING / TECHNOLOGY REGULAR PROGRAMME REGULATIONS 2023 CHOICE BASED CREDIT SYSTEM

These regulations are effective from the academic year 2023 – 2024 and applicable to the candidates admitted to B. E. / B. Tech. during 2023 - 2024 and onwards.

1. ADMISSION

Candidates seeking admission to the first semester of the eight semesters B. E./ B.Tech. Degree Programme:

Should have passed the Higher Secondary Examination (10+2) prescribed by the State Government / Central Government with Mathematics/ Physics/ Chemistry/ Computer Science/ Electronics/ Information Technology/ Biology/ Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/ Entrepreneurship. (Any of the above three subjects) or any similar Examination of any other institution/ University or authority accepted by the Karpagam Academy of Higher Education as equivalent thereto).

Should obtained at least 45% marks (40% marks in case of candidates belonging to reserved category) in the above subjects taken together.

(**OR**)

Passed min. 3 years Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) subject to vacancies in the First Year, in case the vacancies at lateral entry are exhausted. (The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to achieve desired learning outcomes of the programme)

Lateral Entry Admission

Candidates who possess Diploma in Engineering / Technology (10+3 or 10+2+2) awarded by the Directorate of Technical Education with passed minimum THREE years / TWO years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) in ANY branch of Engineering and Technology are eligible to apply for admission to the third semester of B. E./B. Tech. Such candidates shall undergo two additional engineering subjects in the 3^{rd} and 4^{th} semester as prescribed by the University.

OR

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

Passed D.Voc. Stream in the same or allied sector.

(The Universities will offer suitable bridge courses such as Mathematics, Physics, Engineering drawing, etc., for the students coming from diverse backgrounds to achieve desired learning outcomes of the programme)

S. No.	Programme	Eligibility criteria
1.	B.E Bio Medical Engineering	Passed Minimum THREE years / TWO years
		(Lateral Entry) Diploma examination with at
2	B. E. Civil Engineering	least 45% marks (40% marks in case of
		ANY branch of Engineering and Technology.
3.	B. E. Computer Science and	
	Design	OR
	B. E. Computer Science and	Passed B.Sc. Degree from a recognized University
4.	Engineering	as defined by UGC, with at least 45% marks (40%
		marks in case of candidates
-		evamination with Mathematics as a subject
5.	B. E. Electrical and Electronics	examination with Wathematics as a subject.
	Engineering	OR
6.	B. E. Electronics and	Passed D.Voc. Stream in the same or allied
	Communications Engineering	sector.
		(The Universities will offer suitable bridge
7.	B. E. Mechanical Engineering	Engineering drawing etc for the students
		coming from diverse backgrounds to achieve
8.	B. Tech. Artificial Intelligence and	desired learning outcomes of the programme)
	Data Science	6 · · · · · · · · · · · · · · · · · · ·
0	D. Testa Disc. Testa set	
9.	B. Tech Bio - Technology	
10.	B. Tech Food Technology	

Eligibility criteria for admission in the third semester is given in the table below.

Migration from other University

Candidates who have completed their first to sixth semesters of B. E./B. Tech. study in any University are eligible to apply for admission to their next semester of B. E./B. Tech. in the branch corresponding to their branch of study. The student will be exempted from appearing for Examination of the equivalent courses passed in the earlier programme and will have to appear for courses which he/she has not done during the period of his/her earlier programme. Along with the request letter and mark sheets, he/she has to submit a copy of syllabus of the programme duly attested by the Registrar, Competent authority, he/she has undergone. Equivalence Certificate shall be provided by the "Students' Affairs Committee" of Karpagam Academy of Higher Education Students' Affairs Committee comprises all the Heads of the Departments and Dean of the Faculty of Engineering and a nominee of the Registrar.

2. PROGRAMMES OFFERED

A candidate may undergo a programme in any one of the branches of study approved by the University as given below.

List of B. E. and B. Tech. Degree Programmes

- 1. B.E Bio Medical Engineering
- 2. B. E. Civil Engineering
- 3. B. E. Computer Science and Design
- 4. B. E. Computer Science and Engineering
- 5. B. E. Electrical and Electronics Engineering
- 6. B. E. Electronics and Communications Engineering
- 7. B. E. Mechanical Engineering
- 8. B.Tech. Artificial Intelligence and Data Science
- 9. B. Tech. Bio-Technology
- 10. B. Tech Food Technology

3. MODE OF STUDY

Full-Time:

In this mode of study, the candidates are required to attend classes regularly on the specified working days of the University.

Conversion from full time mode of study to part time is not permitted.

Change from one programme to another is not permitted.

4. STRUCTURE OF PROGRAMMES

Every programme will have a curriculum with syllabus consisting of theory and practical courses such as:

- (i) General core courses comprising Mathematics, Basic Sciences, Engineering Sciences and Humanities.
- (ii) Core courses of Engineering/Technology.
- (iii) Elective courses for specialization in related fields.
- (iv) Workshop practice, computer practice, engineering graphics, laboratory work, in-plant training, seminar presentation, project work, industrial visits, camps, etc.

Every student is encouraged to participate in at least any one of the following programmes

- NSS / Sports/Physical exercise/NCC/YRC/Red Ribbon club/Environment club and Energy club
- Other Co-Curricular and Extra Curricular activities

(V) Choice Based Credit System

CBCS is introduced for students admitted in the academic year 2017-18. As per AICTE guidelines, CBCS is an approach in which students opt for courses of their choice. CBCS provides greater flexibility with multiple courses and enable students to undergo additional courses. CBCS is applicable to Full Time Undergraduate & Post Graduate Programmes of study. It provides a choice for students to select from the prescribed courses (Professional soft core, Professional Hard core, Professional Electives, Open Electives, Value added courses, Humanity Sciences, Basic sciences & Engineering sciences). A course designated as hard core for a particular programme of study must invariably be completed by the student to receive the degree in the programme. The Hardcore courses cannot be substituted by another courses. Students can exercise their choice among a set of Soft core courses from the list of Soft core courses specified for each Programme of study. The student should meet the criteria for prerequisites to become eligible to register for that course. The student should request for the course for every semester within the first week of semester. Maximum no of students to be registered in each course shall depend on availability of physical facilities, classroom availability and lab capacity. Registration of already requested courses by students in previous semester is not allowed.

Each course is normally assigned certain number of credits.

No. of credits per lecture period per week	1
No. of credits per tutorial period per week	1
No. of credits for 3 periods of laboratory course per week	2
No. of credits for 3 periods of project work per week	2
No. of credits for 2 periods of Value-added course per week:	1
No. of credits for 3 weeks of in-plant training during	
semester vacations	1

In every semester, the curriculum shall normally have a blend of theory courses not exceeding 6 and practical courses not exceeding 3. However, the total number of courses per semester shall not exceed 8.

The prescribed credits required for the award of the degree shall be within the limitsspecified below.

PROGRAMME	PRESCRIBED CREDIT RANGE
B. E./B. Tech.	160–165

The medium of instruction for all Courses, Examinations, Seminar presentations and Project/Thesis reports is English.

Value Added Course

Besides core courses and elective courses, value added course is introduced. The blend of different courses is so designed that the student would be trained not only in his / her relevant professional field but also as a socially conscious human being.

Evaluation in the courses comprises two parts, one is the Continuous Internal Assessment (CIA) and the other one is the End Semester Examination (ESE). Evaluation in few courses may be by Internal Assessment only.

5. DURATION OF THE PROGRAMME

The prescribed duration of the programme shall be

Programme	Min. No. of semesters	Max. No. of semesters
B. E./B. Tech. (H. Sc. Candidates)	8	14
B. E./B. Tech. (Lateral Entry Candidates)	6	12

Each semester shall normally consist of 90 working days or 540 hours.

Additional classes for improvement, conduct of model test, etc., over and above the specified periods shall be arranged, if required. But for the purpose of calculation of attendance requirement for eligibility to appear for the end semester Examinations (as per Clause 11) by the students, 540 hours conducted within the specified academic schedule alone shall be taken into account and the overall percentage of attendance shall be calculated accordingly.

6. REQUIREMENTS FOR COMPLETION OF THE SEMESTER

Ideally every student is expected to attend all classes and secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classes and the conduct of the candidate has been satisfactory during the course.

A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International level sports or due to participation in Seminar / Conference

/ Workshop / Training Programme / Voluntary Service / Extension activities or similar programmes with prior permission from the Registrar shall be given exemption from prescribed attendance requirements and shall be permitted to appear for the Examination on the recommendation of the Head of the Department concerned and Dean to condone the lack of attendance. The Head of the Department has to verify and certify the genuineness of the case before recommending to the Dean. However, the candidate has to pay prescribed condonation fees.

Candidates who are not recommended for condonation and those who have less than 65% attendance will not be permitted to proceed to the next semester and have to redo the course. However, they are permitted to write the arrear Examinations, if any.

7. CLASS ADVISOR

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a teacher of the Department who shall function as Class Advisor for those students throughout their period of study. Such Class Advisors shall advise the students and monitor the courses undergone by the students, check the attendance and progress of the students and counsel them periodically. If necessary, the Class Advisor may display the cumulative attendance particulars in the Department notice board and also discuss with or inform the Parents/Guardian about the progress of the students. Each student shall be provided with course plan for each course at the beginning of each semester.

8. CLASS COMMITTEE

Every class shall have a class committee consisting of teachers of the class concerned, Maximum of six student representatives [boys and girls] and the concerned Head of the Department. It is like the 'Quality Circle' with the overall goal of improving the teaching-learning process. The functions of the class committee include

- Clarifying the regulations of the degree programme and the details of rules therein particularly Clause 4 and 5 which should be displayed on Department Notice-Board.
- Informing the student representatives, the details of Regulations regarding weight age used for each assessment. In the case of practical courses (laboratory / drawing / project work / seminar, etc.) the breakup of marks for each experiment / exercise /module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Solving problems experienced by students in the class room and in the laboratories.
- Informing the student representatives, the academic schedule, including the dates of assessments and the syllabus coverage for each assessment.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the weak students, if any and requesting the teachers concerned to provide some additional academic support.

The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in a class (like the first semester which is generally common to all branches), the class committee is to be constituted by the Dean.

The class committee shall be constituted within the first week of each semester.

The Chairperson of the Class Committee may convene the meeting of the class committee.

The Dean may participate in any Class Committee of the Faculty.

The Chairperson is required to prepare the minutes of every meeting, submit the same to Dean through the HOD within two days of the meeting and arrange to circulate it among the students and teachers concerned. If there are some points in the minutes requiring action by the Management, the same shall be brought to the notice of the Registrar by the HOD through Dean.

The first meeting of the Class Committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the regulations. Two subsequent meetings may be held in a semester at suitable intervals. During these meetings the student members representing the entire class, shall meaningfully interact and express their opinions and suggestions of the other students of the class in order to improve the effectiveness of the teaching-learning process.

9. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or group, shall have a "Course Committee" comprising all the teachers handling the common course with one of the nominated as Course Coordinator. The nomination of the Course Coordinator shall be made by the Dean depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The 'Course Committee' shall meet to arrive at a common scheme of evaluation for the test and shall ensure a uniform evaluation of the tests. Where ever feasible, the Course Committee may also prepare a common question paper for the Internal Assessment test(s).

10. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD'(Log book) which consists of attendance marked in each theory or practical or project work class, the test marks and the record of class work (topic covered), separately for each course.

Continuous Internal Assessment (CIA): The performance of students in each subject will be continuously assessed by the respective teachers as per the guidelines given below:

S.No.	CATEGORY	MAXIMUM MARKS
1.	Assignment	5
2.	Seminar*	5
3.	Attendance	5
4.	Test –I	8
5.	Test –II	8
6.	Test–III	9
Continuous Internal Assessment: TOTAL		40

THEORY COURSES:

*Evaluation shall be made by a committee.

PATTERN OF TEST QUESTION PAPER (Test I&II)

INSTRUCTION	REMARKS
Maximum Marks	60
Duration	2Hours
Part-A	1 to 9Two Mark Questions, uniformly covering the two units of the syllabus. All the 9 Questions are to be answered. (9x2=18Marks).

Part-B	Question10 to12will be of either or type, covering two units of the syllabus. Each Question may have
	subdivision. (3x14 = 42Marks).

INSTRUCTION	REMARKS	
Maximum Marks	100	
Duration	3 Hours	
Part-A	Part A will be online Examination. 20 Objective type	
	Questions, Covering all the5units. (20x1=20Marks)	
	(Online Examination).	
Dowt R	21 to 25 Two Mark Questions, uniformly covering the	
Talt-D	Five units of the syllabus. All the 5 Questions are to be	
	answered. (5x2=10Marks).	
	Question 26 to 30 will be of either or type, covering Five	
Part-C	units of the syllabus. Each Question may have subdivision.	
	(5x14=70Marks).	

PATTERN OF TEST QUESTION PAPER (Test III)

PRACTICAL COURSES:

S.No	CATEGORY	MAXIMUM MARKS
1.	Attendance	5
2.	Observation work	5
3.	Record work	5
4.	Model Examination	15
5.	Viva–Voce [Comprehensive]	10
Continuous Internal Assessment: TOTAL		40

Every practical exercise / experiment shall be evaluated based on the conduct of exercise/experiment and records maintained.

INTEGRATED THEORY AND PRACTICAL COURSES:

The Continuous Internal Assessment for Integrated Theory and Practical Course is awarded for 40 Marks with mark split up similar to regular theory course. But Assignment and Seminar components are replaced by Observation and Record marks.

S.No.	CATEGORY	MAXIMUM MARKS
1.	Observation	5
2.	Record	5
3.	Attendance	5
4.	Test –I	8
5.	Test –II	8
6.	Test–III	9
Continuous Internal Assessment: TOTAL		40

The external evaluation of integrated practical component from End semester Examination by internal mode is awarded for 50 Marks and later scaled down to 15 Marks and similarly the external evaluation for integrated theory from End semester Examination is awarded for 100 Marks and later scaled down to 45 Marks. Hence the external assessment for integrated theory and practical components contribute to 60 Marks.

INTEGRATED THEORY AND PRACTICAL COURSES:

The Continuous Internal Assessment for Integrated Theory Course is awarded for 40 Marks with mark split up similar to regular theory course.

The external evaluation of integrated practical component from End semester Examination by internal mode is awarded for 50 Marks and later scaled down to 15 Marks and similarly the external evaluation for integrated theory from End semester Examination is awarded for 100 Marks and later scaled down to 45 Marks. Hence the external assessment for Integrated theory and practical components contribute to 60 Marks.

ATTENDANCE

S. No.	Attendance %	Marks
1	91 and above	5.0
2	81-90	4.0
3	76-80	3.0

Attendance carries a maximum of 5 marks and the distribution is as under:

PROJECT WORK/ INTERNSHIPS:

Final year project work will be always in-house. However, as a special case, if a student is able to get a project from a government organization or private or public sector company, the student may be permitted to do his/her project work in reputed institution/research organization/industry. Hence final year students may have commencement of eighth semester classes for 30 days in fast-track mode and complete their final semester and are made eligible for undergoing Internships in Industry and also interested students are permitted for doing projects in Industries.

CERTIFICATION COURSES:

Students have to undergo a minimum of one value added course beyond curriculum as a certified course per semester for duration not less than 30 hours.

11. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATION (ESE)

A candidate shall normally be permitted to appear for the ESE of any semester commencing from I semester if he/she has satisfied the semester completion requirements (Subject to Clause 5) and has registered for Examination in all courses of the semester. Registration is mandatory for Semester Examinations as well as arrear Examinations failing which the candidate will not be permitted to attend the next semester. A candidate already appeared for a subject in a semester and passed the Examination is not entitled to reappear in the same subject of the semester for improvement of grade.

12. END SEMESTER EXAMINATION

ESE will be held at the end of each semester for each subject, for 100 marks, later scaled down to 60 marks.

INSTRUCTION	REMARKS		
Maximum Marks	100		
Duration	3 Hours		
Dowt A	Part A will be online Examination. 20 Objective		
rant - A	type Questions. Covering all the 5 units. 20*1 =		
20 Marks (Online Examination)			
Dout D	21 to 25 Two Mark Questions, uniformly		
rait-D	covering the Five units of the syllabus. All the		
	5 Questions are to be answered.		
	(5 *2= 10Marks).		
	Question 26 to 30 will be of either or type,		
Part- C	covering Five units of the syllabus. Each		
	Question may have subdivision.		
	(5*14=70 Marks)		

PATTERN OF ESE QUESTION PAPER:

13. PASSING REQUIREMENTS

Passing minimum: The passing minimum for CIA is 20 (i.e. out of 40 marks). The passing minimum for ESE is 30 (i.e. out of 60 marks). The overall passing minimum for theory/laboratory course is 50 (Sum of his/her score in CIA and ESE) out of 100 marks.

The passing minimum for value added course is 50 marks out of 100marks. There will be two tests, the first covering 50% of syllabus for 50 marks and the other for 50 marks.

If the candidate fails to secure a pass in a particular course ESE, it is mandatory that candidate shall register and reappear for the Examination in that course during the subsequent semester when Examination is conducted in that course. Further the candidate should continue to register and reappear for the Examination till a pass is secured in such supplementary Examination within the stipulated maximum duration of the programme (Clause 5.1).

The CIA marks obtained by the candidate in his/her first or subsequent appearance where he/she secures a pass shall be retained by the office of the Controller of Examinations and considered valid for all remaining attempts till the candidate secures a pass in his/her ESE.

If the candidate fails to secure a pass in a particular course in CIA, it is mandatory that candidate shall register and reappear for the CIA in that course during the subsequent semester when CIA is conducted in that course by the faculty member assigned for that particular course during that semester by the concerned HOD. Further, the candidate should continue to register and reappear for the CIA till a pass is secured in such subsequent Examination within the stipulated maximum duration of the programme (Clause 5.1).

If a candidate fails to secure a pass in value added course, he/she has to appear for the tests when course is conducted subsequently.

ONLINE COURSE(MOOC) COORDINATOR

To help students in planning their online courses and for general advice on online courses, the HOD shall nominate a MOOC coordinator for the online courses. The Online course MOOC coordinator

shall identify the courses which students can select for their programme from the available online courses offered by the different agencies periodically and inform the same to the students. Further, the coordinator shall advice the students regarding the online courses and monitor their course.

Student Shall study at least one online course from Swayam/NPTEL in anyone of the first seven semesters for which examination shall be conducted at the end of the course by the respective organization body. The student can register to the course which are approved by the department. The student shall produce a pass certificate from the respective body before the end of the seventh semester.

14. AWARD OF LETTER GRADES

All assessments of a course will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate letter grades, each carrying certain number of points will be awarded as per the range of total marks (out of 100) obtained by the candidate in each subject as detailed below:

Letter grade	Marks Range	Grade Point	Description
0	91 - 100	10	OUTSTANDING
A+	81-90	9	EXCELLENT
А	71-80	8	VERY GOOD
B+	66- 70	7	GOOD
В	61 – 65	6	ABOVE AVERAGE
С	55 - 60	5	AVERAGE
D	50 - 54	4	PASS
RA	<50	-	REAPPEARANCE
AB		0	ABSENT

GRADE SHEET

After results are declared, Grade sheet will be issued to each student which will contain the following details:

- i. The list of courses enrolled during the semester and the grade scored,
- ii. The Grade Point Average (GPA) for the semester and
- iii. The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA is the ratio of the sum of the products of the number of Credits (**C**) of courses enrolled and the Grade Points (**GP**) corresponding to the grades scored in those courses, taken for all the courses to the sum of the number of credits of all the courses in the semester.

$$GPA = \frac{Sum of [C*GP]}{sum of c}$$

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. **RA** grade and value added course will be excluded for calculating **GPA** and **CGPA**.

REVALUATION

Revaluation and Re-totaling is allowed on representation. A candidate can apply for revaluation of his/her semester Examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of the Department and Dean. A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate through the Head of the Department and Dean. Revaluation is not permitted for Supplementary Examinations, Practical Examinations, Technical Seminars, In-plant Training and Project Work.

TRANSPARENCY AND GRIEVANCE COMMITTEE

A student may get the Photostat copy of the answer script on payment of prescribed fee, if he/she wishes. The students can represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HOD, the Dean of another Faculty nominated by the University), HOD of the Department concerned, the faculty of the course and Dean from other discipline nominated by the University and the COE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External Examiner will be final. The student has to pay prescribed fee for the same.

15. ELIGIBILITY FOR AWARD OF DEGREE

A student shall be declared to be eligible for award of Degree if he/she has

a. Successfully gained the required number of total credits as specified in the curriculumcorresponding to his/her programme within the stipulated time.

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b. No disciplinary action is pending against him/her.

The award of the degree must be approved by the Board of Management of Karpagam

Academy of Higher Education.

16. CLASSIFICATION OF THE DEGREE AWARDED

A candidate who qualifies for the award of the Degree (vide Clause 15) having passed the Examination in all the courses in his/her first appearance within the specified minimum number of semesters (vide Clause 5.1) securing a CGPA of not less than **8** shall be declared to have passed the Examination in First Class with Distinction.

A r e g u l a r candidate or a lateral entrant is eligible to register forBE(Honors), B.Tech (Honors). If, he / she has passed all the courses in the first appearance andholds / maintains a CGPA of 7.5 at VI Semester. He / she has to take an additional 20 credits bystudying online courses through Swayam/NPTEL. Such a candidate is eligible for the award of B.E. (Honor), B.Tech (Honor). However, is he / she fails in securing 20 additional credits but maintains CGPA of 7.5 and above is not eligible for Honors degree but eligible for First class with Distinction.

A candidate who qualifies for the award of the Degree (vide Clause 15) having passed the Examination in all the courses within the specified minimum number of semesters (vide Clause 5.1) plus one year (two semesters), securing CGPA of not less than **6.5** shall be declared to have passed the Examination in First Class.

All other candidates (not covered in Clauses 17.1 and 17.2) who qualify for the award of the degree (vide Clause 15) shall be declared to have passed the Examination in Second Class.

17. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

A candidate may for valid reasons and on prior application, be granted permission to Withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

Such withdrawal shall be permitted only once during the entire duration of the degree programme. Withdrawal application shall be valid only if the candidate is otherwise eligible to write the Examination

Withdrawal application is valid only if it is made within 10 days prior to the commencement of the

Examination in that course or courses and recommended by the Head of the Department, Dean and

approved by the Registrar.

17.3.1 Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions may be considered on the merit of the case.

Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during III semester.

Withdrawal from the ESE is NOT applicable to arrear Examinations.

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The candidate shall reappear for the withdrawn courses during the Examination conducted in the subsequent semester.

18. PROVISION FOR AUTHORISED BREAK OF STUDY

Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he/she applies to the Registrar, through the Head of the Department and Dean stating reasons thereof and the probable date of rejoining the programme.

The total number of semesters for completion of the programme from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum no. of semesters specified in Clause 5.1 irrespective of the period of break of study (vide Clause 18) in order that he/she may be eligible for the award of the degree (vide Clause 15). The candidate thus permitted to rejoin the programme at the commencement of the semester after the break shall be governed by the curriculum and regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the curriculum and regulations in force at that period of time.

The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification (vide Clause17). However, additional break of study granted will be counted for the purpose of classification.

The total period for completion of the programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in Clause 5.1 irrespective of the period of break of study (vide Clause 18.3) in order that he/she may be eligible for the award of the degree.

If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Withdrawal' or 'Break of Study' (Clause18 and 18 respectively).

19. **SUPPLEMENTARY ESE:** After the publication of VIII semester results, if a student has **ONE** arrear in any theory course of the entire programme, he/she will be permitted to apply within 15 days of the publication of results, and appear for supplementary Examination.

20. INDUSTRIAL VISIT

Every student is required to undergo one industrial visit for every semester, starting from the third semester of the programme.

21. DISCIPLINE

Every student is required to observe discipline and decorous behavior both inside and outside the University and not to indulge in any activity which will tend to bring down the prestige of the University. The erring student will be referred to the Disciplinary Committee constituted by the University, to enquire into acts of indiscipline and recommend to the University about the disciplinary action to be taken. If a student indulges in malpractice in any of the ESE/CIA he/she shall be liable for punitive action as prescribed by the University from time to time.

22. REVISION OF REGULATION AND CURRICULUM

The University may from time-to-time revise, amend or change the Regulations, Scheme of Examinations and syllabi, if found necessary on the recommendations of Board of Studies, Academic Council and Board of Management of Karpagam Academy of Higher Education.

Karpagam Innovation and Incubation Council (KIIC):

(A Section 8 Company)

Based on the 2019 National Innovation and Startup Policy and the 2019–2023 Tamil Nadu Startup Policy, KIIC has recommended to the KAHE students who are affiliated with the KIIC that it be incorporated in the university Program Regulations 2023-24 and implement from this academic year.

Norms to Student Start-Ups

- a) Any (UG/PG /(Ph.D.) Research scholars, student, right from the first year of their programme is allowed to set a startup (or) work part time/ full time in a startup or work as intern in a startup
- b) Any (UG/PG / (Ph.D.) Research scholars) student right from the first year of their programme is allowed to earn credit for working on Innovative prototypes/business Models/ Pre incubation (case to case basis). Start Up activities will be evaluated based on the guidelines being given by the expert committee of the KIIC
- c) Student Entrepreneurs may use the address of incubation center (KIIC) to register their venture while studying in KAHE.
- d) Students engaged in startups affiliated with the KIIC or those who work for them may be exempted from KAHE's attendance requirements for academic courses under current regulations, up to a maximum of 30% attendance per semester, including claims for ODs and medical emergencies Potential Students who have been incubated at KIIC may be permitted to take their University semester exams even if their attendance is below the minimum acceptable percentage, with the proper authorization from the head of the institution.

(On case-to-case basis depends upon the applicability strength, societal benefits and quality of the Innovation and Subsequent engagement of the students with the/ her business)

- e) Any Students Innovators/entrepreneurs are allowed to opt their startup in place mini project /major project, /seminar and summer training etc. (In plant training, Internship, value added Course.). The area in which the student wishes to launch a Startup may be interdisciplinary or multidisciplinary.
- f) Student's startups are to be evaluated by Expert committee, formed by KIIC and KAHE.

Guide lines to award Credits/ Marks to a Student startup

Student's startup stages are divided into five phases and these startup phases can be considered equally in place of the course title as mentioned below with the same credits allotted to the course title in a University curriculum.

Sl. No.	Description/Startup phases	In place of the Subject / Course title	Grades/Credits /Marks
1	Idea stage/Problem Identification	Seminar	Same Marks/Credits can

2	Proof of Concept (POC) /Solution development	In-plant training /Internship	be awarded that are listed in the course title's
3	Product Development (Lab scale) /Prototype Model/ Company Registered	Mini Project/ Value added Course	respective startup phases.
4	Validation/Testing	Main Project phase I	
5	Business Model/Ready for Commercialization/Implementation	Main Project phase II	



B.E - CIVIL ENGINEERING

			Seme	ster – I								
Course code	Course Title	Category	Objectiv Outcor	res & nes	Ins ho	struc urs/v	ction veek	Credits	Ma	ximum	Marks	Page No.
			РО	PSO	L	Т	Р		CIA	ESE	TOTAL	
23BECC101	Professional Communicative English	HS	8,9,10,12	_	3	0	0	3	40	60	100	1
23BECC102	Matrices and Calculus	BS	1,2,3,12	-	3	1	0	4	40	60	100	3
23BECC103	Environmental Studies	BS	1,2,6,7,8,10 ,12	-	3	0	0	3	40	60	100	5
23BECE141	Engineering Physics	BS	1,2,3,6,9,10 ,12	-	4	0	2	5	40	60	100	8
23BECC142	Programming in C	ES	1,2,3,4,9,10 ,12	1	4	0	2	5	40	60	100	11
23BECC111	Engineering Graphics	ES	1,2,3,4,8,10 ,12	1	2	0	2	3	40	60	100	14
23BEMC151	Design Thinking	MC	1,2,3,4,6,7, 8,9,10,12	-	1	0	2	2	100	-	100	17
23BEMC152	Sports and Yoga	MC	-	-	1	0	0	0	100	-	100	19
23BEMC153	தமிழர் மரபும் பண்பாடும்	MC	-	-	1	0	0	0	100	-	100	20
]	TOTAL			22	1	8	25	540	360	900	
			G									
Course code	Course Title	Category	Objectiv Outcor	res & nes	Ins ho	struc urs/v	ction week	Credits	Ma	ximum	Marks	Page No.
			РО	PSO	L	Т	Р		CIA	ESE	TOTAL	
23BECC201C	Transforms and its Applications	BS	1,2,3,12	-	3	1	0	4	40	60	100	22
23BECE202	Energy Science & Engineering	ES	1,2,6,7,10,1 2	-	2	1	0	3	40	60	100	24
23BECC203	Basic Electrical and Electronics Engineering	ES	1,2,3,4,5,8, 9,12	-	3	0	0	3	40	60	100	26
23BECE241	Engineering Chemistry	BS	1,2,3,4,6,7, 8,9,10,12	-	4	0	2	5	40	60	100	28
23BECC243A/ 23BECC243B	Data Structure and Algorithms/Object Oriented Programming with Python	ES	1,2,3,4,9,10 ,12 1,2,3,9,10,1 2	1 2	3	1	2	5	40	60	100	31/34
23BECE111	Workshop Practices	ES	1,2,3,4,9,10 ,12	1	0	0	4	2	40	60	100	37
23BEMC251	Soft Skills	MC	-	_	1	0	0	0	100	-	100	39
23BEMC252	Women Safety and Security	MC	-	_	1	0	0	0	100	-	100	40
]	TOTAL			17	3	8	22	440	360	800	

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		Semester - III										
Course code	Course Title	Category	Object Outc	ives & omes	In ho	struct urs/w	ion eek	Credits	М	Page No.		
			РО	PSO	L	Т	Р		CI A	ESE	TOTAL	
23BECE301	Numerical Methods	BS	1,2,3,9,12	2 1	3	1	0	4	40	60	100	42
23BECE302	Disaster Management	PC	1,2,3,4,5,6 9,11,12	5, 1,2	3	0	0	3	40	60	100	44
23BECE303	Engineering Mechanics	ES	1,2,3,4,7,9	9, 1.2	3	1	0	4	40	60	100	46
23BECE304	Surveying & Levelling	PC	1,2,3,4,6,7 9,11,12	7, 1,2	3	0	0	3	40	60	100	49
23BECE305	Soil Mechanics	PC	1,2,3,6,7,9 11.12), 1,2	3	0	0	3	40	60	100	51
23BECE306	Fluid Mechanics	PC	1,2,5,6,7,9	9, 1	3	0	0	3	40	60	100	53
23BECE311	Surveying Laboratory	PC	1,5,7,9,11, 2	1 2	0	0	3	1.5	40	60	100	55
23BECE312	Soil Mechanics Laboratory	PC	1,5,7,9,11, 2	1 2	0	0	3	1.5	40	60	100	57
23BECE391	Field Project/ Internship	MC	-	-	0	0	2	1	100	0	100	59
23BEMCE351	Aptitude and Reasoning	MC	-	-	1	0	0	0	100	0	100	60
23BEMC352A/B	Foreign Language (French/German)	MC	-	-	1	0	0	0	100	0	100	62/63
		ТОТА	L		20	2	8	24	620	480	1100	
		•	Se	mester -IV	7							•
Course code	Course Title	Category	Object Outc	ives & omes	In ho	struct urs/w	ion eek	Credits	М	aximun	n Marks	Page No.
			РО	PSO	L	Т	Р		CI A	ESE	TOTAL	
23BECE401	Strength of Materials	PC	1,2,5,6, 7,9,11	1	3	0	0	3	40	60	100	64
23BECE402	Foundation Engineering	PC	1,2,7,5, 6,9,11	1	3	0	0	3	40	60	100	67
23BECE403	Water Supply Engineering	ES	1,2,5,6, 7,8,9,11 ,12	1	3	0	0	3	40	60	100	69
23BECE404	Highway Engineering	PC	1,2,5,6, 9,11,12	1	3	0	0	3	40	60	100	71
23BECE441	Hydraulic Engineering	PC	1,2,5,6, 9,11	1	3	0	2	4	40	60	100	73
23BECE4E**	Elective I	PE	1,2,3,4, 6,9,10,1 1,12	1,2	3	0	0	3	40	60	100	76

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23BECE411	Strength of Materials Laboratory	PC	1,5,7,9, 11,12	2	0	0	3	1.5	40	60	100	77
23BECE412	Highway Laboratory	PC	1,5,7,9, 11,12	2	0	0	3	1.5	40	60	100	79
23BECE413	Computer Aided Building Drawing Lab	PC	1,2,5,7, 9,11,12	2	0	0	3	1.5	40	60	100	81
23BECE451	Foundation of Entrepreneurship	MC	-	-	1	0	0	0	100	0	100	83
23BECE452	Essence of Traditional Indian Knowledge Heritage	MC 1 TOTAL 20					0	0	100	0	100	85
		ТОТ	AL		20	0	11	23.5	560	540	1100	
	_		Sem	ester – V	7							
Course code	Course Title	Category	Dobjectives &InstructionObjectives &InstructionOutcomeshours/v		struct urs/w	ion eek	Credits	Maximum Marks			Page No.	
			РО	PSO	L	Т	Р		CI A	ESE	TOTAL	
23BECE501	Structural Engineering	PC	1,2,6,9,11,12	1,2	3	0	0	3	40	60	100	86
23BECE502	Ground Improvement Techniques	ES	1,3,4,9	1	3	0	0	3	40	60	100	88
23BECE503	Waste Water Engineering	ES	1,2,7,9	2	3	0	0	3	40	60	100	90
23BECE504	Railways ,Airports &Harbour Engineering	PC	2,4,7,9,10	1	3	0	0	3	40	60	100	92
23BECE505	Professional Practice , Law & Ethics	HS M	1,2,3,4,5,6,7, 9,12	2	2	0	0	2	40	60	100	94
23BECE5E**	Elective II	PE	1,2,3,4,6,9,10 ,11,12	1,2	3	0	0	3	40	60	100	97
23BECE511	Materials, Testing and Evaluation Laboratory	PC	1,2,6,9	2	0	0	3	1.5	40	60	100	98
23BECE512	Environmental Engineering Laboratory	PC	1,2,6,9	1,2	0	0	3	1.5	40	60	100	100
23BECE591	Field Project/ Internship	MC	1,2,3,4,5,6,9, 11,12	1,2	0	0	2	1	100	0	100	102
23BEMC551	Cyber Security	MC	1,2,3,4,6,12	1,2	1	0	0	0	100	0	100	103
		IUTAI	L		18	0	8	21	520	480	1000	

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			Se	emester -VI								
Course code	Course Title	Category	Objecti Outco	ives & omes	Ins ho	struct urs/wo	ion eek	Credits	M	aximun	n Marks	Page No.
			РО	PSO	L	Т	Р		CI A	ESE	TOTAL	
23BECE601	Design of Reinforced Concrete Structural Elements	PC	1,2,3,4,6, 9,11,12	1,2	3	0	0	3	40	60	100	105
23BECE602	Concrete Technology	PC	1,4,6,9,1 1	1,2	3	0	0	3	40	60	100	107
23BECE6E**	Elective-III	PE	1,2,3,4,6, 9,10,11,1 2	1,2	3	0	0	3	40	60	100	109
23BECE6E**	Elective IV	PE	1,2,3,4,6, 9,10,11,1 2	1,2	3	0	0	3	40	60	100	109
23BECE6E**	Elective V	PE	1,2,3,4,6, 9,10,11,1 2	1,2	3	0	0	3	40	60	100	109
****	Open Elective -I	OE	1,2,3,4,6, 9,10,11,1 2	1,2	3	0	0	3	40	60	100	109
23BECE611	Concrete Technology Laboratory	PC	1,4,6,9,1 1	1,2	0	0	3	1.5	40	60	100	110
23BECE612	Survey Camp	PC	1,4,6,9,1 1	1,2	0	0	0	1	100	0	100	112
23BECE691	Mini Project	MC	-	-	0	0	0	1	100	0	100	114
23BEMC651	Universal Human Values	MC	-	-	1	0	0	0	100	0	100	115
	[ΓΟΤΑ	L		19	0	3	21.5	580	420	1000	
			Semest	er – VII								
Course code	Course Title	Category	Object Outc	ives & omes	Ins hou	structi urs/we	ion eek	Credits	Ma	ximum	Marks	Page No.
			PO	PSO	L	Т	Р		CIA	ESE	TOTAL	
23BECE701	Total Quality Management	HS M	1,2,6,9,11	1,2	3	0	0	3	40	60	100	117
23BECE741	Estimation Valuation and Quantity Surveying	PC	1,3,4,6,9,1	1 2	3	0	2	4	40	60	100	119
23BECE7E**	Elective-VI	PE	1,2,3,4,6,9	,1 1,2	3	0	0	3	40	60	100	122
23BECE7E**	Elective-VII	PE	1,2,3,4,6,9 0,11,12	,1 1,2	3	0	0	3	40	60	100	122
****	Open Elective -II	OE	1,2,3,4,6,9 0,11,12	,1 1,2	3	0	0	3	40	60	100	122
23BECE791	Project Phase I	PW	4,5,9,11	1,2	0	0	8	4	80	120	200	122
	Topect mase i Tw 4,3,3,11 1,2 0 0 3 4 60 120 200 TOTAL 15 0 10 20 280 420 700											

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			Seme	ster -VII	I							
Course code	Course Title	Category	Objective Outcom	Ins hou	tructi ırs/we	on eek	Credits	Maximum Marks			Page No.	
			РО	PSO	L	Т	Р		CIA	ESE	TOTAL	
23BECE891	Project Phase II and Viva Voce	PW	4,5,9,11	1,2	0	0	8	8	80	120	200	123
	Г	TOTAL	4		0	0	8	8	80	120	200	
			Total NO OF	CREDI	TS =16	55						
			Total M	larks =68	300							

PROFESSIONAL ELECTIVES

PROFESSIONAL ELECTIVE I												
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No			
		L	Т	Р		CIA	ESE	TOTAL				
23BECE4E01	Engineering Geology	3	0	0	3	40	60	100	124			
23BECE4E02	Concrete Materials	3	0	0	3	40	60	100	126			
23BECE4E03	Environmental Soil Pollution	3	0	0	3	40	60	100	128			
23BECE4E04	Solid and Hazardous Waste Management	3	0	0	3	40	60	100	130			
		PROFES	SIONAL	ELECTI	VE II				•			
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	Maximum Marks Page					
		L	Т	Р		CIA	ESE					
23BECE5E01	Structural Analysis-I	3	0	0	3	40	60	100	134			
23BECE5E02	Earth Reinforcement	3	0	0	3	40	60	100	137			
23BECE5E03	Air and Noise Pollution and its Control	3	0	0	3	40	60	100	140			
23BECE5E04	Construction Materials and Technology	3	0	0	3	40	60	100	142			
	·	PROFESS	SIONAL I	ELECTI	VE III							
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No			
		L	Т	Р		CIA	ESE	TOTAL				
23BECE6E01	Structural Analysis-II	3	0	0	3	40	60	100	144			
23BECE6E02	Environmental Geo- Technology	3	0	0	3	40	60	100	146			
23BECE6E03	Transport of Water and Wastewater	3	0	0	3	40	60	100	148			
23BECE6E04	Building Construction Practice	3	0	0	3	40	60	100	150			
		PROFESS	SIONAL I	ELECTI	VE IV							
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No			
		L	Т	Р		CIA	ESE	TOTAL				
23BECE6E05	Structural Mechanics	3	0	0	3	40	60	100	152			
23BECE6E06	Ecological Engineering	3	0	0	3	40	60	100	154			

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23BECE6E07	Construction Project Planning and Systems	3	0	0	3	40	60	100	156
23BECE6E08	Sustainable Construction Methods	3	0	0	3	40	60	100	159
		PROFES	SIONAL	ELECTI	VE V				
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No
		L	Т	Р		CIA	ESE	TOTAL	
23BECE6E09	Design of Concrete Structures-I	3	0	0	3	40	60	100	161
23BECE6E10	Design of Steel Structures	3	0	0	3	40	60	100	163
23BECE6E11	Contracts Management	3	0	0	3	40	60	100	165
23BECE6E12	Environmental Impact Assessment and Life Cycle Analyses	3	0	0	3	40	60	100	167
		PROFESS	SIONAL I	ELECTI	VE VI				•
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No
		L	Т	Р		CIA	ESE	TOTAL	
23BECE7E01	Design of Concrete Structures-II	3	0	0	3	40	60	100	169
23BECE7E02	Biological Processes for Contaminant Removal	3	0	0	3	40	60	100	171
23BECE7E03	Repair and Rehabilitation of Structures	3	0	0	3	40	60	100	173
23BECE7E04	Instrumentation and Sensor Technologies for Civil Engineering Applications	3	0	0	3	40	60	100	175
		PROFESS	IONAL F	LECTIV	VE VII	I			
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No
		L	Т	Р		CIA	ESE	TOTAL	
23BECE7E05	Advanced Structural Analysis	3	0	0	3	40	60	100	177
23BECE7E06	Rural Water Supply And Onsite Sanitation Systems	3	0	0	3	40	60	100	179
23BECE7E07	Pre-Stressed Concrete Structures	3	0	0	3	40	60	100	181

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LIST OF OPEN ELECTIVES

COURSES OFFERED BY OTHER DEPARTMENT

		FOO	D TECHI	NOLOG	Y				
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No
		L	Т	Р		CIA	ESE	TOTAL	
23BTFTOE01	Processing of Food Materials	3	0	0	3	40	60	100	183
23BEFTOE02	Nutrition and Dietetics	3	0	0	3	40	60	100	185
23BTFTOE03	Ready to Eat Foods	3	0	0	3	40	60	100	187
23BTFTOE04	Agricultural waste and Byproducts Utilization	3	0	0	3	40	60	100	189
23BTFTOE05	Design of Food Processing Equipment	3	0	0	3	40	60	100	186
	ELECTRI	CAL AND	ELECTE	RONICS	ENGINEE	RING			
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No
		L	Т	Р		CIA	ESE	TOTAL	
23BEEEOE01	Renewable Energy Systems	3	0	0	3	40	60	100	190
23BEEEOE02	Hybrid Electric Vehicles	3	0	0	3	40	60	100	192
		MECHAN	NICAL EN	NGINEE	RING				
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No
		L	Т	Р		CIA	ESE	TOTAL	
23BEMEOE01	Battery Management System	3	0	0	3	40	60	100	194
23BEMEOE02	Industrial Safety Engineering	3	0	0	3	40	60	100	197
23BEMEOE03	Non-Destructive Testing	3	0	0	3	40	60	100	200
23BEMEOE04	Operations Research	3	0	0	3	40	60	100	203
	ELECTRONI	CS AND C	COMMUN	NICATIO	ON ENGINI	EERING			
Course Code	Course Title	Instruct	tion Hour	s/Week	Credits	Μ	aximum	Marks	Page.No
		L	Т	Р		CIA	ESE	TOTAL	
23BEECOE01	Real Time embedded Systems	3	0	0	3	40	60	100	205
23BEECOE02	Consumer Electronics	3	0	0	3	40	60	100	208

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KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University) (Established Under Section 3 of UGC Act 1956) (Accredited with A⁺ Grade by NAAC in the Second Cycle) Coimbatore – 641 021, Tamil Nadu, INDIA. FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING **B.E. CIVIL ENGINEERING (FULL TIME)** (2023 BATCH ONWARDS)

PROGRAM OUTCOMES (POs) Engineering Graduates will be able to:

PO-1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2 Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3 Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO-4 Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO-6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO-7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSO)

The B.E. Degree Programme in Civil Engineering is offered in the department with the following programme specific outcomes:

PSO-1 The Graduates of this Programme with proficiency in mathematics and physical sciences will excel in the core areas of civil engineering such as structural, environmental and water resources engineering.

PSO-2 Utilize principles, methods, software's and codes of practices to excel in the areas of planning, analysis and designs related to Civil Engineering systems.

PSO-3 Prepare detailed drawings, cost estimates, reports, walk through views, interact with clients, manage workers, work in a team and executes construction works.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Civil Engineering education at KAHE, Coimbatore, mainly based on practical oriented learning. The courses offered are focused on training the students to make them adaptable to any type of role in different fields of Civil Engineering.

The B.E. Degree Programme in Civil Engineering is offered in the department with the following educational objectives:

PEO-1 To equip the graduates with sufficient knowledge and experience to become leaders in industry and academia

PEO-2 To offer platform for research and development

PEO-3 To impart professional ethics with a commitment to the society and environment

B.E. CIVIL ENGINEERING

23BECC101

PROFESSIONAL COMMUNICATIVE ENGLISH

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

COURSE OBJECTIVES:

The goal of this course is for students to

- Extend the communicative competence of learners.
- Develop usage of language effectively in academic /work contexts
- Make use of Language skills in Reading and Writing
- Use language efficiently in expressing their opinions via various media.
- Enhance inter-personal communication skills.

COURSE OUTCOMES:

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

- Identify new words by employing vocabulary building techniques.
- Build correct sentence structures and grammatical patterns in oral and written communication.
- Construct business letters, proposals and E-Mail communication.
- Adopt the skills of planning, structuring, and delivery techniques in group discussions and presentations.
- Follow leadership, work ethics and management principles.

UNIT-1 VOCABULARY BUILDING

Word formation process - One-word Substitutes – Homophones – Homonyms – British and American vocabulary – Punctuation marks and capitalization

UNIT-2 FUNDAMENTALS OF ENGLISH GRAMMAR

Subject –verb agreement (Concord) – If-conditionals – Modal verbs - Question types (Wh, Yes or No & Question tag), Prepositions- Articles

UNIT- 3 LANGUAGE SKILLS (READING AND WRITING)

Reading (Skimming& Scanning) - Reading Methods (SQR3) – Writing -Business Letters (Job Application Letter & Resume Preparation, sales letter, Quotation letter) – E- Mail communication & etiquettes – Business Proposals (Structure & Types)

UNIT-4 PROFESSIONAL SKILLS

Interview skills – Dos and Don'ts of an Interview, Group Discussion – Dos and Don'ts of GD, Presentation skills – Planning, structuring and Delivering Techniques.

UNIT -5 INTERPERSONAL SKILLS

Personality development –Conflict management, Team work, Leadership Principles, Negotiation skills

2023-2024

3H-3C

SEMESTER-I

9

9

9

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Note: Students shall have hands on training in improving Speaking skill in the language laboratory @ 2 periods per each unit.

TOTAL:45

TEXT BOOKS

- 1. Raman. Meenakshi, Sharma. Sangeeta (2015). Technical Communication (Principles and Concepts) . Oxford university press. New Delhi.
- 2. Sanjay Kumar, Pushpalata, (2011), Communication skills, 1st Edition Oxford Press.
- 3. Ashraf Rizvi M, Effective TechnicalCommunication, McGraw Hill Education, First Edition, 2013.

CO-PO MAPPING

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	2	3	-	3	-	-
CO2	-	-	-	-	-	-	-	1	2	3	-	2	-	-
CO3	-	-	-	-	-	-	-	2	2	3	-	2	-	-
CO4	-	-	-	-	-	-	-	3	2	3	-	2	-	-
CO5	-	-	-	-	-	-	-	3	2	3	-	3	-	-
AVG	-	-	-	-	-	-	-	2.00	2.00	3.00	-	2.40	-	-

B.E.CIVIL ENGINEERING

23BECC102

MATRICES AND CALCULUS

ALCULUS 4H-4C Marks: Internal:40 External:60 Total:100

Instruction Hours/week: L:3 T:1 P:0

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

The goal of this course is for students:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the student with the differential calculus of multivariable functions. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals.
- To make the students acquire sound knowledge in techniques of solving linear ordinary differential equations.
- To provide knowledge about the concepts of partial differential equation with constant coefficients.

COURSE OUTCOMES:

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

- Make use of orthogonal transformation to reduce the quadratic form to canonical form.
- Utilize differential calculus of multivariable to optimization problems.
- Apply multiple integrals for finding area and volume.
- Solve the nth order Ordinary Differential Equations (ODE) and Homogeneous equation of Euler's type.
- Solve the nth order Partial Differential Equations.

UNIT – I MATRICES

Eigen values and Eigenvectors of a real matrix– Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT – II DIFFERENTIAL CALCULUS OF MULTIVARIABLE FUNCTIONS 12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions –Applications: Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT – III MULTIPLE INTEGRALS

Proper and Improper integrals - Bernoulli's extension formula – Double integrals – Change of order of integration – Double integrals in polar coordinates – Area using double integrals – Evaluation of Triple Integrals

UNIT – IV ORDINARY DIFFERENTIAL EQUATIONS

Linear differential equation of second and higher order with constant coefficients – Euler-Cauchy linear differential equation – Method of Variation of parameters.

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SEMESTER-I

2023-2024

UNIT – V PARTIAL DIFFERENTIAL EQUATIONS

Homogeneous linear partial differential equations of second and higher order with constant coefficients – Classification of partial differential equations.

TOTAL: 45+15

4

TEXT BOOKS:

- 1. Grewal, B. S., & Grewal, J. S. (1996). Higher engineering mathematics. 2018, Khanna Publishers, New Delhi.
- 2. Kreyszig, E. (2007). Advanced Engineering Mathematics 10th Edition with Wiley Plus Set (p. 334). John Wiley & Sons.

REFERENCE BOOKS:

- 1. Thomas, B. T., and Ross L Finney (2002). Calculus and Analytic Geometry, Pearson Publishers, Ninth edition
- 2. Ross, S. L. (1984). Differential Equation-Jhon Wiley & Sons. Inc. New York.
- 3. Henner, V., Belozerova, T., & Khenner, M. (2013). Ordinary and partial differential equations. CRC Press.

WEBSITES:

- 1. www.archive.nptel.ac.in/courses/111/108/111108157/
- 2. www.nptel.ac.in/courses/111107108
- 3. www.archive.nptel.ac.in/courses/111/104/111104125/
- 4. www.nptel.ac.in/courses/111108081
- 5. www.nptel.ac.in/courses/111108144

CO PO MAPPING:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	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	-	-
AVG	3	2	1	-	-	-	-	-	-	-	-	1	-	-

B.E. CIVIL ENGINEERING

23BECC103

ENVIRONMENTAL STUDIES

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

The goal of this course is for students to:

- Create the awareness about environmental problems among people.
- Develop an attitude of concern for the environment.
- Motivate public to participate in environment protection and improvement.
- To gain a variety of experiences and acquire a basic understanding of environment and it's associated problems.
- Relate critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

COURSE OUTCOMES:

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

- Outline the ecological processes supporting the life system.
- Infer the importance of environment and impact of human acivities on natural resources.
- Explain the levels and values of biodiversity and its conservation.
- Summarize the problems of environmental pollution and its control measures.
- Interpret the remediation methods for social issues and degraded environment.

UNIT I INTRODUCTION - ENVIRONMENTAL STUDIES& ECOSYSTEMS

Environment Definition, Scope and importance; Ecosystem, Structure and functions of ecosystem. Energy flow, Food chains and food webs, Ecological succession. Classification of ecosystem. Forest ecosystem, Grass and Ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT II - NATURAL RESOURCES - RENEWABLE AND NON-RENEWABLE RESOURCES

Natural resources - Renewable and Non - Renewable resources. Land resources and land use change, Land degradation, soil erosion and desertification. Forest resources- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water resources- Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water. Use of alternate energy sources, growing energy needs, case studies. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT III - BIODIVERSITY AND ITS CONSERVATION

Levels of biological diversity - genetic, species and ecosystem diversity. Ecosystem and biodiversity services:

Ecological, economic, social, ethical, aesthetic and Informational value. Bio-geographical classification of India. Biodiversity patterns (global, National and local levels). Hot-spots of biodiversity. India as a mega-diversity nation. Endangered and endemic species of India. Threats

2023-2024

3H-3C

SEMESTER-I

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to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT IV -ENVIRONMENTAL POLLUTION

Definition, causes, effects and control measures of Air pollution, Water pollution – Water reuse and recycling, Soil pollution, Noise pollution. Nuclear hazards and human health risks. Solid waste management and control measures of urban, industrial and e-wastes. Role of an individual in prevention of pollution. Case studies.

UNIT V - SOCIAL ISSUES AND THE ENVIRONMENT

Concept of sustainability and sustainable development, Circular economy. Water conservation -Rain water harvesting, watershed management. Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture. Environment Laws (Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act). International agreements (Montreal and Kyoto protocols).Resettlement and rehabilitation of project affected persons. Disaster management (floods, earthquake, cyclones and landslides). Environmental Movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g.,CNG vehicles in Delhi).Human population growth: Impacts on environment ,human health and welfare.

Total: 45

Text Books:

- 1. Anubha Kaushik., and Kaushik, C.P. 2004. Perspectives in Environmental Studies. New Age International Pvt. Ltd. Publications, New Delhi.
- 2. Erach Bharucha. 2004. A text book for Environmental Studies, University Grants Commission and Bharat Vidypeeth Institute of Environmental Education Research, New Delhi.
- 3. Rajagopalan, R. 2016. Environmental Studies: From Crisis to Cure, Oxford University Press.
- 4. Sing, J.S., Sing. S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand & Publishing Company, New Delhi.
- 5. Mishra, D.D. 2010. Fundamental Concepts in Environmental Studies. S. Chand& Company Pvt. Ltd., New Delhi.
- 6. Arvind Kumar. 2004. A Textbook of Environmental Science. APH Publishing Corporation, New Delhi.
- 7. Singh, M.P., Singh, B.S., and Soma, S. Dey. 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
- 8. Tripathy. S.N., and Sunakar Panda. (2004). Fundamentals of Environmental Studies (2nd ed.). Vrianda Publications Private Ltd, New Delhi.
- 9. Verma, P.S., and Agarwal V.K. 2001. Environmental Biology (Principles of Ecology). S. Chand and Company Ltd, New Delhi.
- 10. Uberoi, N.K. 2005. Environmental Studies. Excel Books Publications, New Delhi.

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CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	2	3	3	-	1	-	2	-	-
CO2	2	1	-	-	-	2	3	3	-	1	-	2	-	-
CO3	2	1	-	-	-	2	3	3	-	1	-	2	-	-
CO4	2	1	-	-	-	2	3	3	-	1	-	2	-	-
CO5	2	1	-	-	-	2	3	3	-	1	-	2	-	-
AVG	2.00	1.00	-	-	-	2.00	3.00	3.00	-	1.00	-	2.00	-	-

B.E.CIVIL ENGINEERING

23BECE141

ENGINEERING PHYSICS (THEORY & LABORATORY)

Instruction Hours/week: L:4 T:0 P:2

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

(i)THEORY

Course Objectives

The goal of this course is for students to

- Inculcate the basics of properties of matter, sound and its applications.
- Understand the basics of laser and optical fiber with appropriate applications.
- Disseminate the fundamentals of thermal physics and their applications.
- Introduce the concepts of quantum mechanics for diverse applications.
- Impart the basic knowledge of crystal and its various crystal structures.

Course Outcomes

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

- Identify the elastic properties of the materials using Young's modulus and rigidity modulus. •
- Examine the performance of light, laser and optical fibres. •
- Apply the concept of thermal properties for calculating thermal conductivity of the materials.
- Relate the quantum concepts in electron microscope.
- Outline the basics of crystals, structures and its defects.

UNIT I – PROPERTIES OF MATTER

Elasticity – stress – strain – Hookes law- classification of elastic modulus -Poisson's ratio - Stress-Strain diagram and its uses - factors affecting elastic modulus and tensile strength Moment, Couple and Torque-Twisting couple on a wire - Torsion pendulum - bending of beams - bending moment - cantilever- young's modulus - uniform bending and non-uniform bending (Experimental) - Ishaped girders and its applications.

UNIT II – LASER AND FIBER OPTICS

LASER: Introduction - characteristics - Einstein's co-efficients derivation Principle of laser actionpopulation inversion- pumping methods -Types of laser - Nd: YAG, CO₂ - Applications of LASER in industry and medicine.

Fiber optics - principle- modes of propagation of light in optical fibers - numerical aperture and acceptance angle – types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram).

UNIT III – THERMAL PHYSICS

Mode of Heat Transfer - conduction, convection, radiation (qualitative) - thermal expansions of solid and liquid - bimetallic strips - thermal conductivity: Forbe's and Lee's disc method: theory and experiment – heat conduction through compound media (series and parallel) – Thermal insulators - Laws of thermodynamics - refrigerators- microwave oven and solar water heater.

UNIT IV – QUANTUM PHYSICS

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6H-5C

SEMESTER-I

Black body radiation - Energy Distribution laws: Stefan Boltzmann's law, Wein's Displacement law Rayleigh Jeans Law - Photo electric effect – Compton effect (Qualitative) – De Broglie hypothesis - uncertainty principle – physical significance of wave function - Schrödinger's Time dependent wave equation - Schrödinger's Time independent wave equation – Electron Microscope: Scanning Electron Microscope and Transmission Electron Microscope.

UNIT V – CRYSTAL PHYSICS

9

Total: 45

Classification of solids: Crystalline and amorphous solids – crystal structure - unit cell, primitive cell – seven crystal systems, Bravais lattices, Miller indices – inter-planar distances (Qualitative) - Coordination number and Atomic packing factor for Simple Cubic, Body Centered Cubic, Face Centered Cubic, Hexagonal Closed Packing structures – Defects in crystal: Point & Line defect.

TEXT BOOKS:

- 1. Bhattacharya D.K. & Poonam T., Engineering Physics, Oxford University Press, 2015.
- 2. Gaur R.K. and Gupta S.L, Engineering Physics, Dhanpat Rai Publications, 2012.
- 3. Pandey. B.K. & Chaturvedi. S, Engineering Physics, Cengage Learning India, 2012.
- 4. Charles Kittel, Kittel's Introduction to Solid State Physics, Wiley India Edition, 2019.
- 5. P.M. Mathews, K.Venkatesan, A text book of Quantum Mechanics, 2/e, Mc Graw Hill Education, 2017.
- 6. Laser Fundamentals, William T Silfvast, Cambridge Univ Press. 2012.
- 7. Fiber Optics and Optoelectronics, R P Khare, Oxford, 2012.
- 8. D.S. Mathur, Elements of properties of matter, S.Chand, 2010.

REFERENCES:

- 1. Halliday.D. Resnick R. & Walker. J, Principles of Physics, Wiley, 2015.
- 2. Daniel V.Schroeder, An Introduction to Thermal Physics, Pearson, 2014.

WEBSITE:

- 1. www.nptel.ac.in/courses/122/103/122103011/
- 2. www.nptel.ac.in/courses/113/104/113104081/
- 3. www.hyperphysics.phy-astr.gsu.edu/hbase/optmod/lascon.html

(ii) LABORATORY

COURSE OBJECTIVES

- To develop basic laboratory skills and demonstrating the application of physical principles.
- To prepare for the lab experiment and perform individually a wide spectrum of experiments.
- To present experimental data in various appropriate forms like tabulation, and plots.
- To analyze, Interpret and summarize experimental results.
- To communicate clearly understanding of various experimental principles, instruments/setup, and procedure.

COURSE OUTCOMES

- Apply the knowledge on physics practical experiments and that knowledge will be used by them in different engineering and technology applications.
- Model the lab experiment and perform individually a wide spectrum of experiments.
- Illustrate the experimental data in various appropriate forms like tabulation, and plots.
- Examine the experimental results using the tabulated values and plotted graphs.
- Demonstrate the various experimental principles, instruments/setup, and procedure.

LIST OF EXPERIMENTS – PHYSICS (Any 7 Experiments)

- 1. Torsional pendulum Determination of rigidity modulus of wire and moment of inertia of disc
- 2. Uniform bending Determination of young's modulus.
- 3. Non-uniform Bending Determination of young's modulus.
- 4. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow.
- 5. Laser Determination of the wave length of the laser using grating,
- 6. Optical Fiber Determination of Numerical Aperture and Acceptance angle of the optical fiber.
- 7. Air wedge Determination of thickness of a thin sheet/wire.
- 8. Lee's disc Determination of thermal conductivity.
- 9. Determination of Band gap of a semiconductor.
- 10. Characteristics of photo diode.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	1	-	-
CO2	3	3	2	-	-	1	-	-	2	2	-	1	-	-
CO3	3	2	-	-	-	-	-	-	2	2	-	1	-	-
CO4	2	1	-	-	-	-	-	-	-	1	-	1	-	-
CO5	2	1	-	-	-	-	-	-	-	1	-	1	-	-
AVG	2.6	1.8	1.5	-	-	1.0	-	-	2.0	1.6	-	1.0	-	-

CO-PO MAPPING
23BECC142

PROGRAMMING IN C (THEORY & LABORATRY)

Instruction Hours/week: L:4 T:0 P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

(i) THEORY

COURSE OBJECTIVES:

The goal of this course is for the students:

- To interpret problem solving using C.
- To apply the concept of arrays and strings.
- To identify the functions of C Language.
- To apply the concept of pointers.
- To develop C Programs using user defined function and file handling.

COURSE OUTCOMES:

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

- Apply algorithmic solutions to computational problems using C.
- Solve problems using arrays and strings.
- Build modular applications in C using functions.
- Categorize dynamic memory management operators with pointers.
- Examine sequential and random access file processing.

UNIT I INTRODUCTION

An overview of computers and programming - Understanding computer systems - Programming logic - Steps in program development – Algorithm - Using pseudocode and flowchart – types of programming languages – Compiler – Interpreter – Linker - Introduction to C – Structure of C program - Identifiers and Keywords - Data types - Constants and variables - Type conversion – Operators - Expressions. Formatted and Unformatted Input/Output functions - Control structures

UNIT II ARRAYS AND STRINGS

Arrays in C - Declaring and initializing arrays in C - Defining and processing 1D and 2D arrays -Inserting and deleting elements of an array - Strings - Defining and initializing strings - Processing of string - Character arithmetic - String manipulation functions and library functions of string.

UNIT III FUNCTIONS

Functions - Types of Functions - Function prototypes - Function definition - Function call including passing arguments by value and passing arguments by reference - Passing arrays to functions - Math library functions - Recursive functions - Scope rules (local and global scope) - Storage classes in C.

6H-5C

SEMESTER-I

9

UNIT IV POINTERS

Pointers - Pointer declaration and initialization - Types of pointers - Pointer expressions and arithmetic - Operations on pointers - Passing pointer to a function - Pointer and one-dimensional array - Pointers and strings – Command line arguments - Dynamic memory management functions.

UNIT V USER DEFINED TYPES AND FILE HANDLING

User defined types - Enumerator – Typedef - Structures - Declaration of a structure - Accessing structures - Array of Structures - Structures and pointers - Nested structures – Bit fields – Unions - Declaration of a union – Accessing unions – Union vs Structure - File Input/Output – Preprocessor directives.

TOTAL:45

12

TEXT BOOKS:

- 1. Programming In C By Ashok N. Kamthane,3rd edition, Pearson, 2015.
- 2. Programming In C, Reema Thareja, Oxford University Press, Second Edition, 2016.

REFERENCES BOOKS:

- 1. "C How To Program" By Paul Deitel And Harvey Deitel, 8th edition, Prentice Hall, 2015.
- 2. "Programming In Ansi C" By E. Balagurusamy, 8th edition, Mcgraw Hill Education, 2019.
- 3. "Let Us C", by Yashwant Kanetkar, 17th Edition, Bpb Publications, 2020.
- 4. "C: The complete reference", Herbert Schildt, 4th edition, Mcgraw Hill Education, 2017.

WEBSITES:

- 1. www.hackerrank.com
- 2. www.codechef.com
- 3. www.learn-c.org
- 4. www.udemy.com
- 5. www.hackearth.com

(ii) LABORATORY

LIST OF EXPERIMENTS:

- 1. Develop a C Program to find the roots of quadratic equation for non-zero coefficient using if-else ladder construct.
- 2. Develop Programs using simple control statements such as if else, while, do while.Example Extracting the digits of an integer, reversing digits, finding sum of digits
- 3. Develop a C Program to implement a simple calculator to perform addition, subtraction, multiplication and division operations using switch construct. Display appropriate messages for invalid operator and divide by zero error.
- 4. Develop C Program to generate Fibonacci sequence, calculation of factorials, printing various patterns and generate the Prime numbers between the ranges m & n using for loop.

- 5. Develop a C program to read n elements into an integer array, Insert and Delete element from the array. Print the input array and the resultant array with suitable messages.
- 6. Develop a C program to read two matrices A (m x n) and B (p x q) and compute the product of the two matrices. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only. Program must check the compatibility of orders of the matrices for multiplication. Report appropriate message in case of incompatibility.
- 7. Develop a C function Program to sort the given names in Asecuding Order.
- 8. Develop a C program to count the vowels & consonants in a given string.
- 9. Develop a C Program to find the GCD of two integers using Euclid's algorithm
- 10. Develop a recursive C function to find the factorial of a number, n!, defined by fact(n)=1, if n=0. Otherwise fact(n)=n*fact(n-1). Using this function, develop a C program to compute the Binomial coefficient nCr. Perform input validation as well.
- 11. Develop a C program to find the smallest and largest elements in an array using pointers and then swap these elements and display the resultant array.
- 12. Develop a C program to find the sum of all the elements of an integer array using pointers.
- 13. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using structures and pointers

TOTAL : 30

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	3	-
CO2	3	2	1	-	-	-	-	-	2	2	-	2	3	-
CO3	3	2	1	-	-	-	-	-	2	2	-	2	3	-
CO4	3	3	2	1	-	-	-	-	2	2	-	2	3	-
CO5	3	3	2	1	-	-	-	-	2	2	-	2	3	-
Avg	3	2.4	1.4	1	-	-	-	-	2	2	_	2	3	_

CO-PO MAPPING

B.E. CIVIL ENGINEERING

23BECC111

ENGINEERING GRAPHICS

2022-2023 SEMESTER-I

4H-3C

Instruction Hours/week: L:2 T:0 P:2

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

- Expose them to existing national standards related to technical drawings and develop their ability to produce engineering drawings using drawing instruments.
- Emphasize freehand sketching to aid in the visualization process and to efficiently communicate ideas graphically.
- Introduce CAD software for the creation of 2D engineering drawings.
- Develop a clear understanding of projection and the projection of points.
- Produce computer generated drawings using CAD software and develop a clear understanding of plane geometry.

COURSE OUTCOMES:

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

- Apply BIS and ISO standards in engineering drafting.
- Construct mathematical curves in engineering applications
- Illustrate geometrical solids in 3D space using orthographic projections.
- Develop the projection of simple solids.
- Interpret the information of the 2D and 3D drawing.

UNIT I INTRODUCTION

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Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning–linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute.

UNIT II FREE HAND SKETCHING

Representation of Three-Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout

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views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT III INTRODUCTION TO COMPUTER GRAPHICS – 2D

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software, Consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Annotations, layering and other functions. Sketching of 2D simple geometries, editing and dimensioning of 2D geometries.

UNIT IV **PROJECTION OF POINTS AND LINES**

Projection of points and straight lines located in the first quadrant inclined to both planes-Determination of true lengths and true inclinations (By using CAD software).

UNIT V **PROJECTION OF PLANE SURFACES**

Projection of polygonal surface and circular lamina inclined to both reference planes (By using CAD software).

TEXT BOOKS:

- Venugopal K and Prabhu Raja V, (2021), Engineering Graphics, New Age International 1. Publishers.
- 2. James D. Bethune, (2020), Engineering Graphics with AutoCAD, Macromedia Press.
- C M Agrawal and Basant Agrawal, (2019), Engineering Graphics, Tata McGraw Hill, New 3. Delhi.

REFERENCE BOOKS:

- Annaiah M.H., Prem Kumar, Chandrappa C N, (2022), Computer Aided Engineering 1. Drawing, New Age International Private Limited.
- Narayana, K.L. and P Kannaiah, (2021), Text book on Engineering Drawing, Scitech 2. Publications (India) Pvt. Ltd.
- Shah, M.B. and Rana B.C., (2010), Engineering Drawing and Computer Graphics, Pearson 3. Education.
- Bhatt N.D., Panchal V.M. and Ingle P.R, (2019), Engineering Drawing, Charotar 4. Publishing House.

WEBSITES:

- https://onlinecourses.nptel.ac.in/noc21 me128 1.
- 2. https://www.mygreatlearning.com/academy/learn-for-free/courses/engineering-graphicsdrawing
- https://www.autodesk.in/solutions/technical-drawing 3.

TOTAL: 45

15

09

09

CO-PO MAPPING

COURSE	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO1	PSO2
	1	2	3	4	5	6	7	8	9	0	1	2		
CO1	3	2	-	-	-	-	-	1	-	2	-	2	2	-
CO2	3	2	-	-	-	-	-	1	-	2	-	2	2	-
CO3	3	2	-	-	-	-	-	1	-	2	-	2	2	-
CO4	3	2	-	-	-	-	-	1	-	2	-	2	2	-
CO5	3	3	2	1	-	-	-	1	-	2	-	2	2	-
Average	3	2	2	0.6	-	-	-	1	-	2	-	2	2	-

DESIGN THINKING

Marks: Internal:100

Instruction Hours/week: L:1 T:0 P:2 Total:100

End Semester Exam:3 Hours

COURSE OBJECTIVES:

The goal of this course is for the students to

- Illustrate design thinking concepts and principles
- Utilize design thinking methods in every stage of the problem
- Identify the different phases of design thinking
- Plan for various product and service communication in design thinking
- Interpret the use of tools for the design process

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- Explain the design thinking process, tools and theories.
- Identify the types of users and the requirements of customers.
- Explore the concepts of Prototyping and its testing.
- Analyze design thinking strategies in product and service design.
- Customize existing products by utilizing design thinking strategies.

UNIT I INTRODUCTION

Understanding Design thinking and tools - Human-Centric Design Process - Design Thinking Process- DT Activity with case studies.

UNIT II EMPATHISE WITH USERS

Five Whys - Needs of user - Types of user research -Customer Journey Mapping - Observational Research

UNIT III PROTOTYPING

Ideas to presentable concepts - Scenario-based Prototyping – Testing prototypes - Usability and ergonomic testing - Rapid prototyping.

UNIT IV PRODUCT AND SERVICE DESIGN

Product Design - Interaction Design- Service Design - Communication Design - Transportation Design.

(6)

(6)

(6)

(6)

3H - 2C

SEMESTER-I

UNIT V DESIGN AND INNOVATION

DT For strategic innovations - Extreme Competition - Experience design - Standardization -

Humanization - Creative Culture.

TOTAL HOURS: 30

TEXT BOOKS:

- 1. Bala Ramadurai, "Karmic Design Thinking", 2020.
- 2. Christian Mueller-Roterberg, "Handbook of Design thinking", Amazon Digital Services LLC KDP Print US, 2018.
- 3. Tim Brown, "Change by Design", Harper Business Publisher, 2019
- 4. Hasso Plattner, Christoph Meinel and Larry Leifer, "Design Thinking: Understand Improve Apply", Springer, 2011
- 5. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	-	-	1	1	1	-	3	-	-
CO2	3	2	1	-	-	-	-	2	1	1	-	3	-	-
CO3	3	2	2	1	-	2	1	2	2	2	-	3	-	-
CO4	3	3	2	1	-	2	1	2	2	2	-	3	-	-
CO5	3	3	2	1	-	2	1	2	2	2	-	3	-	-
AVG	2.80	2.20	1.60	1.00	-	2.00	1.00	1.80	1.60	1.60	-	3.00	-	-

CO-PO MAPPING

23BEMC152

SPORTS AND YOGA

2023-2024 SEMESTER-I

1H-0C

Instruction Hours/week: L:1 T:0 P:0

Marks: Internal:100 External:0 Total:100

COURSE OBJECTIVES:

The goal of this course, is for the students:

- To have knowledge of Physical fitness and exercise management to lead better quality life
- To enable to officiate, supervise various sports events and organize sports events
- To acquire the knowledge of Physical Education, Sports and Yoga an understand the purpose and its development
- To gain knowledge to plan, organize and execute sports events

COURSE OUTCOMES:

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

- Practice physical activities and yoga for strength, flexibility and relaxation.
- Use techniques for increasing concentration and decreasing anxiety for stronger academic performance.
- Perform yoga exercises in various combination and forms.
- Improve personal fitness through participation in sports and yoga activities.
- Follow sound nutritional practices for maintaining good health and physical
- performance.

Unit – I Introduction to Physical fitness

Explain importance of physical education - Describe importance of Physical Fitness & Wellness - Explain the components of physical fitness - Demonstrate healthy life style - Prevent health threats by changing life style

Unit - II Fundamentals of Anatomy & Physiology in sports & yoga

Explain importance of anatomy and physiology - Describe effects of exercise in various body systems - Describe concept of correct posture - Explain corrective measures for posture deformities.

Unit– III Yoga & Pranayama

Explain importance of yoga - Perform various pranayama for increasing concentration - Use meditation and other relaxation techniques for improving concentration.

TEXT BOOKS:

- 1. Ajmer Singh, Modern Trends and Physical Education class 11 & class 12, Kalyani Publication, New Delhi ISBN: 9789327264319.
- 2. B.K.S. Iyengar, Light on Yoga, Thomson's Publication, New DelhiISBN: 8172235011
- 3. V.K.Sharma, Health and Physical Education, NCERT Books; Class11,12 Saraswati House Publication, New Delhi
- 4. Acharya Yatendra, Yoga and Stress Management, Fingerprint Publishing ISBN: 938905303X

23BTMC153

தமிழர் மரபும் பண்பாடும்

பருவம் -l

1 H – 0 C

கற்பித்தல் நேரம்/வாரம்: L:0 T:0 P:2 மதிப்பெண்: இடைத்தேர்வு: 100 மொத்தம்:100

பாடத்திட்ட பயன் விளைவு:

- வரலாற்றிற்கு முற்பட்ட தமிழகத்தை மாணவர்களுக்கு அறிமுகப்படுத்துதல்
- பழந்தமிழர் பண்பாடு சார்ந்த வாழ்க்கை முறையை மாணவர்கள் அறிய ஊக்குவித்தல்
- தமிழ் மொழியின் பழைமையும், திராவிட மொழிகளில் தமிழ்மொழியின் தனிச்சிறப்பையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
- தமிழர்களின் வாழ்வியல், தமிழர்கலைகள்,
 ஆற்றங்கரைப்பண்பாடுகள் குறித்து மாணவர்கள் அறியச்செய்தல்.
- இந்தியக்குடியுரிமைப்பணி முதலான போட்டித்தேர்வுகளில் விருப்பப்பாடமாக இடம்பெறுகின்ற தமிழ்நாகரிகமும் பண்பாடும் குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்

பாடத்திட்டப் பொதுநோக்கம்:

- இந்தியக்குடியுரிமைப்பணி முதலான போட்டித்தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத்தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின்வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்'; 'இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல்.
- 5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப்பேணுவதற்குக்கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மைவளர்ச்சி. மொழிபெயர்ப்புத்துறை சார்ந்த வேலைவாய்புத்திறன் பெற்றிருத்தல்.

அலகு:1 தமிழர் மரபு

மரபு-விளக்கம்-சங்ககால தமிழர் மரபு – திணைப்பகுப்பும் தமிழர் மரபும்-உலகப்பொதுமை – அகத்திணை மரபு – புறத்திணை மரபு-இடைக்காலத்தமிழர் மரபு – பிற்கால மரபும் மாற்றமும் – தற்கால தமிழர்மரபு - வளர்ச்சி.

அலகு: 2 தமிழர் பண்பாடு

பண்பாடு – விளக்கம் – பழந்தமிழர் பண்பாடு – இயற்கை சார்ந்த வாழ்வியல் – தமிழர் சமயம் – அரசியல் நிலை–சமூகப் பழக்கவழக்கங்கள் – நம்பிக்கைகள் – வாழ்வியல் அறங்கள் – வணிகம் போன்றவை.

அலகு:3 தமிழர் கலைகள்

தமிழகத்தில் கலைகளின் வளர்ச்சி – சிற்பக்கலை வளர்ச்சி –கோயில் கலை – கற்கோவில்கள் - ஓவியக்கலை – அழகுக்கலைகள் - கூத்துக்கலை – மருத்துவக்கலை – நாடகக்கலை– இசைக்கலை போன்றவை.

அலகு: 4 தமிழர் சமயம்

பழந்தமிழரின் சமயம் – சங்ககால சமயம் – தொல்காப்பியத்தில் சமயம் – சைவ சமயம் – வைணவம் – தமிழ்ப் பண்பாட்டில் பௌத்தம் – தமிழ்ப் பண்பாட்டில் சமணத்தின் தாக்கம்–தமிழ்ப் பண்பாட்டில் இசுலாம் மற்றும் கிறித்துவ சமயத்தின் தாக்கம்- தமிழர் பண்பாட்டில் விழாக்கள்-கோயில்களும் விழாக்களும்- சமூக ஒருங்கிணைப்பில் விழாக்களின் பங்கு-சங்க இலக்கியத்தில் விழாக்கள் பற்றிய குறிப்புகள்-இடைக்கால இலக்கியங்களில் விழாக்கள் பற்றிய செய்திகள் – விழாக்களின் சமூகப்பங்களிப்பு – தற்காலத்தில் தமிழர் விழாக்கள் - விளையாட்டும் விழாக்களும்.

அலகு: 5 இலக்கியங்களில் தமிழர் பண்பாட்டுப் பதிவுகள்

சங்க இலக்கியமும் வாழ்வியலும்-திருக்குறளில் வாழ்வியல் நெறிகள் – இரட்டைக் காப்பியங்களும் வாழ்வியலும் – சிற்றிலக்கியங்களில் வாழ்வியல் பதிவுகள்-இக்கால இலக்கியமும் வாழ்வியலும்.

பார்வைநூல்கள்:

- தமிழ் இலக்கிய வரலாறு தமிழண்ணல், மீனாட்சி புத்தக நிலையம்-மதுரை-இரண்டாம் பதிப்பு-ஜூலை – 2000.
- தமிழர் நாகரிகமும் பண்பாடும், அ. தட்சிணாமூர்த்தி, ஐந்திணைப் பதிப்பகம், சென்னை, திருத்திய பதிப்பு – 2022.
- தமிழர் வரலாறும் பண்பாடும், நா. வானமாமலை, நியூசெஞ்சுரி புக் ஹவுஸ், சென்னை, ஆறாம்பதிப்பு - 2007.
- தமிழக வரலாறு மக்களும் பண்பாடும், கே.கே. பிள்ளை, உலகத் தமிழராய்ச்சி நிறுவனம், சென்னை.

B.E. CIVIL ENGINEERING

23BECC201C

TRANSFORMS AND ITS APPLICATIONS

Instruction Hours/week: L:3 T:1 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

The goal of this course is for students:

- To make the students to understand the concept of periodic function and represent them in Fourier series.
- To make the students to understand the applications of partial differential equations.
- To acquaint the students with the concepts of Fourier transform techniques.
- To impart knowledge in Laplace, transform techniques and its applications.
- To provide knowledge about solving ordinary differential equations using the Inverse Laplace transform.

COURSE OUTCOMES:

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

- Illustrate Fourier series representation of periodic functions.
- Apply Fourier series in one dimensional heat flow and wave equation.
- Make use of Fourier transform for converting elementary functions into frequency domain.
- Utilize Laplace Transform to convert time-domain systems into frequency-domain systems.
- Apply Inverse Laplace Transform in linear differential equations.

UNIT I FOURIER SERIES

Dirichlet's conditions – General Fourier series in the interval (0,2l) & (-l,l) – Half range sine series –Half range cosine series –Harmonic analysis.

UNIT II: APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Fourier series solution for one dimensional wave equation – Fourier series solution for one dimensional heat equation with zero end conditions.

UNIT III FOURIER TRANSFORMS

Fourier transform pair – Complex form of Fourier transform- Fourier sine and cosine transforms – Convolution theorem – Parseval's identity of Fourier transform.

UNIT IV LAPLACE TRANSFORM

Transforms of standard functions – Properties of Laplace transform – Transforms of derivatives and integrals –Initial and final value theorem – Transforms of periodic functions.

UNIT V INVERSE LAPLACE TRANSFORM

12

4H-4C

SEMESTER-II

12

12

Inverse Laplace transforms of standard functions – Inverse Laplace transform using second shifting theorem – Method of partial fractions– Solution of ordinary differential equations with constant coefficients using Laplace transforms

Total: 45+15

TEXT BOOKS:

- 1. John W. Miles Integral Transforms in Applied Mathematics Cambridge University Press 2008
- 2. Erwin Kreyszig Advanced Engineering Mathematics John Wiley and Sons, Tenth Edition 2017

REFERENCE BOOKS:

- 1. Eric W Hansen Fourier Transforms: Principles and Applications John Wiley 2014
- 2. N.W. McLachlan Laplace Transforms and Their Applications to Differential Equations Dover Publications Inc. 2014
- 3. Richard Haberman Applied Partial Differential Equations with Fourier Series and Boundary Value Problems Pearson, Fifth edition 2021

Web URL:

- 1. www.nptel.ac.in/courses/111106111
- 2. www.nptel.ac.in/courses/111107111
- 3. www.nptel.ac.in/courses/111102129
- 4. <u>www.nptel.ac.in/courses/111106139</u>
- 5. www.archive.nptel.ac.in/courses/111/105/111105123/

CO PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	_	-	-	-	-	-	-	-	-	1	_	_
CO2	3	2	1	-	-	-	-	-	-	-	-	1	_	_
CO3	3	2	1	-	-	-	-	-	-	-	-	1	_	_
CO4	3	2	1	-	-	-	-	-	-	-	-	1	_	_
CO5	3	2	1	-	-	-	-	-	-	-	-	1	_	_
AVG	2.8	1.8	1	-	-	-	-	-	-	-	-	1	_	_

B.E CIVIL ENGINEERING

23BECE202

ENERGY SCIENCE AND ENGINEERING

Instruction Hours/week: L: 2 T: 1 P: 0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

- Summarize energy, sustainability, and the environment.
- Explain energy storage systems and their advancements.
- Outline the impact of energy storage system.
- Summarize civil engineering projects related to energy sources.
- Explain the energy conservation, auditing, and green building concepts.

COURSE OUTCOMES:

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

- Summarize energy, sustainability, and the environment.
- Explain energy storage systems and their advancements.
- Outline the impact of energy storage system.
- Summarize civil engineering projects related to energy sources.
- Explain the energy conservation, auditing, and green building concepts.

UNIT I: INTRODUCTION TO ENERGY SCIENCE

Introduction to Energy, sustainability and the environment. Primary energy sources - world energy resources-Indian energy scenario-energy cycle of the earth -environmental aspects of energy utilization, CO₂ emissions and Global warming–renewable energy resources and their importance. 9

UNIT II: ENERGY & EFFECT ON ENVIRONMENT

Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability, energy economics; Climate change, acid rain, ozone layer depletion, Case Studies. Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act.

UNIT III: ENERGY STORAGE SYSTEM

Li-ion batteries - Principle of operation, Battery components and design Electrode, Advance Ni-MH batteries for transportation, Future prospects of Ni-MH batteries vs. lithium ion batteries, Zebra cell, Li-iron sulphide cells, Vanadium and iron-based batteries, Semi-fluid flow batteries for large scale grid application, Ni-H₂ cells for space applications.

UNIT IV: CIVIL ENGINEERING PROJECTS CONNECTED WITH THE ENERGY **SOURCES** 9

Coal mining technologies, Oil exploration off shore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear fuel storage and disposal systems.

2023-2024

3H-3C

SEMESTER-II

UNIT V: ENGINEERING FOR ENERGY CONSERVATION& ENERGY AUDITING 9

Need, Types, Methodology and Barriers. Role of energy Managers. Instruments for energy auditing. Concept of Green Building and Green Architecture; Green building concepts; Energy conservation opportunities Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems.

TEXT BOOKS:

- 1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
- 2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.

REFERENCE BOOKS:

- 1. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
- 2. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
- 3. Ristinen, Robert A. Kraushaar, Jack J. A Kraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
- 4. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
- 5. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company
- 6. Rai G.D (2011). A Nonconventional Energy sources; Khanna Publishers, New Delhi.

		PO	PSO	PSO										
	PO1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1	-	-	-	1	2	-	-	1	-	1	-	-
CO2	2	1	-	-	-	1	2	-	-	1	-	1	-	-
CO3	2	1	-	-	-	1	2	-	-	1	-	1	-	-
CO4	2	1	-	-	-	1	2	-	-	1	-	1	-	-
CO5	2	1	-	-	-	1	2	-	-	1	-	1	-	-
AVG	2	1	-	-	-	1	2	-	-	1	-	1	-	-

CO-PO Mapping

B.E. CIVIL ENGINEERING

23BECC203

Karpagam Academy of Higher Education (Deemed to be University) Coimbatore -641021

BASIC ELECTRICAL & ELECTRONICS ENGINEERING (THEORY)

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

COURSE OBJECTIVES

- To impart the basic knowledge about the Electric circuits.
- To understand the concept of Electrical Machines and Transformers.
- To understand the working of Semiconductor devices and Digital Circuits. •
- To impart the basic knowledge of Measuring Instruments and Electrical Installation.
- Know the fundamentals of Electrical Engineering and Practical.

COURSE OUTCOMES

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Compare the electric circuits DC and AC excitation by	Apply
	applying various circuit laws.	
CO2	Illustrate the basic principles, construction and working of AC,	Understand
	DC Motor and transformer	
CO3	Infer the various characteristics of semiconductor devices and	Apply
	real time application of digital circuits.	
CO4	Explain the principle, construction and operation of moving	Understand
	coil and moving iron instruments, the electrical safety issues	
	and protective devices.	
CO5	Compare the different types of Batteries & its application in	Apply
	Electric Vehicle.	

UNIT I DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's and Norton Theorems.

UNIT II AC Circuits

Representation of sinusoidal waveforms, peak and rms values, Phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III Electrical Machines and Transformer

Construction and working of a three-phase and Single-phase induction motor. Construction, working and speed control of DC motor. Magnetic materials, BH characteristics, Construction and working principle of ideal and practical transformer.

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3H-3C

UNIT IV Semiconductor Devices and Digital Electronics

Bipolar Junction Transistor – Characteristics. Introduction to operational Amplifier –Model– Applications. Number systems – binary codes - logic gates - Boolean algebra, laws & theorems

UNIT V Measuring Instruments and Electrical Installation

Principle, construction, and operation of moving coil and moving iron meters-Measurement of Power. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB. Earthing. Types of Batteries and its application in Electric Vehicle, Important Characteristics for Batteries. Elementary calculations for energy consumption and battery backup.

SUGGESTED BOOKS

- 1. S.K.Bhattacharya, "Basic Electrical Engineering", Pearson, 2019.
- 2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
- 3. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
- 4. VN Mittle and Arvind Mittal, (2006), Basic Electrical Engineering, McGraw Hill.
- 5. A.Sudhaka and Shyammohan S Palli, (2013), Circuits and Networks, McGraw Hill.
- 6. R.Muthusubramanian and S.Salivahanan, (2014), Basic Electrical and Electronics Engineering, McGraw Hill.

WEB LINKS

- 1. www.nptel.ac.in.
- 2. encyclopedia-magnetica.com/doku.php/co energy.
- 3. https://en.wikibooks.org/wiki/electronics/measuring instruments.

CO PO MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	1	1	1	-	-	1.5	2	-	-	2	-	-
CO2	2	2	1	1	1	-	-	1.5	2	-	-	2	-	-
CO3	2	2	1	1	1	-	-	1.5	2	-	-	2	-	-
CO4	2	2	1	1	1	-	-	1.5	2	-	-	2	-	-
CO5	2	2	1	1	1	-	-	1.5	2	-	-	2	-	-
Avg.	2	2	1	1	1	-	-	1.5	2	-	-	2	-	-

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23BECE241

ENGINEERING CHEMISTRY (THEORY & LABORATORY)

Instruction Hours/week: L:4 T:0 P:2

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

The goal of this course is for students:

- To learn the basics of Periodic properties, Intermolecular forces
- To infer the terminologies of electrochemistry and to analyze about energy storage devices
- To build the concept of corrosion and its prevention
- To summarize the basic water technology and its purification.
- To analyze about spectroscopic technique

COURSE OUTCOMES:

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

- Analyse periodic properties of elements.
- Apply the concepts of electrochemistry in storage devices.
- Illustrate the types of corrosion and its prevention.
- Identify the quality of water and its treatment methodologies.
- Explain the principle and working of spectroscopic techniques.

UNIT I - PERIODIC PROPERTIES, INTERMOLECULAR FORCES

Introduction to Periodic Properties- atomic and ionic sizes, ionization energies, electron affinity and electronegativity, effective nuclear charge. Penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations. Polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.

UNIT II ELECTROCHEMISTRY AND STORAGE DEVICES

Thermodynamic functions. Free energy and emf. Cell potentials, the Nernst equation and applications. Types of electrodes Standard Hydrogen Electrode (SHE) & Calomel. Energy storage devices Primary and secondary cells- Leclanche cell, Lead Acid Battery, Nickel Cadmium Battery, Lithium Battery Charging and discharging reactions.

UNIT III CORROSION AND ITS CONTROL

Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion-Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings - Organic coatings-Paints - Constituents and functions -Inorganic coatings- Metallic coatings - Electroplating (Au) and Electro less plating (Ni) - Surface conversion coating - Hot dipping

UNIT IV – WATER TECHNOLOGY

Sources-Characteristics - Specification for drinking water, BIS &WHO-Alkalinity - Types of alkalinity and determination - Hardness - Types and estimation by EDTA method - Domestic water treatment - Disinfection methods (Chlorination, Ozonation. UV treatment) - Boiler feed water -

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SEMESTER-II 6H-5C

Requirements - Disadvantages of using hard water in boilers - Internal conditioning (Phosphate, Calgon and Carbonate conditioning methods) - External conditioning - Demineralization process - Desalination - Reverse osmosis.

UNIT V - SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Spectroscopy (Principles and Instrumentation only). Electronic spectroscopy. Vibrational and rotational spectroscopy. Applications. Surface characterization techniques: Scanning electron microscope (SEM) and Transmission electron microscopy (TEM). Fluorescence and its applications in medicine

TEXT BOOKS:

- 1. P C Jain & Monica Jain, (2015). Engineering Chemistry, 18th edition, Dhanpat Rai Publishing Company
- 2. B. H. Mahan, (2010). University chemistry, Pearson Education.
- M. J. Sienko and R. A. Plane, (1976) Chemistry: Principles and Applications. 5th edition, McGraw-Hill Higher Education.
- 4. C. N. Banwell, (2001) Fundamentals of Molecular Spectroscopy, McGraw-Hill.
- 5. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Webbook)
- 6. P. W. Atkins, (2009). Physical Chemistry, Oxford University Press.
- 7. K. P. C. Volhardt and N. E. Schore, (2014).5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman Publications.

(ii) LABORATORY

COURSE OBJECTIVES

The goal of this course is for students:

- To develop knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.
- To estimate the amount of sodium carbonate and sodium hydrogen carbonate, hardness, chloride in water sample
- To make the student acquire practical skills in the determination of conductance of solutions, EMF etc
- To acquaint the students with the determination of rate constant of a reaction
- To carried out different types of titrations for estimation of concerned in materials.

COURSE OUTCOMES

Upon completion of the course the students will be able to

- Illustrate the principles of chemistry relevant to the analyze of science and engineering.
- Estimate rate constants of reactions from concentration of reactants/products as a function of time

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Total Hours : 45

- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- Determine the partition coefficient of a substance between two immiscible liquids.
- Acquaint the students with the determination of acid value of an oil

Choice of 10 experiments from the following

- 1. Determination of surface tension and viscosity.
- 2. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration.
- 3. Determination of Ca / Mg using complexometric titration.
- 4. Thin layer chromatography.
- 5. Determination of chloride content of water.
- 6. Determination of the rate constant of a reaction.
- 7. Conductometry Determination of cell constant and conductance of solutions.
- 8. pH Metry Determination of Acid / Base.
- 9. Potentiometry determination of redox potentials and emfs.
- 10. Saponification/acid value of an oil.
- 11. Determination of the partition coefficient of a substance between two immiscible liquids.
- 12. Adsorption of acetic acid by charcoal.
- 13. Use of the capillary viscometers to the demonstrate of the isoelectric point as the Ph of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	2	1	-	1	1	1	1	1	-	1	-	-
CO2	3	2	1	1	-	1	1	1	1	1	-	1	-	-
CO3	2	1	-	-	-	1	1	1	-	1	-	1	-	-
CO4	3	2	1	1	-	1	1	1	1	1	-	1	-	-
CO5	2	1	-	-	-	1	1	1	-	1	-	1	-	-
AVG	2.60	1.80	1.33	1.00	-	1.00	1.00	1.00	1.00	1.00	-	1.00	-	-

B.E. CIVIL ENGINEERING

23BECE242A

DATA STRUCTURES AND ALGORITHMS (THEORY & LABORATORY)

2023-2024 **SEMESTER-II**

6H-5C

Instruction Hours/week: L:4 T:0 P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

PRE-REQUISITES: Programming in C

THEORY **i**)

COURSE OBJECTIVES:

The goal of this course is for the students

- To understand the concepts of ADTs.
- To learn linear data structures lists, stacks, and queues.
- To interpret non-linear data structures trees and graphs.
- To implement sorting, searching and hashing algorithms.
- To apply Tree and Graph structures to real world scenario.

COURSE OUTCOMES:

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

- Build abstract data types for linked list data structure.
- Apply the concepts of stack, queue and its applications.
- Experiment with operations on binary trees.
- Identify the traversal techniques of graphs and its applications.
- Inspect sorting, searching and hashing techniques.

UNIT I LISTS

Abstract Data Types (ADTs) – Elementary Data types–List ADT – Array-based implementation - Linked list implementation - Singly linked lists - Doubly-linked lists - Circularly linked lists -Applications of lists – Polynomial ADT – Multilists–Sparse Matrices.

UNIT II STACKS AND QUEUES

Stack ADT – Operations – Applications – Balancing Symbols – Evaluating arithmetic expressions-Infix to Postfix conversion – Function Calls – Queue ADT – Operations – Circular Queue – Deque - Applications of Queues.

UNIT III TREES

Tree ADT – Tree Traversals - Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees – Red-Black Trees – Priority Queue (Heaps) – Binary Heap.

UNIT IV MULTIWAY SEARCH TREES AND GRAPHS

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B-Tree – B+ Tree – Tries – Graph Definition – Representation of Graphs – Types of Graphs – Breadth-first traversal – Depth-first traversal — Bi-connectivity – Euler circuits – Topological Sort – Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES

Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort – Quick Sort – Merge Sort – Heap Sort – Radix Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45

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TEXT BOOKS

- 1. Mark Allen Weiss," Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition, 2005 .
- 2. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein," Introduction to Algorithms", Mcgraw Hill/ MIT Press, Fourth Edition, 2022.

REFERENCE BOOKS

- 1. Narasimha Karumanchi," Data Structures and Algorithms Made Easy", CareerMonk Publications, First Edition, 2016.
- 2. Langsam, Augenstein and Tanenbaum, "Data Structures Using C", Pearson Education, Second Edition, 2015.
- 3. Kamthane," Introduction to Data Structures in C", Pearson Education, First Edition,2007
- 4. Kruse," Data Structures and Program Design in C", Pearson Education, Second Edition, 2003.

WEBSITES

- 1. www.nptel.ac.in/courses/106106145
- 2. www.nptel.ac.in/courses/106102064
- 3. www.coursera.org/learn/data-structures
- 4. www.edx.org/learn/data-structures
- 5. www.cs.usfca.edu/~galles/visualization/Algorithms.html

(ii) LABORATORY

LIST OF EXPERIMENTS

- 1. Array implementation of Stack, Queue and Circular Queue ADTs
- 2. Implementation of Singly Linked List
- 3. Linked list implementation of Stack and Linear Queue ADTs
- 4. Implementation of Evaluating Postfix Expressions, Infix to Postfix conversion
- 5. Implementation of Binary Search Trees and AVL Trees
- 6. Implementation of Heaps using Priority Queues
- 7. Implementation of Dijkstra's Algorithm
- 8. Implementation of Prim's Algorithm

- 9. Implementation of Linear Search and Binary Search
- 10. Implementation of Insertion Sort and Selection Sort
- 11. Implementation of Merge Sort and Quick Sort
- 12. Implementation of Open Addressing (Linear Probing and Quadratic Probing)

TOTAL: 30

CO-PO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	3	-
CO2	3	2	1	-	-	-	-	-	2	2	-	2	3	-
CO3	3	2	1	-	-	-	-	-	2	2	-	2	3	-
CO4	3	2	1	-	-	-	-	-	2	2	-	2	3	-
CO5	3	3	2	1	-	-	-	-	2	2	-	2	3	-
AVG	3	2.2	1.2	1	-	-	-	-	2	2	-	2	3	-

B.E. CIVIL ENGINEERING

23BECE242B

2023-2024 SEMESTER-II

6H-5C

OBJECT ORIENTED PROGRAMMING WITH PYTHON

(THEORY & LABORATORY)

Instruction Hours/week: L:4 T:0 P:2

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

(i) THEORY

COURSE OBJECTIVES

The goal of this course is for the students:

- To learn basic python language syntax, semantics and control structures.
- To apply list, tuple, set and dictionary to handle data.
- To solve the problems using functions and modules.
- To infer the object-oriented programming concepts in python.
- To interpret inheritance and exception handling in python.

COURSE OUTCOMES

Upon completion of this course the students will be able to

- Apply python control flow statements to solve problems.
- Model data structures using string, tuple, list, set, and dictionary.
- Identify Python built-in functions to write user defined functions.
- Apply object-oriented programming concepts in python.
- Analyze the concepts of exception handling to a real world scenario.

UNIT I PYTHON FUNDAMENTALS

Introduction to Python – language classification - python language syntax - keywords - identifiers - indentation - comments - input - output - escape characters – variables – operators - Control Statements.

UNIT II DATA STRUCTURES IN PYTHON

String - Mutable vs immutable types – indexing and slicing – String functions - Tuple - Tuple operations – List - List operations – List as array – List comprehension - Set - Set operations – Dictionary – Dictionary operations.

UNIT III - FUNCTIONS AND MODULES

Python built in functions - User defined functions - Creating function – Invoking functions – Types of function arguments – Recursion and lambda or anonymous functions - Defining, Creating and Accessing a Package, importing packages and user defined modules.

UNIT IV - CLASSES AND OBJECTS

Object Oriented terminologies (class, object, method, inheritance, abstraction, encapsulation, polymorphism) – UML Class diagram - access specifiers – Creating classes – Creating object – Accessing members - __init__() method - instance, static and class methods - Importance of self – Implementing encapsulation.

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UNIT V - INHERITANCE, POLYMORPHISM AND EXCEPTION HANDLING

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Implementing inheritance – Types of inheritance – Implementing Polymorphism - Method overloading – Method overriding – Operator overloading - Abstract Classes - Association and Aggregation - Errors vs exceptions – Handling exceptions – Raising exception – Creating user defined exception.

TOTAL: 45

TEXT BOOKS

- 1. Think Python: How to Think Like a Computer Scientist Anany Levitin, Allen B. Downey Second Edition, O'Reilly, 2016.
- Python 3 Object-oriented Programming, Dusty Phillips, Third Edition, Packet Publishing, 2018.

REFERENCES BOOKS

- 1. The Absolute Beginner's Guide to Python Programming, Kevin Wilson, Apress Media LLC, First Edition, 2022.
- 2. Python 3 The Comprehensive Guide, Johannes Ernesti, Peter Kaiser, Rheinwerk Publishing Inc., First Edition, 2022
- 3. Fundamentals of Python Programming, Richard L. Halterman, Southern Adventist University, First Edition, 2019

WEBSITES

- 1. <u>www.docs.python.org/3/</u>
- 2. <u>www.www.programiz.com/python-programming</u>
- 3. <u>www.scaler.com/topics/python/</u>
- 4. www.geeksforgeeks.org/python-oops-concepts/
- 5. <u>www.edureka.co/blog/object-oriented-programming-python/</u>

(ii) LABORATORY

LIST OF EXPERIMENTS

- 1. Programs using operators and control structures.
- 2. Programs using string functions.
- 3. Programs using tuple.
- 4. Programs using list.
- 5. Programs using set.
- 6. Programs using dictionary.
- 7. Programs using built-in functions.
- 8. Implementing user defined functions with various parameter options
- 9. Implementation of class & objects.

- 10. Implementation of inheritance and association.
- 11. Implementation of overloading and overriding.
- 12. Implementation of exception handling.

TOTAL: 30

CO-PO MAPPING

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	2	2	-	2	-	3
CO2	3	2	1	-	-	-	-	-	2	2	-	2	-	3
CO3	3	2	1	-	-	-	-	-	2	2	-	2	-	3
CO4	3	2	1	-	-	-	-	-	2	2	-	2	-	3
CO5	3	3	2	1	-	-	-	-	2	2	-	2	-	3
AVG	3	2	1	-	-	-	-	-	2	2	-	2	-	3

B.E EEE		2022-2023
23BECE111		SEMESTER-I
	WORKSHOP PRACTICES	4H-2C
T / / T		1 (0 75 1 400

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

COURSE OBJECTIVES

The goal of this course is for the students to built

- To prepare the students to gain the knowledge about various manufacturing methods.
- To impart knowledge on the operations in CNC machining.
- To prepare the students to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- To provide practical knowledge on the use of Basic Mechanical Components.
- To provide practical knowledge on the use of Mechanical components.

COURSE OUTCOMES

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

- Inspect machined component in lathe operation
- Identify the mating gap in the filed work piece and chiselled work piece
- Develop soldering processes for the given circuit
- Apply the principles of carpentry techniques to make functional structures.
- Build plumbing exercises to install and connect plumbing fixtures.

(i) LECTURES and VIDEOS:

Detailed contents

- 1. Study on various manufacturing methods- Casting and Forming.
- 2. Study on Machining and Welding.
- 3. Study on Job fitting.
- 4. Study on CNC machine operation.
- 5. Study on Fitting operations and power tools.

(ii) WORKSHOP PRACTICE:

- 1. Fitting shop Filing and Matting practices.
- 2. Welding shop Arc welding practices.
- 3. Casting Foundry practices.
- 4. Machine shop Identifying components of Lathe machine and various Lathe operations.
- 5. Plumbing Exercises Identifying Plumbing components.

TEXT BOOKS:

- 1. Gowri S, Jeyapoovan, T.Engineering Practices Lab Manual, 5th edition, Vikas Publishing House Pvt. Ltd, Chennai. 2017.
- 2. Bawa, H.S, Workshop Practice, 2nd edition, Tata McGraw Hill Publishing

Company Limited, New Delhi, 2019.

REFERENCE BOOKS:

- 1. Choudhry S K, Elements of workshop technology, Vol 2, 13th edition, Indian book distributing company,Kolkatta, 2020.
- 2. D K Singh, Manufacturing Technology, 2nd edition, Pearson Education, 2018.

WEBSITES:

- 1. http://ecoursesonline.iasri.res.in/course/view.php?id=86
- 2. https://engg.kkwagh.edu.in/workshop_about_engg

CO-PO MAPPING

COURSE	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	2	1	-	1	2	-
CO2	2	1	-	-	-	-	-	-	2	1	-	1	2	-
CO3	3	2	1	-	-	-	-	-	2	1	-	1	2	-
CO4	3	2	1	-	-	-	-	-	2	1	-	1	2	-
CO5	3	2	1	-	-	-	-	-	2	1	-	1	2	-
Average	3	2	2	1	-	-	-	-	2	1	-	1	2	-

23BEMC251

SOFT SKILLS

SEMESTER-II 1H - 0C

Instruction Hours/week: L:1 T:0 P:0

Marks: Internal:100 Total:100

End Semester Exam:3 Hours

COURSE OBJECTIVES

The goal of this course is for the students to

- Encourage all round development of the students by focusing on soft skills.
- Make the students aware of critical thinking and problem-solving skills.
- Develop leadership skills and organizational skills through group activities.
- Function effectively with heterogeneous teams.
- Develop social and work-life skills as well as personal and emotional well-being.

COURSE OUTCOMES

Upon completion of this course the students will be able to

- Memorize various elements of effective communicative skills.
- Interpret people at the emotional level through emotional intelligence.
- Apply critical thinking skills in problem solving.
- Analyze the needs of an organization for team building.
- Judge the situation and take necessary decisions as a leader.

UNIT I COMMUNICATION SKILLS

Introduction, meaning, significance of soft skills – Definition, significance, types of communication skills - Intrapersonal & Inter-personal skills

UNIT II CRITICAL THINKING

Active Listening –Observation –Curiosity –Introspection –Analytical Thinking –Openmindedness –Creative Thinking- Public Speaking

UNIT III PROBLEM SOLVING & DECISION MAKING

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles – Time Management

TEXT BOOKS

- 1. Personality Development and Soft Skills (English, Paperback, Mitra Barun K.) Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
- 2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha Kapoor Publisher : I K International Publishing House; 0 edition (February 28, 2018)
- 3. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.

B.E. CIVIL ENGINEERING

23BEMC252

WOMEN SAFETY AND SECURITY

Instruction Hours/ week: L:1 T:0 P:0

AFETY AND SECURITY

RITY 1H - 0C Marks: Internal:100 Total:100 End Semester Exam:3 Hours

COURSE OBJECTIVES

The goal of this course is for the students to

- Highlight the social construction of gender in Indian society and the role of social institutions in the socialization process.
- Make aware about the practical issues concerning gender and politics.
- Classify the students in engendering national policies and programmes.
- Observe the liability of women and women's work in the context of globalization.
- Acquaint knowledge about the political participation of women and the gendered structures of governance and polity.

COURSE OUTCOMES

Upon completion of this course the students will be able to

- Infer into the basic concepts related to sex, gender, femininity etc.
- Demonstrate the rationale for women's studies
- Compare Gender Equality Issues and Movements in Women's Studies
- Summarize the Social construction of Gender, Gender Roles and Gender stereotyping.
- Illustrate Social Structures, Changing Status of Women in India.

UNIT I FUNDAMENTAL CONCEPTS OF WOMEN'S STUDIES

Definition- Objectives of Women's Studies; Importance of Women's Studies; Women's

Studies as an Academic Discipline; Role of UGC Centre for Women's Studies

UNIT II SOCIAL EMPOWERMENT

Women in Higher Education; Gender issues in Health, Environment, Family welfare

Measures, Indecent representation of Women in media; Women in Difficult circumstances; Constitutional.

UNIT III POLITICAL EMPOWERMENT

Women leaders in politics- Women in Local Governance- Barriers- Reservation policies-

Women's Political Rights, Property Rights - Violence against Women - Women's work

TEXT BOOKS

- Amy S. Wharton. (2005). "The Sociology of Gender: An Introduction to Theory and Research". (KeyThemes in Sociology) Blackwell Publishing, UK, Indian Reprint, Kilaso Books, New Delhi.
- 2. Devaki Jain and Pam Rajput (Ed). (2003). "Narratives from the Women"s Studies

2023 - 2024

SEMESTER-II

Family: Recreating Knowledge, Sage, and New Delhi.

3. Jasbir Jain (Ed). (2005). "Women in Patriarchy: Cross Cultural". Rawat Publication Jaipur.

COURSE OBJECTIVES:

The goal of this course is for students :

- 1. To inculcate the basic concepts of solving algebraic and transcendental equations.
- 2. To understand the numerical techniques of interpolation in various intervals
- 3. To provide the knowledge of numerical differentiation and integration
- 4. To provide the knowledge of solving ordinary differential equations numerically
- 5. To inculcate various techniques of solving partial differential equations numerically.

COURSE OUTCOMES:

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

- 1. Solve the systems of linear and nonlinear equations by iterative methods.
- 2. Apply different methods to calculate the value of interpolating polynomial at given point.
- 3. Apply the numerical techniques of differentiation and integration for engineering problems.
- 4. Interpret solutions of ODE using computational methods.
- 5. Make use of the appropriate numerical methods to study phenomena modeled as PDEs.

UNIT I SOLUTION OF EQUATIONS

Regula False Method - Newton Raphson method for solving algebraic and transcendental equations -Solution of system of linear equations - Gauss elimination method - Gauss Jordan method -Gauss Seidel method

UNIT II INTERPOLATION

Interpolations with unequal intervals-Lagrange's interpolation -Newton's divided interpolation - Interpolation with equal intervals-Newton's forward and backward interpolation

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION

Approximation of derivatives using Newton's forward and backward interpolation -Numerical integration using Trapezoidal, Simpson's 1/3 and 3/8 rule.

UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EOUATIONS 12

Single step method- Euler's method-Taylor's series method-Fourth order Runge – Kutta method -Multi step method-Milne's predictor corrector method

UNIT V NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Solutions of one-dimensional heat equation by Bender-Schmidt and Crank Nicholson methods - Numerical solutions of one-dimensional wave equation by explicit method

Total Periods: 60

12

12

End Semester Exam: 3 Hours

TEXT BOOKS:

- 1. Chapra, Steven C. Numerical methods for engineers. Mcgraw-hill, 2010.
- 2. Gerald, Curtis F. Applied numerical analysis. Pearson Education India, 2004.

REFERENCE BOOKS:

- 1. Burden, Richard L., J. Douglas Faires, and Annette M. Burden. Numerical analysis. Cengage learning, Brooks/Cole, 4th edition 2012.
- 2. Kreyszig, Erwin, K. Stroud, and G. Stephenson. "Advanced engineering mathematics." Integration 9.4, John Wiley and Sons, Tenth Edition (2011).

WEB URLs:

1. https://archive.nptel.ac.in/courses/111/107/111107105/

2. https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/resources/lecture-2-eulersnumerical-method-for-y-f-x-y/

3. http://www.infocobuild.com/education/audio-video-courses/mathematics/numerical-analysis-iitmadras.html

4. http://www.infocobuild.com/education/audio-video-courses/mathematics/NumericalMethods-FiniteDifference-IIT-Roorkee/lecture-06.html

CO / PO Mapping															
Cos	PO1	PO2	PO3	PO4	PO 5	PO6	PO 7	PO8	PO9	PO1 0	PO11	PO12	PSO1	PSO 2	PSO 3
CO1	3	2	1	-	-	-	-	-	1	-	-	1	1	-	-
CO2	3	2	1	-	-	-	-	-	1	-	-	1	1	-	-
CO3	3	2	1	-	-	-	-	-	1	-	-	1	1	-	-
CO4	2	1	-	-	-	-	-	-	1	-	-	1	1	-	-
CO5	3	2	1	-	-	-	-	-	1	-	-	1	1	-	-
Avg	2.8	1.8	0. 8	-	-	-	-	-	1	-	-	1	1	-	-

B.E Civil Engineering	5		2023-2024
			SEMESTER -III
23BECE302	DISASTER MA	NAGEMENT	3H-3C
Instruction Hours/we	ek:L:3 T:0 P:0	Marks:Int	ernal:40 External:60 Total:100
			End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students:

- 1. To understand basic concepts in Disaster preparedness and planning management.
- 2. To understand the disaster phenomenon, its different contextual aspects, impacts and public health consequence.
- 3. To increase skills and abilities for implementing disaster risk reduction.
- 4. To ensure skills to design, implement and evaluate research on disasters.
- 5. To ensure ability to analyze potential effects of disasters and the strategies and methods to deliver public health response to avert these effects.
- 6. To understand Categories of Disasters

COURSE OUTCOMES:

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

1. Describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities.

- 2. Understand the information on risks, relief needs.
- 3. Understand about the capacity to manage the public health aspects of the disasters.
- 4. Perform research on the different aspects of emergencies and disaster events.
- 5. Work on the field of emergencies.
- 6. Understand the impacts of Disasters Key Skills

UNIT I **INTRODUCTION**

Concepts and definitions: disaster, hazard, vulnerability, risks- severity, frequency and details, capacity, impact, prevention, mitigation, communication system during disaster - Disasters classification; natural disasters - manmade disasters - hazard and vulnerability profile of India, ecological fragility - mountain and coastal areas. 9

UNIT II **DISASTER IMPACTS**

Disaster impacts health, psycho-social issues; demographic aspects -hazard locations - global and national disaster trends - climate change and urban disasters.

UNIT III **DISASTER RISK REDUCTION**

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems.

UNIT IV DISASTERS, ENVIRONMENT AND DEVELOPMENT

Factors affecting vulnerability such as impact of developmental projects and environmental modifications sustainable and environmentally friendly recovery; reconstruction and development methods.

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UNIT V POST DISASTER MANAGEMENT

Funding techniques – community rebuilding models – psychology and health rehabilitation – temporary housing and sanitation models, Agencies of disaster.

TOTAL: 45

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Pradeep Sahni	Disaster Risk Reduction	South Asia, PrenticeHall	2004
2.	Singh B.K	Handbook of Disaster Management: Techniques & Guidelines	RajatPublication	2008

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Ghosh G.K	Disaster Management	APH Publishing Corporation	2006
2.	Ghosh G.K	Disaster Medical Systems Guidelines. Emergency Medical Services Authority	Stateof California, EMSA no.214	2003

WEBSITES:

1.	NPTEL :: Civil Engineering - NOC:Natural Hazards - Part-1
2.	Disaster Recovery And Build Back Better - Course (nptel.ac.in)

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PS O3
CO1	3	3	3	2	2	2	-	-	2	-	2	2	2	2	-
CO2	3	3	3	3	3	2	-	-	2	-	2	2	2	2	-
CO3	3	3	2	2	2	2	-	-	2	-	2	2	2	2	-
CO4	3	3	3	3	2	2	-	-	2	-	2	2	2	2	-
CO5	3	3	2	2	2	2	-	-	2	-	2	2	2	2	-
Avg	3	3	2.6	2.4	2.2	2	-	-	2	-	2	2	2	2	-

CENTROID AND CENTRE OF GRAVITY 12

Introduction to friction- Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; Basic Structural Analysis: Equilibrium in three dimensions; Method of Joints; Simple Trusses; Zero force members;

Centroid of simple figures, composite sections; Centre of Gravity and its implications; Areamoment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment

B.E Civil Engineering

23BECE303

Instruction Hours/week:L:3 T:1 P:0

COURSE OBJECTIVES:

The goal of this course is for the students to:

1.To gain working knowledge of statics with emphasis on force equilibrium and free bodydiagrams.

ENGINEERING MECHANICS

2. To understand the mechanical behavior of materials under various load conditions.

3.To gain the knowledge of Centre of gravity and centroid of different sections.

4.To understand basic dynamics concepts – force, momentum, work and energy.

5.To determine the type of forces in members.

6. To apply basic knowledge of maths and physics to solve real-world problems

COURSE OUTCOMES:

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

1. Analyze the system of forces in two- and three-dimensional objects and also to draw thefree body diagram of any object.

2.Calculate the forces through method of joints and able to determine the type of friction in the bodies.

3.Evaluate the centroid, Centre of gravity, moment of inertia for standard and compositesections. 4. Employ the methods of virtual work and energy method to the system of rigid bodies.

5. Determine the type of motion and solve simple problems using De Alembert's Principle.

UNIT I INTRODUCTION TO ENGINEERING MECHANICS 12

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

UNIT II FRICTION

Beams & types of beams; Frames.

UNIT III

4H-4C

12

SEMESTER -III
UNIT IV VIRTUAL WORK AND ENERGY METHOD

Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium- Stability of equilibrium.

UNIT V INTRODUCTION TO KINETICS OF RIGID BODIES

Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in planemotion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

TEXT BOOKS:

S. No.	Author(s)Title of the BookPublisher		Publisher	Year of Publication
1.	Dr.N. Kottiswaran	Engineering Mechanics	Balaji Publications	2016
2.	Bansal R.K	A Text Book of Engineering Mechanics	Laxmi Publications	2010

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Irving H. Shames	Engineering Mechanics	4 th Edition, Prentice Hall	2006
2.	Vela Murali	Engineering Mechanics	Oxford University Press	2010

WEBSITES:

1.	Engineering Mechanics - Course (nptel.ac.in)
2.	NPTEL :: Mechanical Engineering - NOC:Engineering Mechanics

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12

TOTAL: 60

Cos	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PS 03
CO1	3	3	3	2	-	-	1	-	2	-	2	2	2	2	-
CO2	3	3	3	3	-	-	1	-	2	-	2	2	2	2	-
CO3	3	3	2	2	-	-	1	-	2	-	2	2	2	2	-
CO4	3	3	3	3	-	-	1	-	2	-	2	2	2	2	-
C05	3	3	2	2	-	-	1	-	2	-	2	2	2	2	-
Avg	3	3	2.6	2.4	-	-	1	-	2	-	2	2	2	2	-

B.E Civil Engineering		2023-2024
	SEN	/IESTER-III
23BECE304	SURVEYING AND LEVELLING	3H-3 C
Instruction Hours/week:L:3 T:0 I	:0 Marks:Internal:40 External:	60 Total:100
	End Semester Ex	xam: 3Hours

The goal of this course is for the students to:

- 1. To introduce the rudiments of plane surveying and geodetic principles to Civil Engineers
- 2. To learn the various methods of plane and geodetic surveying to solve real-world problems.
- 3. To introduce the concepts of Control Surveying.
- 4. To introduce the basics of Astronomical Surveying

COURSE OUTCOMES:

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

- 1. Remember the rudiments of various surveying and its principles.
- 2. Understand the knowledge in computation of levels of terrain and ground features.
- 3. Imparts concepts of Theodolite Surveying for complex surveying operations
- 4. Understand the procedure for establishing horizontal and vertical control.
- 5. Understand about the knowledge on modern surveying instruments.

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING

Definition – Classifications – Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging – Well conditioned triangles – Chain traversing – Compass – Basic principles – Types – Bearing – System and conversions – Sources of errors and Local attraction – Magnetic declination – Dip – compass traversing – Plane table and its accessories – Merits and demerits – Radiation – Intersection – Resection – Plane table traversing.

UNIT II LEVELLING

Level line – Horizontal line – Datum – Benchmarks – Levels and staves – Temporary and permanent adjustments – Methods of leveling – Fly leveling – Check leveling – Procedure in leveling – Booking – Reduction – Curvature and refraction – Reciprocal leveling – Precise leveling - Contouring.

UNIT III THEODOLITE SURVEYING

Horizontal and vertical angle measurements – Temporary and permanent adjustments – Heights and distances – Tacheometric surveying – Stadia Tacheometry – Tangential Tacheometry – Trigonometric leveling – Single Plane method – Double Plane method.

UNIT IV CONTROL SURVEYING AND ADJUSTMENT

Horizontal and vertical control – Methods – Triangulation – Traversing – Gale's table – Trilateration – Concepts of measurements and errors – Error propagation and Linearization – Adjustment methods - Least square methods – Angles, lengths and levelling network.

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UNIT V MODERN SURVEYING

Total Station: Digital Theodolite, EDM, Electronic field book – Advantages – Parts and accessories – Working principle – Observables – Errors - COGO functions – Field procedure and applications. GPS: Advantages – System components – Signal structure – Selective availability and anti spoofing receiver components and antenna – Planning and data acquisition – Data processing – Errors in GPS – Field procedure and applications

TEXT BOOKS:

TOTAL: 45

S. No.	Author(s)	Author(s)Title of the BookPublish		Year of Publication
1.	Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain	Surveying Vol. I & II	Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition	2016
2.	T. P. Kanetkarand S. V. Kulkarni	Surveying and Levelling, Parts 1 & 2	Pune Vidyarthi Griha Prakashan, Pune	2008

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	R. Subramanian	Surveying and Levelling	Oxford University Press, Second Edition	2012
2.	James M. Anderson and Edward M. Mikhail	Surveying	Seventh Edition, Mc Graw Hill	2001

WEBSITES:

1.	NPTEL :: Civil Engineering - Surveying
2.	https://nptel.ac.in/courses/105/107/105107122

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	3	3	2	-	3	1	-	2	-	2	2	2	2	-
CO2	3	3	3	3	-	3	1	-	2	-	2	2	2	2	-
CO3	3	3	2	2	_	3	1	_	2	_	2	2	2	2	-
CO4	3	3	3	3	-	3	1	-	2	-	2	2	2	2	-
CO5	3	3	2	2	-	3	1	-	2	-	2	2	2	2	-
Avg	3	3	2.6	2.4	-	3	1	-	2	-	2	2	2	2	-

B.E Civil Engineering		2023-2024
		SEMESTER -III
23BECE305	SOIL MECHANICS	3H-3C
Instruction Hours/week:L:3 T:0 P:0	Marl	ks:Internal:40 External:60 Total:100
		End Semester Exam: 3Hours

The goal of this course is for the students to:

1.Describe the nature of soil and gives an overall preview of the classification of soils.

2. Express the state of stresses acting on soils, especially the transmission of stressesbetween soil particles based on Boussinesq, Westergaard, Newmark's principle.

3. Examine the compaction and consolidation behavior of soils by considering the interaction of soils with and without the presence of water.

4. Assess the capillary phenomena of soils in the seepage condition.

5. Evaluate the strength properties of soils by experimental testing procedures for the designof various civil engineering structures.

6. To gain the knowledge of different soil classification.

COURSE OUTCOMES:

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

1. Distinguish the soil engineering properties and its classification.

2. Analyze the distribution of stresses in subsoil under the energy of external loads using Bossiness, Westergaard, Newmark's principles.

3. Apply the mechanism of compaction and consolidation for the settlements analysis of soils and determine the bearing capacity of shallow foundations.

4. Analyze the effective stress concepts and permeability characteristics of soils for the design of hydraulic structures and safety analysis of slopes.

5. Understand and will gain knowledge of the soil classification.

UNIT I SOIL CLASSIFICATION

Nature of soil - phase relationships - Soil description and classification for engineering purposes, their significance - Index properties of soils - BIS Classification system - Unified and Textural classification systems - Field Identification of soils 9

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UNIT II **STRESS DISTRIBUTION**

Stress distribution - Soil media - capillary stress and quick sand conditions -Newmark's influence chart - Equivalent point load and other approximate methods - Pressure bulb.

UNIT III **COMPACTION AND CONSOLIDATION**

Soil compaction-Comparison of laboratory and field compaction methods - Factors influencing compaction behaviour of soils - Terzaghi's one dimensional consolidation theory Computation of rate of settlement - \sqrt{t} and log t methods - e-log p relationship - Factors influencing compression behaviour of soils - Components of settlement - Immediate and consolidationsettlement.

UNIT IV EFFECTIVE STRESS AND PERMEABILITY

Soil water - Effective stress concepts in soils - Capillary stress -Permeability - Darcy's Law-Permeability measurement in the laboratory and field - Factors influencing permeability of soils - Seepage - Flow nets - Simple problems of sheet pile and weir- Stability of slopes - Fellenius method - Friction circle method

UNIT V SHEAR STRENGTH

Shear strength of cohesive and cohesion less soils - Mohr-Coulomb failure theory - Measurement of shear strength - Direct shear test - Unconfined compression test - Triaxial compression test - Vane shear tests - Pore pressure parameters - Cyclic mobility - Liquefaction.

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gopal Ranjan and Rao A.S.R	Basic and Applied soil mechanics	Wiley EasternLtd, New Delhi (India)	2000
2.	Punmia, B.C	Soil Mechanics and Foundations	Standard PublishersAnd Distributors, New Delhi	2002

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book Publisher		Year of Publication					
		Soil Mechanics and	CBS Publishers						
1.	Murthy, V.N.S	Foundation	Distribution Ltd., New	2007					
		Engineering	Delhi						
		Principles of	Thompson Brooks / Coles						
2.	Das, B.M	Geotechnical	Learning Singapore, 5th	2002					
		Engineering	Edition						
WEBSI	TES:								
1.	NPTEL :: Civil Engineering - Soil Mechanics								
2.	Soil Mechanics/Ge	otechnical Engineering I -	Course (nptel.ac.in)						

CO-PO MAPPING

Cos	PO1	PO2	PO3	PO4	PO5	P 06	PO 7	P 08	P 09	PO 10	PO 11	PO1 2	PSO 1	PSO 2	PS 03
CO1	3	3	3	-	-	3	1	-	2	-	2	1	2	2	-
CO2	3	3	3	-	-	3	1	-	2	-	2	1	2	2	-
CO3	3	3	2	-	-	3	1	-	2	-	2	1	2	2	-
CO4	3	3	3	-	-	3	1	-	2	-	2	1	2	2	-
CO5	3	3	2	-	-	3	1	-	2	-	2	1	2	2	-
Avg	3	3	2.6	-	-	3	1	-	2	-	2	1	2	2	-

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TOTAL: 45

B.E Civil Engineering		2023-2024
		SEMESTER -III
23BECE306	FLUID MECHANICS	3H-3C
Instruction Hours/week:L:3 T:0 P:0	Marks:	Internal:40 External:60 Total:100
		End Semester Exam: 3Hours

The goal of this course is for the students to:

1.To provide exposure to the students to fluid statics, kinematics and dynamics.

2. To measure the pressure and computations of hydrostatic forces on structural components.

3.To explain the concepts of Buoyancy all find useful applications in many engineering problems.

4. To analyze engineering problems involving fluids – such as those dealing with pipe flow,

open channel flow, jets, turbines and pumps, dams and spillways, culverts, river and

groundwater flow with a mechanistic perspective is essential for the civil engineering students.

5.To classify the model analysis problems using Dynamic similarity principles.

6.To apply dimensional analysis.

COURSE OUTCOMES:

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

1. Understand the broad principles of fluid statics, kinematics and dynamics

2. Understand definitions of the basic terms used in fluid mechanics

3.Understand classifications of fluid flow

4.Be able to apply the continuity, momentum and energy principles

5.Be able to apply dimensional analysis

6.Understand the open channel flow, jets, turbines and pumps, dams and spillways, culverts, river

UNIT I **BASIC CONCEPTS AND DEFINITIONS**

Distinction between a fluid and a solid; -Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility. UNIT II **FLUID STATICS** 9

Fluid Pressure-Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometer. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies. 9

UNIT III FLUID KINEMATICS

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

UNIT IV **FLUID DYNAMICS**

Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation derivation; Energy Principle; Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube.

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UNIT V DIMENSIONAL ANALYSIS AND DYNAMIC SIMILITUDE

Definitions of Reynolds Number, Froude Number, Mach number, Weber Number and Euler Number; Buckingham's π -Theorem.

TEXT BOOKS:

TOTAL: 45

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S.P.Ojha, R. Berndtsson and P. N. Chadramouli	Fluid Mechanics and Machinery	Oxford University Press	2010
2.	P M Modi and S M Seth	Hydraulics and Fluid Mechanics	Standard BookHouse	2002

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	K. Subramanya	Theory and Applications of Fluid Mechanics	Tata Mc GrawHill	2007
2.	1. R.L. Daugherty, J.B. Franzini and E.J. Finnemore	Fluid Mechanics with Engineering Applications	International Student Edition, Mc GrawHill	2002

WEBSITES:

1.	NPTEL :: Mechanical Engineering - NOC:Introduction to Fluid Mechanics
2.	NPTEL :: Mechanical Engineering - Fluid Mechanics

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PS O2	PS 03
C01	3	3	-	-	1	3	1	-	2	-	3	1	2	-	-
CO2	3	3	-	-	1	3	1	-	2	-	3	1	2	-	-
CO3	3	3	-	-	1	3	1	-	2	-	3	1	2	-	-
CO4	3	3	-	-	1	3	1	-	2	-	3	1	2	-	-
CO5	3	3	-	-	1	3	1	-	2	-	3	1	2	-	-
CO6	3	3	-	-	1	3	1	-	1	-	3	1	2	-	-
Avg	3	3	-	-	1	3	1	-	2	-	3	1	2	-	-

B.E Civil Engineering		2023-2024
		SEMESTER -III
23BECE311	SURVEYING LABORATORY	3H-1.5C
Instruction Hours/week:L:0 T:0 P:3	Marks:Internal:4	0 External:60 Total:100
	End S	Semester Exam: 3Hours

The goal of this course is for the students to:

1. At the end of the course the student will possess knowledge about survey field techniques.

COURSE OUTCOMES:

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

- 1. Impart knowledge on the usage of basic surveying instruments like chain/tape, compass and levelling instruments.
- 2. Able to use levelling instrument for surveying operations.
- 3. Able to use theodolite for various surveying operations.
- 4. Able to carry out necessary surveys for social infrastructures.

LIST OF EXPERIMENTS:

Chain Survey

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset

2. Setting out works – Foundation marking using tapes single Room and Double Room Compass Survey

3. Compass Traversing – Measuring Bearings & arriving included angles

Levelling - Study of levels and levelling staff

4. Fly levelling using Dumpy level & Tilting level

5. Check levelling

Theodolite - Study of Theodolite

6. Measurements of horizontal angles by reiteration and repetition and vertical angles

7. Determination of elevation of an object using single plane method when base is Accessible/inaccessible.

Tacheometry – Tangential system – Stadia system

8. Determination of Tacheometric Constants

9. Heights and distances by stadia Tacheometry

10. Heights and distances by Tangential Tacheometry

Total Station - Study of Total Station, Measuring Horizontal and vertical angles

11. Traverse using Total station and Area of Traverse

12. Determination of distance and difference in elevation between two inaccessible points using Total station

TOTAL: 30

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain	Surveying Vol. I & II	Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition	2016
2.	T. P. Kanetkarand S. V. Kulkarni	Surveying and Levelling, Parts 1 & 2	Pune Vidyarthi Griha Prakashan, Pune	2008

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	R. Subramanian	Surveying and Levelling	Oxford University Press, Second Edition	2012
2.	James M. Anderson and Edward M. Mikhail	Surveying	Seventh Edition, Mc Graw Hill	2001

Cos	PO	PO1	PO1	PO1	PS	PS	PS								
	1	2	3	4	5	6	7	8	9	0	1	2	01	02	03
CO1	3	-	-	-	3	-	1	-	2	-	1	1	-	2	-
CO2	3	-	-	-	3	-	1	-	2	-	1	1	-	2	-
CO3	3	-	-	-	3	-	1	-	2	-	1	1	-	2	-
CO4	3	-	-	-	3	-	1	-	2	-	1	1	-	2	-
Avg	3	-	-	-	3	-	1	-	2	-	1	1	-	2	-

B.E Civil Engineering		2023-2024
		SEMESTER -III
23BECE312	SOIL MECHANICS LABORATO	RY 3H-1.5C
Instruction Hours/week:L:0 T:	P:3 Marks:Interna	1:40 External:60 Total:100
	En	d Semester Exam: 3Hours
	En	d Semester Exam: 3Hou

The goal of this course is for the students to:

1. To develop skills to test the soils for their index and engineering properties and to characterize the soil based on their properties.

COURSE OUTCOMES:

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

- 1. Conduct tests to determine the index properties of soils.
- 2. Determine the insitu density and compaction characteristics.
- 3. Conduct tests to determine the compressibility, permeability, and shear strength of soils.
- 4. Understand the various tests on Geosynthetics.

1. DETERMINATION OF INDEX PROPERTIES Specific gravity of soil solids

- a. Grain size distribution Sieve analysis
- b. Grain size distribution Hydrometer analysis
- c. Liquid limit and Plastic limit tests
- d. Shrinkage limit and Differential free swell tests

2. DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS

- a. Field density Test (Sand replacement method)
- b. Determination of moisture density relationship using standard proctor compaction test.

3. DETERMINATION OF ENGINEERING PROPERTIES

- a. Permeability determination (constant head and falling head methods)
- b. One dimensional consolidation test (Determination of co-efficient of consolidation only)
- c. Direct shear test in cohesion less soil
- d. Unconfined compression test in cohesive soil
- e. Laboratory vane shear test in cohesive soil
- f. Tri-axial compression test in cohesion less soil (Demonstration only)
- g. California Bearing Ratio Test

TOTAL: 30

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gopal Ranjan and Rao A.S.R	Basic and Applied soil mechanics	Wiley EasternLtd, New Delhi (India)	2000
2.	Punmia, B.C	Soil Mechanics and Foundations	Standard PublishersAnd Distributors, New Delhi	2002

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
		Soil Mechanics and	CBS Publishers	
1.	Murthy, V.N.S	Foundation	Distribution Ltd., New	2007
		Engineering	Delhi	
		Principles of	Thompson Brooks / Coles	
2.	Das, B.M	Geotechnical	Learning Singapore, 5th	2002
		Engineering	Edition	

Car	PO	PO1	PO1	PO1	PS	PS	PS								
Cos	1	2	3	4	5	6	7	8	9	0	1	2	01	02	03
CO1	3	-	-	-	2	-	1	-	2	-	1	1	-	2	-
CO2	3	-	-	-	2	-	1	-	2	-	1	1	-	2	-
CO3	3	-	-	-	2	-	1	-	2	-	1	1	-	2	-
CO4	3	-	-	-	2	-	1	-	2	-	1	1	-	2	_
Avg	3	-	-	-	2	-	1	-	2	-	1	1	-	2	-

B.E Civil Engineering

23BECE391

FIELD PROJECT/INTERNSHIP

0H-1C

SEMESTER-III

Instruction Hours/week:L:0 T:0 P:2

End Semester Exam: 3Hours

Marks:Internal:100 External:00 Total:100

COURSE OBJECTIVES:

The goal of this course is for the students to:

- 1. To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks.
- 2. To develop skills in facing and solving the field problems

COURSE OUTCOMES:

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

- 1. The intricacies of implementation textbook knowledge into practice
- 2. The concepts of developments and implementation of new techniques

Strategy:

The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff

B.E-Civil Engin	ieering	202	23 -2024
		SEMES'	TER-III
23BEMCE351	APTITUDE	& REASONING	1H-0C
Instruction Ho	ırs/week: L:1 T:0 P:0	Marks: Internal:100 T	otal :100

Course Objectives:

The goal of this course is for the students:

- 1. To Categorize, apply, and use thought processes to distinguish between concepts
- 2. of Quantitative methods.
- 3. To Prepare and explain the fundamentals related to various possibilities and
- 4. probabilities related to quantitative aptitude.
- 5. To Critically evaluate numerous possibilities related to puzzles.
- 6. To Understand and solve puzzle-related questions from specific and other competitive tests.
- 7. To Solve questions related to Time and distance and time and work etc.

Course Outcomes:

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

- 1. Understand the basic concepts of quantitative ability
- 2. Understand the basic concepts of logical reasoning Skills
- 3. Acquire satisfactory competency in the use of reasoning
- 4. Solve campus placements aptitude papers covering Quantitative Ability, Logical
- 5. Gaun Reasoning Ability Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

UNIT - I 1. Quantitative Ability (Basic Mathematics)

- 1.1. Number Systems
- 1.2. LCM and HCF
- 1.3. Decimal Fractions
- 1.4. Simplification
- 1.5. Square Roots and Cube Roots
- 1.6. Problems on Ages
- 1.7. Surds & Indices
- 1.8. Percentages

UNIT – II 2. Quantitative Ability (Applied & Engineering Mathematics)

- 2.1. Logarithm
- 2.2. Permutation and Combinations
- 2.3 Probability
- 2.4 Profit and Loss
- 2.5 Simple and Compound Interest
- 2.6. Time, Speed and Distance
- 2.7. Time & Work
- 2.8. Ratio and Proportion
- 2.9. Area
- 2.10 Mixtures and Allegation

UNIT – III 3. Verbal - Aptitude

- 1.1 Words
- 1.2 Idioms

1.3 Phrases in Context

- 1.4 Reading comprehension techniques
- 1.5 Narrative sequencing
- 1.6 Data interpretation

Textbooks:

- 1. A Modern Approach to Verbal & Non-Verbal Reasoning By R S Agarwal
- 2. Analytical and Logical Reasoning By Sijwali B S
- 3. Quantitative aptitude for Competitive examination By R S Agarwal
- 4. Analytical and Logical Reasoning for CAT and other management entrance tests By Sijwali B S
- 5. Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4th edition
- 6. https://prepinsta.com/
- 7. https://www.indiabix.com/
- 8. https://www.javatpoint.com/

B.E – Civil Engir	neering	20	23 - 2024
		SEMES	TER-III
23BEMC352A	FOREIGN LAN	GUAGE –GERMAN	1H-0C
Instruction Hour	rs/week: L:1 T:0 P:0	Marks: Internal:100 T	Total:100
		End Semester Exam	:3 Hours

The goal of this course is for the students to

- 1. Learn design thinking concepts and principles
- 2. Use design thinking methods in every stage of the problem
- 3. Learn the different phases of design thinking
- **4.** Apply various methods in design thinking to different problems
- 5. Identify a solution to any problem of life and business

COURSE OUTCOMES:

Upon completion of this course the students will be able to

- 1. Demonstrate the critical theories of design, systems thinking, and design methodologies
- 2. Define key concepts of design thinking
- 3. Practice design thinking in all stages of problem solving
- 4. Apply design thinking approach to real world problems
- 5. Use the concept of design thinking in their business world.

UNIT-I : Herzlich willkommen! -Wie ist dein Name ? -Ich trinke gern Kaffee.-Wir konjugieren die Verben.

UNIT-II : A bit of history and ZAHLEN - Verben, W-Fragen, Ja-Nein Fragen, Imperativ-das Alphabet, die Woche, das Jahr -Was sind deine Hobbys ? Formular $ausf\tilde{A}^{1/4}$ llen

UNIT-III : Mein Lehrbuch | Meine pers
önlichen Daten-Mein Arbeitsbuch -Wir beginnen Lektion -Wir lesen Lektion 3

UNIT-IV : formeller Brief- Wie lernst du Deutsch ? -Wir hören ein deutsches Lied- Wir lernen Hörverständnis | Wir beginnen Lektion

 $\label{eq:UNITV} \textbf{UNITV}: Eine E-Mail schreiben \mid Eine Wohnung beschreiben- Im Kaufhaus \mid Welche/Diese-Gesund und munter$

BOOKS AND REFERENCES:

- 1. NETZWERK Deutsch als Fremdsprache A1(Goyal, New Delhi, 2015)
- 2. Schulz-Griesbach: Deutsch als Fremdsprache. Grundstufe in einem Band (for Grammar)

WEB RESOURCES:

- 1. https://www.tatsachen-ueber-deutschland.de/en
- 2. https://www.goethe.de/en/spr/kup/prf/prf/sd1/ueb.html

B.E- Civil Engine	ering	20	23 - 2024
		SEMES	TER-III
23BEMC352B	FOREIGN LAN	GUAGE – FRENCH	1H-0C
Instruction Hours	s/week: L:1 T:0 P:0	Marks: Internal:100 T	'otal:100
		End Semester Exam	:3 Hours

The goal of this course is for the students to

- 1. Learn design thinking concepts and principles
- 2. Use design thinking methods in every stage of the problem
- 3. Learn the different phases of design thinking
- 4. Apply various methods in design thinking to different problems
- 5. Identify a solution to any problem of life and business

COURSE OUTCOMES:

Upon completion of this course the students will be able to

Demonstrate the critical theories of design, systems thinking, and design methodologies

- 1. Define key concepts of design thinking
- 2. Practice design thinking in all stages of problem solving
- 3. Apply design thinking approach to real world problems
- 4. Use the concept of design thinking in their business world.

UNIT- I

Recognize the French letters, Identify the letter-combinations that are characteristic of the French language, Identify the remaining letter-combinations that are characteristic of the French language, **UNIT - II**

Use the imperative in the affirmative form, Say the time in French, Talk about the weather in French, .Talk about actions that just happened, Speak about actions that are yet to happen

UNIT – III

Learn a few basic and commonly used 2nd group verbs, Understand the concept of French 'modal verb, Learn a few basic and commonly used 3rd group verbs, Learn what reflexive verbs, Distinguish between moods and tenses

UNIT – IV

Place an order in a restaurant, Learn a third past tense, Identify a direct object, Identify an indirect object, Use direct and indirect objects pronouns in a single sentence

BOOKS AND REFERENCES:

- 1. Alter Ego Méthode de Français, A1 (2006): Berthet, Hugot et al., Hachette
- 2. Alter Ego Cahier d'activités, A1 (2006): Berthet, Hugot et al., Hachette
- 3. Écho Méthode de Français, A1 (2013): Girardet, Pecheur, CLE International

WEB RESOURCES:

- 1. www.leo.org
- 2. WWW. Nptel.com

B.E Civil Engineering		2023-2024
		SEMESTER -IV
23BECE401	STRENGTH OF MATERIALS	3H-3C
Instruction Hours/week:L:3 T:0 P:0	Marks:Internal:40 Ex	xternal:60 Total:100

Instruction Hours/week:L:3 T:0 P:0

End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

1.To introduce the continuum mechanics and material modeling of engineering materials based on first energy principles.

2. To know about thermodynamics, this allows understanding, modeling, and design of a large range of engineering materials.

3.To describe the subject of mechanics of materials involves analytical methods for determining the strength, stiffness, and stability of the various members in a structural system.

4. To obtain stresses and deflections of beams on elastic foundations

5.To solve torsion problems in bars and thin-walled members

6. The subject of mechanics of materials involves analytical methods for determining the strength, stiffness (deformation characteristics)

COURSE OUTCOMES:

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

1. Identify the characteristics and calculate the magnitude of combined stresses in individual members and complete structures.

2. Analyze solid mechanics problems using classical methods and energy methods;

3.Compare the various situations involving structural members subjected to combinedstresses by application of Mohr's circle of stress.

4.Locate the shear center of thin wall beams.

5.Evaluate the deflection at any point on a beam subjected to a combination of loads; solvefor stresses and deflections of beams under unsymmetrical loading.

6. Apply various failure criteria for general stress states at points; solve torsion problems inbars and thin-walled members.

UNIT I SIMPLE STRESSES AND STRAINS

Concept of stress and strain- stress and strain diagram, Elasticity and plasticity - Types of stresses and strains, Hooke's law-stress - strain diagram for mild steel -Working stress - Factor of safety - Lateral strain, Poisson's ratio and volumetric strain - Elastic moduli and the relationshipbetween them – Bars of varying section-composite bars- Temperature stresses. Strain Energy- Resilience-Gradual, sudden, impact and shock loadings – simple applications.

UNIT II COMPOUND STRESSES AND STRAINS

Two dimensional system, stress at a point on a plane- principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications-Two dimensional stress- strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain 9

UNIT III SHEAR FORCE AND BENDING MOMENT DIAGRAMS

Shear force (SF) and Bending moment (BM) diagrams. SF and BM diagrams for cantilevers simply

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supported and fixed beams with or without overhangs. Calculation of maximumBM and SF and the point of contraflexure -application of moments

FLEXURAL STRESSES-THEORY OF SIMPLE BENDING **UNIT IV**

Derivation of bending equation: Neutral axis – Determination of bending stresses – Sectionmodulus of rectangular and circular sections, I,T, Angle and Channel sections – Design of simplebeam sections. Shear Stresses- Derivation of moment equation- Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections. Slope and deflection-Relationship between moment, slope and deflection, Moment area method, Macaulay'smethod. 9

UNIT V TORSION

Derivation of torsion equation and its assumptions-Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs. Thin Cylinders and Spheres.

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Timoshenko, S. and Young, D.	Elements of Strength of Materials	DVNC,New York, USA. Delhi	2011
2.	R K Rajput	Strength of Materials	DVNC,New York, USA. Delhi	2002
REFER	ENCE BOOKS:			
S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hibbeler, R. C. Mechanics of Materials	Theory and Applications of Fluid Mechanics	Tata Mc GrawHill	2007
2.	Ferdinand P. Beer, E. Russel	Mechanics of	Tata Mc GrawHill	2012

TEXT BOOKS:

Jhonston Jr WFRSITFS

1.	NPTEL :: Mechanical Engineering - Strength of Materials
2.	NPTEL :: Civil Engineering - Strength of Materials

Materials

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TOTAL: 45

Cos	PO	PO1	PO1	PO	PS	PS	PS								
Cus	1	2	3	4	5	6	7	8	9	0	1	12	01	02	03
CO1	3	3	-	-	2	3	1	-	2	-	3	-	2	I	-
CO2	3	3	-	-	2	3	1	-	2	-	3	-	2	-	-
CO3	3	3	-	-	2	3	1	-	2	-	3	-	2	-	-
CO4	3	3	-	-	2	3	1	-	2	-	3	-	2	-	-
CO5	3	3	-	-	2	3	1	-	2	-	3	-	2	-	-
CO6	3	3	-	-	2	3	1	-	2	-	3	-	2	-	-
Avg	3	3	-	-	2	3	1	-	2	-	3	-	2	-	-

	2023-2024
	SEMESTER -IV
FOUNDATION ENGINEERING	3H-3 C
Marks:Internal:40	External:60 Total:100
End Se	mester Exam: 3Hours
	FOUNDATION ENGINEERING Marks:Internal:40 End Se

The goal of this course is for the students to:

1.To describe the selection of foundation based on different soil conditions and explorations of soils for analyze and design the foundations.

2.To express the concept of bearing capacity and settlement of foundations.

3.To describe the load transfer mechanism of pile foundation in different soil conditions and design of single and pile groups.

4.To assess the characteristics of problematic soils and remedial measures for the construction of foundation on such soils.

5. To assess the earth pressures on retaining walls by using active and passive earth pressure theories.

6.To have deep knowledge on types of foundation

COURSE OUTCOMES:

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

1.Understand the various soil conditions through the different methods of soil exploration and investigation.

2.Assess the bearing capacity of shallow foundation and its settlement based on different sub soil parameters using in-situ tests.

3. Assess the load carrying capacities and design of pile foundation.

4.Express the engineering behavior of expansive soils and selection of suitable foundation for such soils.

5.Assess the earth pressures acting on retaining wall subjected to various loads and design of retaining wall for the appropriate/suitable foundation system.

6.Deep knowledge on types of foundation

UNIT I SELECTION OF FOUNDATION AND SUB-SOIL EXPLORATION 9

Types of foundation - Factors affecting the selection of foundations - Types of foundationbased on soil condition-Soil exploration- Boring and drilling methods of exploration -Soil sampling techniques -Field penetration tests -Bore log- Excavation methods -Introduction to geophysical methods.

UNIT II SHALLOW FOUNDATION

Design criteria -Modes of shear failures - Bearing capacity theories - IS Code andPresumptive methods of bearing capacity – Settlement of foundation -Allowable bearing pressure - Bearing capacity from in-situ tests - Factors affecting bearing capacity - Bearing capacity of raft/mat foundation as per code of practice - Contact pressures under rigid and flexible footings - Floating foundation

UNIT III PILE FOUNDATIONS

Load transfer mechanism - Types of piles and their function - Factors influencing selection fpile

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- Method of installation - Load carrying capacity of piles - Static formula and dynamic formulae

- Penetration test data & Pile load test - Pile group - Group capacity - Negative skin friction.

FOUNDATIONS ON PROBLEMATIC SOIL AND INTRODUCTION TO 9 **UNIT IV GEOSYNTHETICS**

Significant characteristics of expansive soil - Footing on expansive soil - Problems and preventive measures - Under-reamed pile foundation, design and field installation - Significant characteristics of silt and loess, problems -Remedial measures - Introduction to geosynthetics.

UNIT V **RETAINING WALLS**

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Types of retaining walls - Rankine's theories of earth pressure - Mechanism of active and passive earth pressure - Design of different retaining walls under different soil conditions.

TOTAL: 45

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	P. Purushothama Raj	Soil Mechanics and Foundation Engineering	Pearson Education	2011
2.	V. N. S. Murthy	Soil Mechanics & Foundation Engineering	SaiKripa Technical Consultants, Banglore	2002

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Taylor D.W	Fundamentals of Soil Mechanics	Asia Publishing House, Mumbai	2008
2.	Alamsingh	Soil Mechanics & Foundation Engineering	CBS Publishers & Distributors,Delhi	2008
WEBSI'	TES:	· · · · · · · · · · · · · · · · · · ·	•	

2. Foundation Engineering - Course (nptel.ac.in)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS 01	PS O2	PS 03
CO1	3	3	-	-	-	3	1	-	2	-	3	-	2	-	-
CO2	3	3	-	-	-	3	1	-	2	-	3	-	2	-	-
CO3	3	3	-	-	-	3	1	-	2	-	3	-	2	-	-
CO4	3	3	-	-	-	3	1	-	2	-	3	-	2	-	-
CO5	3	3	-	-	-	3	1	-	2	-	3	-	2	-	-
CO6	3	3	-	-	-	3	1	-	2	-	3	-	2	-	-
Avg	3	3	-	-	-	3	1	-	2	-	3	-	2	-	-



B.E Civil Engineering			2023-2024
			SEMESTER -IV
23BECE403		WATER SUPPLY ENGINEERING	3H-3 C
Instruction Hours/week:L:3 T	:0 P:0	Marks:Internal:40 Ex	ternal:60 Total:100
		End Sem	ester Exam: 3Hours

The goal of this course is for the students to:

- 1. To equip the students with the principles and design of water treatment units and distribution systems.
- 2. To make adequate provisions for emergencies like firefighting, festivals, meeting, etc
- 3. To make provisions for future demand due to the increase in population, increase in standard of living, storage and conveyance.
- 4. To prevent pollution of water at source, storage, and conveyance.
- 5. To maintain the treatment units and distribution system in good condition with adequate staff and material.

COURSE OUTCOMES:

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

- 1. An understanding of water quality criteria and standards, and their relation to public health
- 2. The ability to design the water conveyance system
- 3. The knowledge in various unit operations and processes in water treatment
- 4. An ability to understand the various systems for advanced water treatment.
- 5. An insight into the structure of drinking water distribution system

UNIT I SOURCES OF WATER

Public water supply system - Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir - Development and selection of source - Source Water quality - Characterization -Significance – Drinking Water quality standards

UNIT II WATER SUPPLY

Estimation of surface and subsurface water resources - Predicting demand for water- Impurities of water and their significance - Physical, chemical and bacteriological analysis - Waterborne diseases - Standards for potable water. Intake of water: Pumping and gravity schemes

UNIT III WATER TREATMENT

Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation - Clarifloccuator - Plate and tube settlers - Pulsator clarifier - sand filters

UNIT IV ADVANCED WATER TREATMENT

Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems - Iron and Manganese removal - Defluoridation - Construction and Operation and Maintenance aspects.

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UNIT V WATER STORAGE AND DISTRIBUTION

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Storage and balancing reservoirs - types, location and capacity. Distribution system: layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations - House service connections.

TOTAL: 45

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication							
1.	Garg. S.K	Water Supply Engineering	Khanna Publishers, Delhi	2008							
2.	Punmia B.C, Arun K.Jain, Ashok K	Water supply Engineering	supplyLakshmi publicationperingprivate limited, New Delhi								
REFERENCE BOOKS:											
S. No.	Author(s)	Title of the Book	Publisher	Year of Publication							
1	Fair GM	Water Supply and									
1.	Geyer.J.C	Wastewater Disposal	John Wiley and Sons	1954							
2.	Geyer.J.C Babbit.H.E, and Donald.J.J	Wastewater Disposal Water Supply Engineering	John Wiley and Sons McGraw Hill book Co	1954 1984							
1. 2. WEBSI	Geyer.J.C Babbit.H.E, and Donald.J.J	Wastewater Disposal Water Supply Engineering	John Wiley and Sons McGraw Hill book Co	1954 1984							
1. 2. WEBSI 1.	Geyer.J.C Babbit.H.E, and Donald.J.J TES: NPTEL :: Civil Eng	Wastewater Disposal Water Supply Engineering	John Wiley and Sons McGraw Hill book Co apply Engineering	1954 1984							

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO 12	PS O1	PS O2	PS O3
CO1	3	3	-	-	2	3	1	1	2	-	3	1	2	-	-
CO2	3	3	-	-	2	3	1	1	2	-	3	1	2	-	-
CO3	3	3	-	-	2	3	1	1	2	-	3	1	2	-	-
CO4	3	3	-	-	2	3	1	1	2	-	3	1	2	-	-
CO5	3	3	-	-	2	3	1	1	2	-	3	1	2	-	-
Avg	3	3	-	-	2	3	1	1	2	-	3	1	2	-	-

B.E Civil Engineering 2023-2024 **SEMESTER -IV 23BECE404 HIGHWAY ENGINEERING 3H-3C** Instruction Hours/week:L:3 T:0 P:0 Marks:Internal:40 External:60 Total:100 End Semester Exam: 3Hours **COURSE OBJECTIVES:** The goal of this course is for the students to: To recognize the function and scope of Transportation Engineering. 1.

- 2. To understand the alignments of roads, rails and bridges.
- To recognize problems and issues in Parking, Accident, Public Transport. 3.
- To have a real understanding on pavement designs. 4.
- To gain knowledge about the pavement material sand designs. 5.

COURSE OUTCOMES:

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

- 1. Remember and carry out surveys involved in planning and highway alignment.
- 2. Understand and identify the proper alignment of highways and their classifications.
- 3. Analyze and design the horizontal and vertical alignment of highways.
- 4. Understand the traffic problems through traffic regulations and control.
- 5. Remember and study the materials used in pavement and their maintenance.
- 6. Apply and Design the pavements as per IRC

UNIT I HIGHWAY DEVELOPMENT AND PLANNING

Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation

UNIT II **GEOMETRIC DESIGN OF HIGHWAYS**

Introduction- highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, Alignments of bridges, problems.

TRAFFIC ENGINEERING & CONTROL UNIT III

Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems UNIT IV PAVEMENT MATERIALS AND MAINTENANCE 9

Materials used in Highway Construction- Soils, Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements

UNIT V **DESIGN OF PAVEMENTS**

Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems.

TOTAL: 45

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TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Khanna, S.K., Justo, C.E.G and Veeraragavan	'Highway Engineering'	Revised 10thEdition, Nem Chand & Bros	2017
2.	Srinivasa Kumar, R	Textbook of Highway Engineering	Universities Press	2011

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kadiyalai, L.R	Traffic Engineering and Transport Planning'	Khanna Publishers	2005
2.	Partha Chakraborty	Principles Of Transportation Engineering	PHI Learning	2008

WEBSITES:

1.	NPTEL :: Civil Engineering - Transportation Engineering I
2.	NPTEL :: Civil Engineering - NOC:Geometric Design of Highways

Car	PO	PO1	PO1	PO1	PS	PS	PS								
Cos	1	2	3	4	5	6	7	8	9	0	1	2	01	02	03
CO1	3	2	-	-	2	3	-	-	2	-	3	1	2	-	-
CO2	3	2	-	-	2	3	-	-	2	-	3	1	2	-	-
CO3	3	2	-	-	2	3	-	-	2	-	3	1	2	-	-
CO4	3	2	-	-	2	3	-	-	2	-	3	1	2	-	-
CO5	3	2	-	-	2	3	-	-	2	-	3	1	2	-	-
CO6	3	2	-	-	2	3	-	-	2	-	3	1	2	-	-
Avg	3	2	-	-	2	3	-	-	2	-	3	1	2	-	-

B.E Civil Engineering

23BECE441

HYDRAULIC ENGINEERING (THEORY AND LAB)

Instruction Hours/week:L:3 T:0 P:2

Marks:Internal:40 External:60 Total:100 End Semester Exam: 3Hours

(i) Theory COURSE OBJECTIVES:

The goal of this course is for the students to:

1.To introduce the students about various hydraulic engineering problems like openchannel flows and hydraulic machines.

2.To relate the theory and practice of problems in hydraulic engineering.

3.To have knowledge in hydraulic machines.

4.To apply fundamental concepts and techniques of hydraulics and hydrology in theanalysis, design, and operation of water resources systems.

5.To Identify the pumps classification and be able to develop a system curve used in pump selection.

6. To gain knowledge of pump and turbines

COURSE OUTCOMES:

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

1. Review an effective section for flow in different cross sections.

2. Analyze problems in uniform, gradually and rapidly varied flows in steady state conditions.

3.Recognize the principles, working and application of turbines.

4.Compare the principles, working and application of pumps.

5.Design and select pumps for different hydraulic applications.

6. Will gain a complete knowledge of open channel flow.

UNIT I INTRODUCTION TO OPEN CHANNEL FLOW

Comparison between open channel flow and pipe flow- geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution channel section. Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Turbulent Flow- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram.

UNIT II UNIFORM FLOW

Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient ".Most economical section of channel. Computation of Uniform flow, Normal depth.

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4H-4C

SEMESTER

UNIT III NON-UNIFORM FLOW

Specific energy, Specific energy curve, critical flow, discharge curve Specific forceSpecific depth, and Critical depth. Channel Transitions. Measurement of Discharge and Velocity – Venturi Flume, Standing Wave Flume, Parshall Flume, Broad Crested Weir. Measurement of Velocity- Current meter, Floats, Hot-wire anemometer. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. Direct Step method, Graphical Integration method and Directintegration method.

UNIT IV FLOW THROUGH PIPES

Loss of head through pipes-Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow throughlaterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.

UNIT V HYDRAULIC MACHINES

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Indicator diagrams and its variations - Air vessels - Savings in work. Turbines - Classification - Impulse turbine – Pelton wheel - Reaction turbines - Francis turbine - Kaplan turbine - Draft tube - Cavitation - Performance of turbine - Specific speed - Runaway speed..

(ii) Laboratory

Practical Work:

- 1. Uniform Flow.
- 2. Flow through pipes.
- 3. Turbulent flow through pipes.
- 4. Laminar flow through pipes.
- 5. Major losses / Minor losses in pipe
- 6. Flow under Sluice Gate.
- 7. Gradually Varied Flow.
- 8. Venturi Flume.
- 9. Standing Wave Flume.
- 10. Hydraulic Jump

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TOTAL: 45

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	P.M. Modi and S.M. Seth	Hydraulics and Fluid Mechanics	Standard Book House	2017
2.	K. Subramanya	Theory and Applications of Fluid Mechanics	Tata McGrawHill	2011

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	K. Subramanya	Open channel Flow	Tata McGrawHill	2005
2.	Ven Te Chow	Open Channel Hydraulics	Tata McGraw Hill.	2008
WEBSI	TES:	•		•

1.	NPTEL ::	Civil E	Engineer	ing - N	OC:Hvdrauli	Engine	ering
							0

2. Hydraulic Engineering - Course (nptel.ac.in)

CO-PO MAPPING (Theory)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS 01	PS O2	PSO3
CO1	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO2	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO3	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO4	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO5	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO6	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
Avg	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-

CO-PO MAPPING (Laboratory)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PSO3
C01	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO2	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO3	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO4	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO5	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-
CO6	3	2	-	-	2	3	-	-	2	-	3	-	2	-	_
Avg	3	2	-	-	2	3	-	-	2	-	3	-	2	-	-

B.E Civil Engineering		2023-2024
		Semester-IV
23BECE4E**	PROFESSIONAL ELECTIVE-I	3H-3C

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

B.E Civil Engineering 2023-2024 SEMESTER -IV 23BECE411 STRENGTH OF MATERIALS LABORATORY 3H-1.5C Instruction Hours/week:L:0 T:0 P:3 Marks:Internal:40 External:60 Total:100

COURSE OBJECTIVES:

The goal of this course is for the students to:

1.To develop skills to test the soils for their index and engineering properties and to characterize the soil based on their properties.

COURSE OUTCOMES:

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

- 1. Analyze the test determine the index properties of streel.
- 2. Understand the insitu density and compaction characteristics.
- 3. Conduct tests to determine the Durability and shear strength of soils.
- 4. Understand the various tests on Different types of metals.

EXPERIMENTS:

1.Tension test on steel rod.

- 2. Torsion test on mild steel rod.
- 3.Deflection test on metal beam.
- 4.Double shear test on metal.

5.Impact test on metal specimen (Izod and Charpy).

6.Hardness test on metals (Rockwell and Brinell Hardness Tests).

7.Compression test on helical spring.

8.Deflection test on carriage spring.

9.Determination of Compression test on wood.

TEXT BOOKS:

TOTAL: 30

End Semester Exam: 3Hours

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Timoshenko, S. and Young, D.	Elements of Strength of Materials	DVNC,New York, USA. Delhi	2011
2.	R K Rajput	Strength of Materials	DVNC,New York, USA. Delhi	2002

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Hibbeler, R. C. Mechanics of Materials	Theory and Applications of Fluid Mechanics	Tata Mc GrawHill	2007
2.	Ferdinand P. Beer, E. Russel Jhonston Jr	Mechanics of Materials	Tata Mc GrawHill	2012

Car	PO	PO1	PO1	PO1	PS	PS	PS								
Cos	1	2	3	4	5	6	7	8	9	0	1	2	01	02	03
CO1	3	-	-	-	1	-	1	-	2	-	1	1	-	2	-
CO2	3	-	-	-	1	-	1	-	2	-	1	1	-	2	-
CO3	3	-	-	-	1	-	1	-	2	-	1	1	-	2	-
CO4	3	-	-	-	1	-	1	-	2	-	1	1	-	2	-
Avg	3	-	-	-	1	-	1	-	2	-	1	1	-	2	-

B.E Civil Engineering		2023-2024
		SEMESTER -IV
23BECE412	HIGHWAY LABORATORY	3H-1.5C
Instruction Hours/week:L:0 T:0 P	3 Marks:Inte	ernal:40 External:60 Total:100
		End Semester Exam: 3Hours

The goal of this course is for the students to:

1. To develop skills to test the roads for their index and engineering properties and to characterize the aggregates and bituminous roads based on their properties.

COURSE OUTCOMES:

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

- 1. Characterize Pavement Aggregate through relevant test.
- 2. Ascertain the Quality of Bitumen.
- 3. Determine the Optimum Binder Content Using Marshall Method.
- 4. Evaluate the Consistency and Properties of Bitumen.
- 5. Determine the Bitumen Content in the Bituminous Mixes

TEST ON AGGREGATES

- 1. Specific gravity determination of the coarse aggregate sample
- 2. Determination of abrasion value of the coarse aggregate sample.
- 3. Determination of water absorption capacity of the coarse aggregate sample.

TEST ON BITUMEN

- 4. Specific gravity determination of the bitumen/asphalt sample.
- 5. Determination of consistency of the bituminous material.
- 6. Viscosity determination of bituminous binder.
- 7. Determination of softening point of the asphalt/bitumen sample
- 8. Determination of ductility value of the bitumen sample
- 9. Estimation of loss of bitumen on heating
- 10. Determination of optimum binder content by Marshall method

BITUMINOUS MIXES

- 11. Determination of stripping value of the bituminous mix Demonstration
- 12. Determination of bitumen content in the bituminous mix by cold solvent extraction method

TEXT BOOKS:

ГО	TA	L:	30
			•••

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Khanna, S.K., Justo, C.E.G and Veeraragavan	'Highway Engineering'	Revised 10thEdition, Nem Chand & Bros	2017
2.	Srinivasa Kumar, R	Textbook of Highway Engineering	Universities Press	2011

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Kadiyalai, L.R	Traffic Engineering and Transport Planning'	Khanna Publishers	2005
2.	Partha Chakraborty	Principles Of Transportation Engineering	PHI Learning	2008

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS 01	PS O2	PS 03
C01	2	-	-	-	2	-	1	-	2	-	1	1	-	2	-
CO2	2	-	-	-	2	-	1	-	2	-	1	1	-	2	-
CO3	2	-	-	-	2	-	1	-	2	-	1	1	-	2	-
CO4	2	-	-	-	2	-	1	-	2	-	1	1	-	2	-
CO5	2	-	-	-	2	-	1	-	2	-	1	1	-	2	-
Avg	2	-	-	-	2	-	1	-	2	-	1	1	-	2	-

B.E Civil Engineering 2023-2024 SEMESTER -IV

23BECE413 COMPUTER AIDED BUILDING DRAWING LABORATORY 3H-1.5C

Instruction Hours/week:L:0 T:0 P:3

Marks:Internal:40 External:60 Total:100 End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

- 1. To develop parametric design and the conventions of formal Engineering drawing.
- 2. Produce and interpret 2D & 3D drawings.
- 3.To communicate a design idea/concept graphically/visually.

4.To examine a design critically and with understanding of CAD - The student learn to interpret drawings.

5.To produce designs using a combination of 2D and 3D software.

6.To get detailed information's through CAD drawings.

COURSE OUTCOMES:

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

- 1. Develop Parametric design and the conventions of formal engineering drawing.
- 2. Produce and interpret 2D & 3D drawings.
- 3. Communicate a design idea/concept graphically/ visually.

4. Examine a design critically and with understanding of CAD - The student learns to interpret drawings, and to produce designs using a combination of 2D and 3D software.

- 5. Get a Detailed study of an engineering artifact.
- 6. Planning and designing of structures

List of Drawing Experiments:

- 1. Buildings with load bearing walls including details of doors and windows.
- 2. RCC frames building- plan a section.
- 3. Structural detailing of RC elements
- 4. Reinforcement drawings for typical slabs, beams, columns and spread footings.
- 5. Industrial buildings Simple Trusses PEB
- 6. Perspective view of one storey buildings

TEXT BOOKS:

TOTAL: 30

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Venugopal	Engineering Drawing and Graphics + AUTOCAD	New AgeInternational Pvt.Ltd	2007
2.	Subhash C Sharma & Gurucharan Singh	Civil Engineering Drawing	Standard Publishers	2005

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication	
1.	Malik R.S., Meo, G.S	Civil Engineering Drawing	Computech PublicationLtd New Asian	2009	
2.	Ajeet Singh	Working with AUTOCAD 2000 with updates on AUTO CAD2001	Tata- Mc Graw-Hill Company Limited, New Delhi	2002	

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS 01	PS O2	PS 03
CO1	3	2	-	-	1	-	1	-	2	-	1	1	-	2	-
CO2	3	2	-	-	1	-	1	-	2	-	1	1	-	2	-
CO3	3	2	-	-	1	-	1	-	2	-	1	1	-	2	-
CO4	3	2	-	-	1	-	1	-	2	-	1	1	-	2	-
CO5	3	2	-	-	1	-	1	-	2	-	1	1	-	2	-
CO6	3	2	-	-	1	-	1	-	2	-	1	1	-	2	-
Avg	3	2	-	-	1	-	1	-	2	-	1	1	-	2	-
23BECE451

FOUNDATION OF

2023 -2024 Semester-IV

1H-0C

ENTREPRENEURSHIP

Instruction Hours/week: L:1 T:0 P:0

Marks: Internal:100 Total:100 End Semester Exam:3 Hours

COURSE OBJECTIVES:

The goal of this course is for the students to

- 1. Equip and develop the learners' entrepreneurial skills and qualities essential to undertake business.
- 2. Impart the learners' entrepreneurial competencies needed for managing business efficiently and effectively.
- 3. Understand basic concepts in the area of entrepreneurship.
- 4. Develope personal creativity and entrepreneurial initiative
- 5. Adopt the key steps in the elaboration of business idea.

COURSE OUTCOMES:

Upon completion of this course the students will be able to

- 1. Gain entrepreneurial competence to run the business efficiently.
- 2. Undertake businesses in the entrepreneurial environment.
- 3. Prepare business plans and undertake feasible projects.
- 4. Be efficient in launching and developing their business ventures successfully.
- 5. Monitor the business effectively towards growth and development.

Unit I -ENTREPRENEURAL COMPETENCE

Entrepreneurship concept - Entrepreneurship as a Career - Entrepreneurial Personality - Characteristics

of Successful Entrepreneurs - Knowledge and Skills of an Entrepreneur.

Unit II -ENTREPRENEURAL ENVIRONMENT

Business Environment - Role of Family and Society - Entrepreneurship Development

Unit III - BUSINESS PLAN PREPARATION

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership

Unit IV -LAUNCHING OF SMALL BUSINESS

Finance and Human Resource Mobilization - Operations Planning - Market and Channel Selection

- Growth Strategies

Unit- V MANAGEMENT OF SMALL BUSINESS

Monitoring and Evaluation of Business - Effective Management of small Business - Case Studies.

Text Books

- 1. S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, 2016.
- 2. R.D.Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2018.

- 3. Rajeev Roy ,Entrepreneurship, Oxford University Press, 2nd Edition, 2011.
- 4. Donald F Kuratko, T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning, 2012.

23BECE452

ESSENCE OF TRADITIONAL INDIAN KNOWLEDGE AND HERITAGE

Semester-IV 1H-0C

Instruction Hours/week: L:1 T:0 P:0

Marks: Internal:100 Total:100 End Semester Exam:3 Hours

COURSE OBJECTIVES:

The goal of this course is for the students to

- 1. Impart a holistic understanding about Indian Culture and Thoughts from a Historical perspective.
- 2. Encourage critical appreciation of the Indian thoughts and cultural manifestations.
- 3. Introduce the students to important concepts from the diverse intellectual traditions of India.
- 4. Make use of Indian cultural heritage and various epistemological inquiries.
- 5. Gain knowledge of Indian heritage.

COURSE OUTCOMES:

Upon completion of this course the students will be able to

- 1. Understand the cultural diversity.
- 2. Infer the need of cultural unity.
- 3. Know the Dravidian culture.
- 4. Realize the power of Indian educational system called gurukul.
- 5. Come to know the concepts of vedic thought.

UNIT I Introduction to Indian thought and Culture

Plurality of Indian culture - Cultural Diversity and Cultural Unity -Different manifestations of Indian Culture: Indus valley culture -Vedic culture and Dravidian culture. -The Medieval Bhakti Culture

UNIT II Traditional knowledge Systems of India

Introduction to the Traditional Indian Education system of Gurukul - Parampara -Understanding Indian Philosophy: Vedic thought and the nine schools of philosophy - Indigenous Knowledge and Women in India

Text books:

- 1. Chatterjee, Satishchandra and Dhirendramohan Datta. (2007) Introduction to Indian Philosophy. Rupa Publications, New Delhi.
- 2. Husain, S. Abid. (2003). The National Culture of India. National Book Trust, New Delhi.

B.E Civil Engineerin	ıg		2023-2024
			SEMESTER-V
23BECE501	STRUCTUR	AL ENGINEERING	3H-3C
Instruction Hours/wee	k:L:3 T:0 P:0	Marks:Internal:40 H	External:60 Total:100
		End Ser	nester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students:

1.Students will be exposed to the theories and concepts of concrete and steel design.

2.To understand the concept of analysis of structures by various classical methods.

3.Hands-on design experience and skills will be gained and learned through problem sets and a comprehensive design project.

4.An understanding of real-world open-ended design issues will be developed. Weekly recitations and project discussions will be held besides lectures.

5.To know about statically determinate and indeterminate suspension bridges and arches.

6.To analyze the forces in cables under concentrated and uniformly distributed loads.

COURSE OUTCOMES:

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

1. Understand the principles of sustainable development as an engineer.

2. Apply their knowledge of structural mechanics dealing with the in

addressing designproblems of Structural Engineering

3. Analyze the skills to solve problems dealing with different loads in concrete and steel.

4. Apply their skill in analysis and design of various structural elements.

- 5. Remember the special design concepts in their design projects.
- 6. Analyze the forces in cables under concentrated and uniformly distributed loads

UNIT I INTRODUCTION

Concepts of energy principles, safety, sustainable development in performance; what makes a structure; principles of stability, equilibrium; what is a structural engineer, role of engineer, architect, user, builder; what are the functions' what do the engineers design, first principles of process of design

UNIT II PLANNING AND DESIGN PROCESS

Materials, Loads, and Design Safety; Behavior and Properties of Concrete and Steel; Windand Earthquake Loads.

UNIT III MATERIALS AND STRUCTURAL DESIGN CRITERIA

Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames, and design philosophies for structural engineering. Laboratory experiments dealing with the analysis of determinate and indeterminate structures..

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UNIT IV DESIGN OF STRUCTURAL ELEMENTS

Concrete Elements, Steel Elements, Structural Joints; Theories and concepts of both concrete and steel design and analysis both at the element and system levels. Approximate Analysis Methods as a Basis for Design; Design of Tension Members and Connections; Bending Members; Structural Systems.

UNIT V SYSTEM DESIGN CONCEPTS

Special Topics that may be covered as Part of the Design Project Discussions; Flat slabs; Prestressed Concrete Elements; Constructability and Structural Control; Fire Protection.

TEXT BOOKS:

TOTAL: 45

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	S. Ramamrutham & R. Narayan	Theory of structures	Dhanpat Rai Publishing Co,New Delhi	2013
2.	Bhavaikatti, S.S (2008)	Structural Analysis – Vol. 1 & Vol. 2	Vikas Publishing Pvt Ltd., New Delhi	2008

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Nilson, A. H	Design of Concrete Structures	13th edition. McGraw Hill	2004
2.	Mc Cormac, J.C., Nelson, J.K., Jr	Structural Steel Design	3rd edition. Prentice Hall, N.J	2003

WEBSITES:

1.	Introduction To Structural Analysis - Engineering Libretexts
2.	Structural Analysis Textbook By Civilenggforall Free Download Pdf

CO-PO MAPPING

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	2	-	-	2	-	2	2	-	2	-
CO2	3	3	-	-	-	2	-	-	2	-	2	2	-	2	-
CO3	3	3	-	-	-	2	-	-	2	-	2	2	-	2	-
CO4	3	3	-	-	-	2	-	-	2	-	2	2	-	2	-
CO5	3	3	-	-	-	2	-	-	2	-	2	2	-	2	-
CO6	3	3	-	-	-	2	-	-	2	-	2	2	-	2	-
Avg	3	3	-	-	-	2	-	-	2	-	2	2	-	2	-

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B.E Civil Engineering					2023-2024
					SEMESTER-V
23BECE502	GROUND IMPE	ROVEMENT	TECHN	IQUES	3H-3C
		3.4		1 40 5	1 (0 - 1 1 1 0 0

Instruction Hours/week:L:3 T:0 P:0

Marks:Internal:40 External:60 Total:100

End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

1.Understand the different problematic soils and effect of ground improvement techniques.

2.Describe the seepage analysis and suitable dewatering systems for the particularsoil conditions.

3.Express the concept of compaction efforts on ground improvement and their installation and working principles.

4.Describe the load transfer mechanism and effect of geo textilesreinforcements in ground improvement.

5.Describe the various stabilization methods for the different types of problematic soils. 6.To express soil stabilization methods for the problematic soils

COURSE OUTCOMES:

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

1.Understand the suitable ground improvement techniques for different the different weak deposits.

2.Understand the dewatering systems for different soil conditions and their effect.

3.Remember the working principles of different compaction methods on improvingweak deposits.

4. Analyze the design of geo textiles reinforcements for ground improvement.

5.Understand the soil stabilization methods for problematic soils.

6.Analyze and Describe the dewatering systems for particular soil conditions.

UNIT I HYDRAULIC MODIFICATIONS

Scope and necessity of ground improvement in Geotechnical engineering basic concepts. Drainage – Ground Water lowering by well points, deep wells, vacuum, and electro-osmotic methods. Stabilization by thermal and freezing techniques - Applications.

UNIT II MECHANICAL MODIFICATIONS

Insitu compaction of granular and cohesive soils, Shallow and Deep compaction methods – Sand piles – Concept, design, factors influencing compaction. Blasting and dynamic consolidation design and relative merits of various methods – Soil liquefaction mitigation methods.

UNIT III PHYSICAL MODIFICATION

Preloading with sand drains, fabric drains, wick drains – theories of sand drain - Stone column with and without encased, limestone – functions – methods of installation – design, estimation of load carrying capacity and settlement. Root piles and soil nailing – methods of installation – Design and Applications

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UNIT IV MODIFICATION BY INCLUSIONS

Reinforcement – Principles and basic mechanism of reinforced earth, simple design: Synthetic and natural fiber-based Geotextiles and their applications. Filtration, drainage, separation, erosion control.

UNIT V CHEMICAL MODIFICATION

Grouting – Types of grouts – Suspension and solution grouts – Basic requirements of grout. Grouting equipment – injection methods – jet grouting – grout monitoring – Electro – Chemical stabilization – Stabilization with cement, lime - Stabilization of expansive clays

TEXT BOOKS:

TOTAL: 45

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Purushothama Raj, P	Ground Improvement Techniques	Tata Mc-Graw-Hill Publishingcompany, New Delhi	2012
2.	Moseley	Ground Improvement	USA and Canada – CRC Press Inc. Florida	2004

REFERENCE BOOKS:

S. No.	Author(s) Title of the Book		Publisher	Year of Publication
1.	Koemer, R.M	Design with Geosynthetics.	Prentice Hall, New Jersey	2002
2	Khedkar, M.S and Mandal, J	Soil Reinforcement with Geotextiles.	CIRIA- Special Publication,London	2009

WEBSITES:

1.	https://archive.nptel.ac.in/courses/105/105/105105210/
2.	https://freevideolectures.com/course/3435/ground-improvement-techniques

CO-PO MAPPING

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	3	-	-	-	-	3	-	-	-	3	-	-
CO2	3	-	3	3	-	-	-	-	3	-	-	-	3	-	-
CO3	3	-	3	3	-	-	-	-	3	-	-	-	3	-	-
CO4	3	-	3	3	-	-	-	-	3	-	-	-	3	-	-
CO5	3	-	3	3	-	-	-	-	3	-	-	-	3	-	-
CO6	3	-	3	3	-	-	-	-	3	-	-	-	3	-	-
Cos	3	-	3	3	-	-	-	-	3	-	-	-	3	-	-

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B.E Civil Engineering		2023-2024
		SEMESTER-V
23BECE503	Wastewater Engineering	3H-3C
Instruction Hours/week:	L:3 T:0 P:0	Marks: Internal:40 External:60 Total:100

The goal of this course is for the students to:

1.Help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation, and maintenance of sewage treatment plants.

COURSE OUTCOMES:

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

1. Analyze and estimate sewage generation and design sewer systems including sewage pumping stations.

2.Understanding on the characteristics and composition of sewage, self-purification of streams.

3.To Understand and perform the basic design of the unit operations and processes that are used in sewage treatment.

4. Understand the standard methods for disposal of sewage.

5. Analyze and get more knowledge on sludge treatment and disposal.

UNIT I PLANNING AND DESIGN OF SEWERAGE SYSTEM

Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - Sewer appurtenances - Corrosion in sewers -Prevention and control – Sewage pumping-drainage in buildings - Plumbing systems for drainage

UNIT II PRIMARY TREATMENT OF SEWAGE

Objectives - Unit Operations and Processes - Selection of treatment processes - Onsite sanitation - Septic tank- Grey water harvesting - Primary treatment - Principles, functions and design of sewage treatment units – screens - grit chamber-primary sedimentation tanks - Construction, Operation and Maintenance aspects.

UNIT III SEWAGE TREATMENT

Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended aeration systems - Trickling filters - Sequencing Batch Reactor (SBR) - UASB - Waste Stabilization Ponds - Other treatment methods - Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects.

UNIT IV DISPOSAL OF SEWAGE

Standards for- Disposal — Methods — dilution — Mass balance principle — Selfpurification of river- Oxygen sag curve — deoxygenation and reaeration — Streeter-Phelps model — Land disposal —Sewage farming — sodium hazards — Soil dispersion system.

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End Semester Exam: 3Hours

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UNIT V SLUDGE TREATMENT AND DISPOSAL

Objectives — Sludge characterization — Thickening — Design of gravity thickener-Sludge digestion — Standard rate and High-rate digester design- Biogas recovery — Sludge Conditioning and Dewatering — Sludge drying beds- ultimate residue disposal recent advances.

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Garg, S.K	Environmental Engineering Vol. II.	Khanna Publishers,New Delhi.	2015
2.	Duggal K.N	Elements of Environmental Engineering.	S.Chand and Co. Ltd., New Delhi.	2004

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mark J. Hammer, Mark J. Hammer, Jr	Mark J. Hammer, Mark J. Hammer, Jr.	Prentice Hall of India.	2006
2.	N.L. Nemerrow	Theories and practices of Industrial Waste Engineering.	Prentice Hall of India.	2003

WEBSITES:

1.	https://archive.nptel.ac.in/courses/105/106/105106119/
2.	https://pdfkeys.com/download/1741591-Environmental-Engineering- Lecture- Notes.pdf

CO-PO MAPPING

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	3	-	3	-	-	-	-	3	-
CO2	3	3	-	-	-	-	3	-	3	-	-	-	-	3	-
CO3	3	3	-	-	-	-	3	-	3	-	-	-	-	3	-
CO4	3	3	-	-	-	-	3	-	3	-	-	-	-	3	-
CO5	3	3	-	-	-	-	3	-	3	-	-	-	-	3	-
Avg	3	3	-	-	-	-	3	-	3	-	-	-	-	3	-

TOTAL: 45

B.E	Civil	Engineering	

2023-2024

SEMESTER-V

23BECE504 RAILWAYS AIRPORT AND HARBOUR ENGINEERING 3H-3C

Instruction Hours/week:L:3 T:0 P:0

Marks:Internal:40 External:60 Total:100

End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

1.To introduce the students about Railways planning, design, construction and maintenance and planning design principles of airport and Harbor

COURSE OUTCOMES:

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

1.Understand the methods of route alignment and design elements in Railway Planning and Constructions.

2.Understand the Construction techniques and Maintenance of Track laying and Railway stations.

3.Gain an insight on the planning and site selection of Airport Planning and design. 4.Analyze and design the elements for orientation of runways and passenger facility systems.

5.Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted.

UNIT I RAILWAY PLANNING AND CONSTRUCTION

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods--Geometric design of railway, gradient, super elevation, widening of gauge on curves- Level Crossings.

UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE

Earthwork – Stabilization of track on poor soil - Track drainage – Calculation of Materials required for track laying - Construction and maintenance of tracks – Railway Station and yards and passenger amenities-Signaling.

UNIT III AIRPORT PLANNING

Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area.

UNIT IV AIRPORT DESIGN

Runway Design: Orientation, Wind Rose Diagram, Problems on basic and Actual Length, Geometric Design – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings.

UNIT V HARBOUR ENGINEERING

Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins, and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Coastal Regulation Zone, 2011

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TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Khanna.S.K. Arora.M.G and Jain.S.S	Airport Planning and Design.	Nemachand and Bros, Roorkee.	1994
2.	Robert Honjeff and Francis X.Mckelvey	Planning and Design of Airports.	McGraw Hill, New York.	1996

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Venkatramaiah. C	Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.	Universities Press (India) Private Limited, Hyderabad.	2015
2.	Mundrey J S	Railway Track Engineering.	McGraw Hill Education (India) Private Ltd, New Delhi.	2013

WEBSITES:

1.	https://www.brainkart.com/subject/Railways-and-Airports-and-Harbour- Engineering_43/
2.	https://www.scitechpublications.com/productDetails.aspx?product_id=28

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	-	3	-	3	3	-	-	3	-	-
CO2	-	3	-	3	-	-	3	-	3	3	-	-	3		-
CO3	-	3	-	3	-	-	3	-	3	3	-	-	3	-	-
CO4	-	3	-	3	-	-	3	-	3	3	-	-	3	-	-
CO5	-	3	-	3	-	-	3	-	3	3	-	-	3	-	-
Avg	-	3	-	3	-	-	3	-	3	3	-	-	3	-	-

B.E Civil Engineering 2023-2024 SEMESTER-V 23BECE505 PROFESSIONAL PRACTICE, LAW AND ETHICS 2H-2C Extended to Log Tetrack (0 Tetrack) (0 Te

Instruction Hours/week:L:2 T:0 P:0

Marks:Internal:40 External:60 Total:100

End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

1.To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession.

2. To develop some ideas of the legal and practical aspects of their profession.

3. To give an understanding of Intellectual Property Rights and Patents.

4. To give a good insight into contracts and contracts management.

5.To know about Intellectual Property Rights, Patents.

6.To Gathered ideas of the legal and practical aspects of their profession.

COURSE OUTCOMES:

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

1.Familiarize the students to what constitutes professional practice, introduction of various stakeholders and their respective roles and understanding the fundamental ethics governing the profession.

2.Gained a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement of labour.

3. Good understanding of Intellectual Property Rights, Patents.

4. To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession.

5.To develop good ideas of the legal and practical aspects of their profession.

6.Gathered ideas of the legal and practical aspects of their profession.

UNIT I PROFESSIONAL PRACTICE & PROFESSIONAL ETHICS 9

Professional Practices- Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies; professional bodies -Institution of Engineers, Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities; Clients/ owners; Developers; Consultants; Contractors; Manufacturers/ Vendors/ Service agencies

Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; VigilMechanism, Whistle blowing, protected disclosures.

UNIT II GENERAL PRINCIPLES OF CONTRACTS MANAGEMENT 9

Indian Contract Act, 1872 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /" Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non- performance; Contract documentation; Contract Notices; Wrong practices in contractin; Reverse auction; Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Terms.

UNIT III ARBITRATION, CONCILIATION AND ADR (ALTERNATIVE 9 DISPUTE RESOLUTION) SYSTEM

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

UNIT IV ENGAGEMENT OF LABOUR AND LABOUR &OTHER 9 CONSTRUCTION- RELATED LAWS 9

Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour subcontract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers Act (1996) and Rules (1998); RERA Act 2017, NBC 2017. Gender Empowerment measure (GEM)- Global Gender Gap Index-Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013; Protection of Women from Domestic ViolencePrevention Act, 2005.

UNIT V LAW RELATING TO INTELLECTUAL PROPERTY

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Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights andassignment, Criteria of infringement, Piracy in Internet – Remediesand procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patentslaw in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement andrelated remedies.

TOTAL: 45

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Avtar singh	Law of Contract.	Eastern Book Co	2002
2.	Meena Rao	Fundamental concepts in Law of Contract.	3rd Edition. ProfessionalOffset	2006

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	T. Ramappa	Intellectual Property Rights Law in India.	Asia Law House Bare text.	2010
2.	T. Ramappa	Right to Information Act.	Asia Law House Bare text.	2010

WEBSITES:

1.	https://www.scribd.com/document/557778730/Professional-Ethics-NPTEL- Syllabus
2.	https://www.goseeko.com/studymaterial/aryabhatta-knowledge-university- bihar/engineering/civil-engineering/fourth-year/sem-1/professional- practice-law-and- ethics

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	2	2	3	-	2	-	-	2	-	2	-
CO2	3	3	1	1	2	2	3	-	2	-	-	2	-	2	-
CO3	3	3	1	1	2	2	3	-	2	-	-	2	-	2	-
CO4	3	3	1	1	2	2	3	-	2	-	-	2	-	2	-
CO5	3	3	1	1	2	2	3	-	2	-	-	2	-	2	-
CO6	3	3	1	1	2	2	3	-	2	-	-	2	-	2	-
Cos	3	3	1	1	2	2	3	-	2	-	-	2	-	2	-

B.E Civil Engineering			2023-2024	
			Semester-VI	
23BECE6E**	Professional	rofessional Elective-II 3 0 P: 0 Marks: Internal:40 External:60 Tota		
Instruction Hours/week: I	L: 3 T: 0 P: 0	Marks: Inte	ernal:40 External:60 Total:100	
			End Semester Exam:3 Hours	

B.E Civil Engin	leering	2023-2024
		SEMESTER-V
23BECE511	MATERIALS, TESTING AND EVALUATION	3H-1.5 C

Instruction Hours/week:L:0 T:0 P:3

Marks:Internal:40 External:60 Total:100

End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

1. Make measurements of behavior of various materials used in Civil Engineering.

2. Provide physical observations to complement concepts learnt.

3.Introduce experimental procedures and common measurement

instruments, equipment, devices.

4. Exposure to a variety of established material testing procedures and techniques.

5.Different methods of evaluation and inferences drawn from observations.

6.To compute engineering values (e.g., stress or strain) from laboratory measures.

COURSE OUTCOMES:

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

1.To understand the strength measurement of various materials.

2.To conduct experiments in the subject matter learnt.

3.To use laboratory instruments for attaining the results of material behavior.

4. To work with different laboratories procedures to test the materials.

5.To work with different evaluation methods of materials.

List of Experiments:

1. Tensile Strength of materials

2.Test for compressive strength of Bricks

3.Test for Water absorption of Bricks

4.Determination of Efflorescence of Bricks

5.Compression test on wood

6.Impact test

7.Shear test

8. Tension I - Elastic Behavior of metals & materials

9. Tension II - Failure of Common Materials

10. Torsion test on circular bars

11.Hardness tests (Brinnel's and Rockwell)

12.Bituminous Mix Design and Tests on bituminous mixes - Marshall method

TOTAL: 30

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Arora S.P. and Bindra S.P	Planning Techniques and Method of Construction.	Dhanpat Raiand Sons	2004
2.	Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C	Construction Planning, Equipment and Methods.	McGraw Hill, Singapore	2006

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Chudley, R., Greeno	'Building Construction Handbook.	(6th ed.), R. Butterworth- Heinemann.	2006
2.	Khanna, S.K., Justo, C.E.G and Veeraragavan, A	Highway Materials and Pavement Testing.	Nem Chand& Bros, Fifth Edition.	2003

WEBSITES:

1.	https://www.slideshare.net/BASWESHWARJIRWANKAR1/mte- 184490338
2.	https://www.vssut.ac.in/lecture_notes/lecture1640072907.pdf

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	2	-	-	2	-	-	-	-	2	-
CO2	3	3	-	-	-	2	-	-	2	-	-	-	-	2	-
CO3	3	3	-	-	-	2	-	-	2	-	-	-	-	2	-
CO4	3	3	-	-	-	2	-	-	2	-	-	-	-	2	-
CO5	3	3	-	-	-	2	-	-	2	-	-	-	-	2	-
Avg	3	3	-	-	-	2	-	-	2	-	-	-	-	2	-

B.E Civil Engineering 2023-2024 SEMESTER-3H-1.5C

23BECE512 **ENVIRONMENTAL ENGINEERING LABORATORY**

Instruction Hours/week:L:0 T:0 P:3

Marks:Internal:40 External:60 Total:100

End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

1.To understand the impact of humans on the environment and environment on humans.

2. To know the adverse effect of the pollutants on the environment viz atmosphere, water, and soil.

3. To gain the knowledge of the most appropriate technique for the treatment of water, wastewater solid waste.

4. To know the rolls of government and non-government agencies in environment pollution control.

5.To understand the concept of solid waste management.

6.To know the different designing elements in sewer systems.

COURSE OUTCOMES:

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

1.Determine the quality of water used for different purposes.

2.Inspect the sewer appurtenances.

3.Design the different elements of water treatment plant.

4. Handle the solid waste without disturbing the environment.

5.Design the water supply system for any building.

6.Select the most appropriate technique for the treatment of water, wastewater solid waste and contaminated air.

List of Experiments:

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH.

2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic, etc.

3. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness.

4. Analysis of ions: copper, chloride and sulfate.

- 5.Optimum coagulant dose.
- 6.Chemical Oxygen Demand (COD).
- 7. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD).
- 8.Break point Chlorination.
- 9.Bacteriological quality measurement: MPN.
- 10. Ambient Air quality monitoring (TSP, RSPM, SOx, NOx).
- 11.Ambient noise measurement.

TOTAL: 30

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	MetCalf and Eddy	Wastewater Engineering, Treatment, Disposal and Reuse	TataMcGraw-Hill, New Delhi	2013
2.	S.K.Garg	Environmental Engineering	Kanna Publications	2000

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication	
1.	P. Aarne Vesilind, Susan	Introduction to Environmental	Morgan, Thompson /Brooks/Cole; Second	2008	
	M	Engineering	Edition		
2.	Gilbert Masters	Introduction to Environmental Engineering and Science	PrenticeHall, New Jersey	2008	

WEBSITES:

1.	https://jecassam.ac.in/engineering/civil/laboratories/environmental- engineering- laboratory/
2.	https://nptel.ac.in/courses/103107084

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	2	-	-	2	-	-	-	2	2	-
CO2	3	3	-	-	-	2	-	-	2	-	-	-	2	2	-
CO3	3	3	-	-	-	2	-	-	2	-	-	-	2	2	-
CO4	3	3	-	-	-	2	-	-	2	-	-	-	2	2	-
CO5	3	3	-	-	-	2	-	-	2	-	-	-	2	2	-
CO6	3	3	-	-	-	2	-	-	2	-	-	-	2	2	-
Avg	3	3	-	-	-	2	-	-	2	-	-	-	2	2	-

B.E Civil Engineerin	g		2023-2024
23RECE501	FIFI D PRO IF	CT/INTERNSHIP	SEMESTER-V
Instruction Hours/wee	k:L:0 T:0 P:2	Marks:Internal:100	00 External:60 Total:100
		End	Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

1.To train the students in field work so as to have a firsthand knowledge of

practicalproblems in carrying out engineering tasks.

2.To develop skills in facing and solving field problems.

COURSE OUTCOMES:

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

1. The intricacies of implementation textbook knowledge into practice.

2. The concepts of developments and implementation of new techniques.

Strategy

The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

TOTAL: 30

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	1	2	-	-	1	-	2	1	2	2	-
CO2	3	3	1	1	1	2	-	-	1	-	2	1	2	2	-
Avg	3	3	1	1	1	2	-	-	1	-	2	1	2	2	-

23BEMC551

CYBER SECURITY

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

COURSE OBJECTIVES:

Instruction Hours/week: L:1 T:0 P:0

- 1. To understand the field of digital security and concepts of access control mechanism.
- 2. To introduce keywords and jargons involved in securing browser
- 3. To understand network basics and familiarize on security of network protocols.
- 4. To understand cyber-attacks and data privacy
- 5. To learn the tools and methods used in cyber security.

COURSE OUTCOMES:

- 1. Infer the importance of a network basics and brief introduction on security of network protocols
- 2. Apply a solid foundation in digital security and measures taken to protect device from

threats.

- 3. Discuss about cyber-attacks and data privacy issues and preventive measures.
- 4. Make use of tools and methods used in cyber security.
- 5. Explain Cyber security organizational implications.

UNIT I NETWORKING BASICS

Networking basics (home network and large-scale business networks), Networking protocols,

Security of protocols, sample application hosted on-premises.

UNIT II BASICS OF DIGITAL SECURITY

Basics of digital security, protecting personal computers and devices, protecting devices from

Virus and Malware, Identity, Authentication and Authorization, need for strong credentials, keeping credentials secure, protecting servers using physical and logical security, World Wide

Web (www), the Internet and the HTTP protocol, security of browser to web server interaction

UNIT III INTRODUCTION TO CYBER-ATTACKS

Introduction to cyber-attacks, application security (design, development and testing), operations security, monitoring, identifying threats and remediating them, Principles of data security - Confidentiality, Integrity and Availability, Data Privacy, Data breaches, preventing

attacks and breaches with security controls, Compliance standards, Computer Ethics. **UNIT IV TOOLS AND METHODS**

9 Tools and methods used in cyber security: Proxy servers and anonymizers – Phishing – Password cracking – Keyloggers and spywares – Virus and worms – Trojan horse – Stegnography – DoS and DDoS attack – SQL Injection – Buffer overflow – Attacks on wireless networks – Phishing and Identity theft.

UNIT V CYBER SECURITY ORGANIZATIONAL IMPLICATIONS

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Cyber security organizational implications: Cost of cyber crimes and IPR – Web threads for organizations – Security and privacy implications – Social media marketing – Incident handling – Forensics best practices for organization.

TEXT BOOKS:

1. Sammons, John, and Michael Cross. The basics of cyber safety: computer and mobile

device safety made easy. Elsevier, 2016.

2. Nina Godbole and Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley Publisher, First Edition, 2011

REFERENCES BOOKS:

- 1. Charles P. Pfleeger, Shari Lawrence, Pfleeger Jonathan Margulies; Security in Computing, Pearson Education Inc . 5th Edition, 2015
- 2. Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cyber security essentials. John Wiley & Sons, 2018
- 3. Harish Chander, Cyber Laws and IT Protection, PHI Learning, First Edition, 2012
- 4. James Graham, Ryan Olson and Rick Howard, Cyber Security Essentials, CRC Press, First Edition, CRC Press, First Edition

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	2	-	-	-	-	-	2	2	2	-
CO2	3	2	2	2	-	2	-	-	-	-	-	2	2	2	-
CO3	3	3	2	2	-	2	-	-	-	-	-	2	2	2	-
CO4	3	3	2	2	-	2	-	-	-	-	-	2	2	2	-
CO5	3	2	2	2	-	2	-	-	-	-	-	2	2	2	-
Avg	3	2.6	2	2	-	2	-	-	-	-	-	2	2	2	-

SEMESTER-VI

23BECE601 DESIGN OF REINFORCED CONCRETE STRUCTURAL ELEMENTS 3H-3C

Instruction Hours/week:L:3 T:0 P:0

Marks:Internal:40 External:60 Total:100

End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students:

- 1. To introduce the different design philosophy for reinforced concrete and discuss the limit state method of design of RC rectangular beams
- 2. To learn the concept in the design of RC flanged beams and design for shear and torsion and design of RC slabs and staircase, short RC columns, RC footing for walls, pad, sloped and combined rectangular footings.

COURSE OUTCOMES:

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

- 1. Understand the various design concepts and design RC rectangular beams by working stress.
- 2. Understand the various design concepts and design RC rectangular beams limit state methods.
- 3. Understand the design of flanged beams, design for shear and torsion, and anchorage and its Factors.
- 4. Understand the design of flanged beams, design for shear and torsion, and anchorage development length.
- 5. Analyze and Design the RC slabs and staircase and draw the reinforcement detailing.

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES

Concept of Elastic method, ultimate load method and limit state method – Working stress method as detailed in IS code - Design of Singly Reinforced beam by working stress method - Limit State philosophy as detailed in IS code - Advantages of Limit State Method over other methods - Analysis and design of singly and doubly reinforced rectangular beams by limit State Method

UNIT II LIMIT STATE METHOD - FLANGED BEAM, SHEAR & 9 TORSION

Analysis and design of flanged beams – Use of design aids for Flexure - Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending, shear and torsion - serviceability.

UNIT III LIMIT STATE DESIGN OF SLABS AND STAIRCASE

Analysis and design of cantilever, one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions- Types of Staircases – Design of dog-legged Staircase –Introduction to Flat Slab UNIT IV LIMIT STATE DESIGN OF COLUMNS

Types of columns - Design of short Rectangular and circular columns for axial,

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UNIT V LIMIT STATE DESIGN OF FOOTING

Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns only.

TOTAL: 45

TEXT I	BOOKS:			
S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gambhir.M.L	Fundamentals of Reinforced Concrete Design	Prentice Hall of India Private Limited, New Delhi	2006
2.	Krishnaraju.N	Design of Reinforced Concrete Structurres	CBS Publishers & Distributors Pvt. Ltd., New Delhi	2008

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Sinha, S.N	Reinforced Concrete Design	Tata McGraw Hill Publishing Company Ltd., New Delhi	2007
2.	Unnikrishna Pillai, S., Devdas Menon	Reinforced Concrete Design	Tata McGraw Hill Publishing Company Ltd.	2021

WEBSITES:

1.	https://archive.nptel.ac.in/courses/105/105/105105105/
2.	https://easyengineering.net/design-of-reinforced-concrete-structures-by- ramamrutham/

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	1	-	-	2	-	2	2	1	2	-
CO2	3	3	1	2	-	1	-	-	2	-	2	2	1	2	-
CO3	3	3	1	2	-	1	-	-	2	-	2	2	1	2	-
CO4	3	3	1	2	-	1	-	-	2	-	2	2	1	2	-
CO5	3	3	1	2	-	1	-	-	2	-	2	2	1	2	-
Avg	3	3	1	2	-	1	-	-	2	-	2	2	1	2	-

B.E Civil Engineering		2023-2024
		SEMESTER-VI
23BECE602	CONCRETE TECHNOLOGY	3H-3 C
Instruction Hours/week:L:3 T:0 P:0	Marks:I	nternal:40 External:60 Total:100
		End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students:

- 1. To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes.
- 2. To identify the functional role of ingredients of concrete and apply this knowledge to mix design philosophy.
- 3. To Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete
- 4. To Evaluate the effect of the environment on service life performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non- Destructive Testing of concrete structure
- 5. To develop an awareness of the utilization of waste materials as novel innovative materials for use in concrete
- 6. To design a concrete mix which fulfills the required properties for fresh and hardened concrete

COURSE OUTCOMES:

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

- 1. Define and classify the properties of materials required for concrete tests on those materials and design procedures for making conventional and special concretes.
- 2. Identify and remember the functional role of ingredients of concrete and apply this knowledge to mix design philosophy.
- 3. Apply the fundamental knowledge in the fresh and hardened properties of concrete.
- 4. Evaluate the effect of the environment on service life performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non-Destructive Testing of concrete structure.
- 5. Develop an awareness of the utilization of waste materials as novel innovative materials foruse in concrete.
- 6. Analyze and design a concrete mix which fulfills the required properties for fresh and hardened concrete.

UNIT I CONSTITUENT MATERIALS

Cement-Different, types-Chemical composition and Properties -Tests on cement-IS Specifications- Aggregates-Classification-Mechanical properties and tests as per BIS Gradingrequirements- Water- Quality of water for use in concrete

UNIT II CHEMICAL AND MINERAL ADMIXTURES

Accelerators-Retarders- Plasticizers- Super plasticizers- Water proofers – Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaolin - Their effects on concrete properties.

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UNIT III PROPORTIONING OF CONCRETE MIX

Principles of Mix Proportioning-Properties of Concrete Related to Mix Design Physical Properties of materials required for Mix Design – Design Mix and Nominal Mix-BIS Method of Mix Design – Mix Design Examples

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS – Properties of Hardened Concrete-Determination of Compressive and Flexural Strength-Stress-strain curve for concrete Determination of Young's Modulus

UNIT V SPECIAL CONCRETE

Light weight concretes – High strength concrete – Fibre reinforced concrete – Ferro cement – Ready mix concrete – SIFCON-Shot crete – Polymer concrete – High performance concrete- Geopolymer Concrete

TEXT	ROC	KS.

TOTAL: 45

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gupta.B.L., Amit Gupta	Concrete Technology	Jain Book Agency	2010
2.	Shetty, M.S	Concrete Technology	S.Chand and Company Ltd, New Delhi	2003

REFERENCE BOOKS:

KELE	LINCE DOURS:			
S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Santhakumar,A.R	Concrete Technology	Oxford University Press, New Delhi	2007
2.	Neville, A.M	Properties of Concrete	Pitman Publishing Limited, London	2007
WEDG	INEQ			

WEBSITES:

1.	https://archive.nptel.ac.in/courses/105/102/105102012/
2.	https://www.smartzworld.com/notes/concrete-technology-pdf-notes-ct/

CO-PO MAPPING

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO1															
CO2	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO3	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO4	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO5	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO6	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
Avg	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-

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B.E Civil Engineering		2023-2024
		Semester-VI
23BECE6E **	Professional Elective	-III 3H-3C
Instruction Hours/week: L: 3	T: 0 P: 0 M	arks: Internal:40 External:60 Total:100
		End Semester Exam:3 Hours
B.E Civil Engineering		2023-2024
		a b b b b b b b b b b

			Semester-VI
23BECE6E**	Professional	Elective-IV	3H-3 C
Instruction Hours/week: L: 3 T: 0 P: 0		Marks: Internal:	40 External:60 Total:100
		End	Semester Exam:3 Hours

B.E Civil Engineering			2023-2024
			Semester-VI
23BECE6E**	Professional E	lective-V	3H-3C
Instruction Hours/week: L: 3 T: 0 P: 0		Marks: I	nternal:40 External:60 Total:100
			End Semester Exam:3 Hours

B.E Civil Engineering		2023-2024
		Semester-VI
23*****	Open Elective-I	3H-3 C
Instruction Hours/week: L: 3 T: 0 P: 0		Marks: Internal:40 External:60 Total:100
		End Semester Exam: 3 Hours

B.E Civil Engineerin	ng		2023-2024
			SEMESTER-VI
23BECE611	CONCRETE TE	CHNOLOGY LABORATORY	3H-1.5C
Instruction Hours/we	ek:L:0 T:0 P:3	Marks:Internal:40 Ext	ernal:60 Total:100
		End Seme	ester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students:

- 1. To facilitate the understanding of the behavior of construction materials.
- 2. To know the concept and procedure of different type of test conducted on cement, aggregateand finished concrete.
- 3. To understand the procedure of designing the concrete mix of given specification of its ingredients along with appropriate water cement ratio and admixtures.
- 4. To learn the procedure of testing concrete ingredients and properties of concrete as per standardcode recommendations.
- 5. To learn the procedure of testing bituminous materials as per standard code recommendations
- 6. To relate material characteristics to various application of construction

COURSE OUTCOMES:

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

- 1. Find the fineness, specific gravity, initial and final setting time of cement.
- 2. Find the grading, specific gravity and density of fine aggregate.
- 3. Find the compressive strength, water absorption and efflorescence of bricks.
- 4. Find the specific gravity, impact value, crushing value, elongation and flakiness index of coarseaggregate.
- 5. Find the slump of fresh concrete and compressive strength of hardened concrete.
- 6. Perform different tests conducted on cement, aggregate and concrete at site.

I. TEST ON CEMENT

- 1. Determination of fineness
- 2. Determination of consistency
- 3. Determination of initial and final setting time
- 4. Determination of specific gravity

II. TEST ON FINE AGGREGATES

- 5. Grading of fine aggregates
- 6. Test for specific gravity
- 7. Compacted and loose bulk density of fine aggregate

III. TEST ON COARSE AGGREGATE

- 8. Determination of specific gravity
- 9. Determination of impact value
- 10.Determination of elongation index
- 11.Determination of flakiness index
- 12.Determination of aggregate crushing value

IV.TEST ON CONCRETE

- 13.Test for slump
- 14.Test for Compressive strength

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Gupta.B.L., Amit Gupta	Concrete Technology	Jain Book Agency	2010
2.	Shetty, M.S	Concrete Technology	S.Chand and Company Ltd, New Delhi	2003

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Santhakumar,A.R	Concrete Technology	Oxford University Press, New Delhi	2007
2.	Neville, A.M	Properties of Concrete	Pitman Publishing Limited, London	2007

WEBSITES:

1 •	https://www.academia.edu/30447487/Lab_Manual_of_Concrete_Technology
2	https://www.researchgate.net/publication/304222790_Concrete_Laboratory_M
•	anual

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO1															
CO2	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO3	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO4	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO5	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
CO6	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-
Avg	3	-	-	2	-	1	-	-	2	-	2	-	1	2	-

B.E Civil Engineering		2023-2024
		SEMESTER-VI
23BECE612	SURVEY CAMP	0H-1C
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Instruction Hours/week:L:0 T:0 P:0

Marks:Internal:40 External:60 Total:100

End Semester Exam: 3Hours

TOTAL: 45

COURSE OBJECTIVES:

The goal of this course is for the students:

- 1. The objective of the survey camp is to enable the students to get practical training in the field work.
- 2. Groups of not more than six members in a group will carry out each exercise in surveycamp.
- 3. The camp must involve work on a large area outside the campus.
- 4. Survey camp should not be conducted inside the campus
- 5. At the end of the camp, each student shall have mapped and contoured the area.
- 6. The camp record shall include all original field observations, calculations and plots.

COURSE OUTCOMES:

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

- 1. Familiarize in handling different survey instruments.
- 2. Apply modern surveying techniques in field to establish horizontal control.
- 3.Understand the surveying techniques in field to establish vertical control network.
- 4. Exposed to different survey adjustment techniques.
- 5. Familiarize in setting out work different computation process.
- 6. Able to carry out the survey in field under different environmental conditions.

Exercises

1. Plane Table Surveying on proposed area to find the field points.

- i) Two-Point method
- ii) Three Point Method

2. Levelling for canal alignment

- i) Fly Levelling
- ii) Check Levelling

3. Curve setting on Railways

- i) Setting out simple curves
- ii) Setting out compound curves

4. Triangulation on hilly areas

5. Contouring

- i) Grid contouring on leveled surface.
- ii) Radial Contouring on hilly areas

6. Road survey (LS and CS)

i) L.S & C.S - Road alignment for a Length of not less than 1 Kilo Meter at least L.S at Every 30m and C.S at every 90 m.

7. Traverse - using Total station

TEXT BOOKS:

1 ublication	S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
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1.	Dr. B. C. Punmia, Ashok K. Jain and Arun K Jain	, Surveying Vol. I & II	Lakshmi Publications Pvt Ltd, New Delhi, Sixteenth Edition	2016
2.	T. P. Kanetkarand S. V. Kulkarni	Surveying and Levelling, Parts 1 & 2	Pune Vidyarthi Griha Prakashan, Pune	2008

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	R. Subramanian	Surveying and Levelling	Oxford University Press, Second Edition	2012
2.	James M. Anderson and Edward M. Mikhail	Surveying	Theory and Practice, Seventh Edition, Mc Graw Hill	2001

WEBSITES:

1.	https://nptel.ac.in/courses/105107122
2.	https://archive.nptel.ac.in/courses/105/104/105104101/

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	2	-	1	-	-	2	-	2	-	2	2	-
CO2	3	-	-	2	-	1	-	-	2	-	2	-	2	2	-
CO3	3	-	-	2	-	1	-	-	2	-	2	-	2	2	-
CO4	3	-	-	2	-	1	-	-	2	-	2	-	2	2	-
CO5	3	-	-	2	-	1	-	-	2	-	2	-	2	2	-
CO6	3	-	-	2	-	1	-	-	2	-	2	-	2	2	-
Avg	3	-	-	2	-	1	-	-	2	-	2	-	2	2	-

B.E-Civil Engineering	
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2023 - 2024

23BECE691

MINI PROJECT

Semester-VI 3H-2C

Instruction Hours/week: L:1 T:0 P:2

Marks: Internal:100 Total:100

The students will be directed to do a mini project in their domain field for 3 months. Their project work will be evaluated forty percentages by internal examiner and sixty percentage by external examiner for End Semester Examination. End Semester Examination evaluation will be based on the report submitted by the student after the completion of their project report.

23BEMC651

UNIVERSAL HUMAN VALUES

Semester-VI 1H-0C

Instruction Hours/week: L:1 T:0 P:0

Marks: Internal:100 Total:100

COURSE OBJECTIVES:

The goal of this course is for students:

- 1. To see the need for developing a holistic perspective of life
- 2. To facilitate the development of a Holistic perspective among students towards life and profession
- 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct
- 4. To sensitise the student about the scope of life individual, family (interpersonal relationship), society and nature
- 5. To develop more confidence and commitment to understand, learn and act accordingly

COURSE OUTCOMES:

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

- 1. Build comfortable relationship with each other
- 2. Recall technical education without study of human values can generate more problems than solutions
- 3. Infer that lack of understanding of human values is the root cause of most of the present day problems
- 4. Demonstrate that the natural acceptance (intention) is always for living in harmony
- 5. Differentiate between the characteristics and activities of different orders

UNIT I- ASPIRATIONS AND CONCERNS

Individual academic – career - Expectations of family – peers - society - nation - Fixing one's goals

UNIT II- SELF MANAGEMENT

Self confidence- peer pressure- time management- anger- stress- Personality development- self improvement

UNIT III- HARMONY OF THE SELF AND BODY

Understanding Human being as the Co-existence of the Self and the Body -Distinguishing between the Needs of the Self and the Body-Mental and physical health -Health issues- healthy diet- healthy lifestyle -Hostel life

UNIT IV- HARMONY IN RELATIONSHIP

Harmony in the Family – the Basic Unit of Human Interaction - Values in Human-to-Human Relationship- gratitude towards parents, teachers and others - Ragging and interaction- Competition and cooperation -Peer pressure

UNIT V- HARMONY IN THE SOCIETY

Understanding Harmony in the Society- Participation in society- Participation in nature existence.

Total periods : 15

TEXT BOOKS:

1.R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics 2nd Revised Edition, Excel Books, New Delhi 2019

2.A.N. Tripathi Human Values New Age Intl. Publishers, New Delhi 2004

WEBSITE:

1.http://uhv.ac.in 2.http://www.uptu.ac.in 3.http://www.storyofstuff.com

Karpagam Academy of Higher Education, Coimbatore

B.E Civil Engineering

23BECE701

TOTAL QUALITY MANAGEMENT

Instruction Hours/week:L:3 T:0 P:0

Marks:Internal:40 External:60 Total:100

2023-2024 SEMESTER-VII

3H-3C

End Semester Exam: 3Hours

COURSE OBJECTIVES:

The goal of this course is for the students:

- 1. Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM
- 2. framework, Barriers and Benefits of TQM.
- 3. Explain the TQM Principles for application.
- 4. Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking and
- 5. FMEA.
- 6. Describe Taguchi's Quality Loss Function, Performance Measures and apply Techniques
- 7. like QFD, TPM, COQ and BPR.
- 8. Illustrate and apply QMS and EMS in any organization.

COURSE OUTCOMES:

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

- 1. Apply TQM concepts in a selected enterprise.
- 2. Apply TQM principles in a selected enterprise.
- 3. Understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
- 4. Understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.
- 5. Apply QMS and EMS in any organization.

UNIT I INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM - Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES

Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planning Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition & Reward and Performance Appraisal--Continuous process improvement –Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I

The seven traditional tools of quality - New management tools - Six-sigma Process Capability-Bench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfalls and Criticisms of Benchmarking - FMEA - Intent, Documentation, Stages: Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II

Quality circles - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM -

Karpagam Academy of Higher Education (Deemed to be University) Coimbatore -641021 117

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UNIT V QUALITY MANAGEMENT SYSTEM

Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards - AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements-Implementation-Documentation Internal Audits-Registration-ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction— ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001-Benefits of EMS.

TEXT BOOKS:

TOTAL: 45

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dale H.Besterfiled, Carol .Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and RashmiUrdhwareshe	Total Quality Management	Pearson Education Asia	2013

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Joel.E. Ross	Total Quality Management	Text and Cases", Routledge	2016
2.	Oakland, J.S	TQM	Butterworth – Heinemann Ltd., Oxford, Third Edition	2003

WEBSITES:

1.	NPTEL :: Management - NOC:Total Quality Management - I
2.	Total Quality Management - I - Course (nptel.ac.in)

CO-PO MAPPING

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	2	-	-	2	-	2	-	2	2	-
CO2	3	3	-	-	-	2	-	-	3	-	2	-	2	2	-
CO3	3	3	-	-	-	2	-	-	2	-	2	-	2	2	-
CO4	3	3	-	-	-	2	-	-	2	-	2	-	2	2	-
CO5	3	3	-	-	-	2	-	-	2	-	2	-	2	2	-
Avg	3	3	-	-	-	2	-	-	2.2	-	2	-	2	2	-

SEMESTER-VI

23BECE741 ESTIMATION, VALUATION AND QUANTITY SURVEYING 4H-4C (Theory and Lab)

Instruction Hours/week:L:3 T:0 P:2

Marks:Internal:40 External:60 Total:100

(i) Theory

COURSE OBJECTIVES:

The goal of this course is for the students:

1. To understand competitive bidding works and to submit a competitive bid proposal.

2. To understand the technical specifications for various works to be performed for a project and impact the cost of a structure.

3. To understand the different methods of contract and their proposals.

4. To understand the valuation process involved.

5. To understand the government policies and their applications.

6. To understand about business forecasting and investment analysis.

COURSE OUTCOMES:

Upon completion of this course the students will be able to

1.Understand and have an idea of Economics in general, Economics of India particularly for publicsector agencies and private sector.

2.Be able to perform and evaluate present worth, future worth and annual worthanalyses on one of more economic alternatives.

3.Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses onone or more economic alternatives.

4.Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.

5.Be able to fill out a tender document and submit the same in bid.

6.Be able to focus on business forecasting and investment analysis.

UNIT I INTRODUCTION TO ECONOMICS

Basic Macro-economic Concepts and Identities for both closed and open economies. Aggregate demand and Supply. Price Indices, Interest rates, Direct and Indirect Taxes. Cost & Cost Control –Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money. Business Forecasting – Elementarytechniques. Statements – Cash flow, Financial. Case Study Method

UNIT II INTRODUCTION TO ESTIMATION

Types of estimates- Units of measurements- methods of estimates- advantages – costanalysisdetailed estimate- Abstract estimate- Calculation of Quantities by centre line method-Long wall-Short wall method- Load bearing and framed structures. Estimate for Joineries for paneled and

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glazed doors, windows, ventilators, hand rails.

UNIT III ESTIMATE OF BUILDINGS

Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basicmaterials. Use of Computers in quantity surveying

UNIT IV SPECIFICATIONS

Types, requirements and importance, detailed specifications for buildings, roads, minorbridges and industrial structures. Rate analysis-Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity.

UNIT V TENDER

Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price buildup: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management.

(ii) Laboratory

Term Work Assignments:

- 1. Deriving an approximate estimate for a multistoried building by approximate methods.
- 2. Detailed estimate for the following with the required material survey for the same.
 - a. Ground plus three storied RCC Framed structure building with block workwalls
 - b. bridge with minimum 2spans
 - c. factory building
 - d. roadwork
 - e. cross drainage work
 - f. Ground plus three storied building with load-bearing walls g Cost of finishes,MEP works for (f)above.
- 3. Preparation of valuation report in standard Government form.
- 4. Assignments on rate analysis, specifications and simple estimates.
- 5. Detailed estimate of minor structure.

TOTAL: 45

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6. Preparation of Bar bending schedule.

TEXT BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Dutta, B.N	Estimating and Costing in Civil Engineering (Theory & Practice	UBSPublishers	2016
2.	B D.D.Kohli and Ar. R.C. KohliA text book of Estimating and costing		S Chand andCompany pvt ltd, New Delhi	2013

REFERENCE BOOKS:

S. No.	Author(s)	Title of the Book	Publisher	Year of Publication
1.	Mankiw Gregory N	Principles of Economics	Thompson Asia	2002
2.	V. Mote, S. Paul, G. Gupta	Managerial Economics	Tata McGrawHil	2004

WEBSITES:

1.	https://nptel.ac.in/courses/105/107/105107122
2.	Estimation and Quantity Surveying (PDF) - 2.15 MB @ PDF Room

CO-PO MAPPING

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	2	-	2	1	-	2	-	2	-	-	2	-
CO2	3	-	1	2	-	2	1	-	2	-	2	-	-	2	-
CO3	3	-	1	2	-	2	1	-	2	-	2	-	-	2	-
CO4	3	-	1	2	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	1	2	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	1	2	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	1	2	-	2	1	-	2	-	2	-	-	2	-

B.E Civil Engineering		2023-2024
		Semester-VII
23BECE7E**	Professional Elective-	VI 3H-3C
Instruction Hours/week: L: 3	T: 0 P: 0 Ma	rks: Internal:40 External:60 Total:100
		End Semester Exam:3 Hours
B.E Civil Engineering		2023-2024
		Semester-VII
23BECE7E**	Professional Elective-	VII 3H-3C

 Instruction Hours/week: L: 3 T: 0 P: 0
 Marks: Internal:40 External:60 Total:100

 End Semester Exam:3 Hours

B.E Civil Engineering		2023-2024
		Semester-VII
23BECE7E**	Open Elective-II	3H-3C
Instruction Hours/week: L	: 3 T: 0 P: 0	Marks: Internal:40 External:60 Total:100
		End Semester Exam:3 Hours

B.E Civil Engineering		2023-2024
		Semester-VII
23BECE791	PROJECT PHASE I	8H-4C
Instruction Hours/week: L: 0 T: 0 P: 8	Marks: Internal:80 Ex	xternal:120 Total:200
	End Se	emester Exam:3 Hours

OBJECTIVE

- 1. To work in convenient groups of not more than four members in a group on a project involvinganalysis and Design related to Civil Engineering.
- 2. Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions.
- 3. This experience of project work shall help the student in expanding his / her knowledge base
- 4. Will provide opportunity to utilise the creative ability and inference capability.
- 5. Students will gain the presentation skills.

23BECE891

PROJECT PHASE II & VIVA VOCE

Semester-VIII

8H-8C

Instruction Hours/week: L: 0 T: 0 P: 8

Marks: Internal:80 External:120 Total:200 End Semester Exam:3 Hours

OBJECTIVE

- 1. To work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Civil Engineering.
- 2. Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions.
- 3. This experience of project work shall help the student in expanding his / her knowledge base
- 4. Will provide opportunity to utilise the creative ability and inference capability.
- 5. Students will gain the presentation skills.
- 6. To explain his/her project to the external examiner and can publish the projects in a reputedjournal/Conference.

2023-2024

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23BECE4E01

ENGINEERING GEOLOGY

Semester-IV **3H-3C**

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

Course Objectives

- 1. Identify the main and most common igneous, sedimentary and metamorphic rocksencountered by foundations and construction.
- 2. To identify and define the main morphological and geological characteristics as shown on maps,
- 3. Analyze geological parameters important in geotechnical studies.
- 4. To establish and describe topographical and geological sections,
- 5. Identify potential geological hazards and various structures and ways of preventing and dealing with them.
- 6. To collect, analyze, and report geologic data using standards in engineering practice

Course Outcomes:

After completing the course, the students will be able to

- 1. Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice
- 2. The fundamentals of the engineering properties of earth materials and fluids.
- 3. Rock mass characterization and the mechanics of planar rock slides and topples.
- 4. Soil characterization and the unified soil classification system.
- 5. The mechanics of soils and fluids and their influence on settlement, liquefaction, and soil slope stability.
- 6. Students are able to identify the different types of formation of earth.

UNIT I: GENERAL GEOLOGY

Geology in Civil Engineering – Branches of geology – Earth Structures and composition –Earth Weathering – Work of rivers, wind, sea and groundwater and their engineering processes significance-Earthquakes -Seismo-tectonics of Indian plates, seismic zones of India.

UNIT II: MINERALOGY

Physical properties of minerals – Study of the following rock forming minerals – Quartz family. Feldpar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet - Properties, behaviour and engineering significance of clay minerals – Coal and petroleum – Their origin and occurrence in India. 9

UNIT III: PETROLOGY

Classification of rocks - Distinction between igneous, sedimentary and metamorphic rocks. Description, occurrence, engineering properties and distribution of following rocks. Igneous rocks -Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt -Sedimentary rocks sandstone, Limestone, shale conglomerate, metamorphic rocks. Quartzite, Marble, Slate, Phyllite, Gniess and Schist.

UNIT IV: STRUCTURAL GEOLOGY

Attitude of beds – Outcrops – Introduction to Geological maps – study of structures – Folds, faults and joints.

UNIT V: INVESTIGATIONS IN CIVIL ENGINEERING

Remote sensing techniques – Study of air photos and satellite imageries – Interpretation for Civil Engineering projects – Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road cuttings, Landslides – Causes and preventions. Sea erosion and coastal protection.

Total Periods : 45

TEXT BOOKS:

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.

2. Text Book of Engineering Geology, N. Chenna Kesavulu, 2ndEdition (2009), Macmillan Publishers India.

Publishers India.

REFERENCE BOOKS:

1. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

2. Garg. S.K. (2004), Physical and Engineering Geology, Khanna Publishers. – Delhi.

3. Blyth – Edward Arnold F.G.H (1998), A Geology for Engineers, (7th Edition)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO2	3	-	I	-	-	2	1	-	2	-	2	2	2	2	-
CO3	3	Ι	I	-	-	2	1	-	2	-	2	2	2	2	-
CO4	3	Ι	I	-	-	2	1	-	2	-	2	2	2	2	-
CO5	3	Ι	I	-	-	2	1	-	2	-	2	2	2	2	-
CO6	3	-	-	-	-	2	1	-	2	_	2	2	2	2	-
Avg	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-

CO-PO MAPPING

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23BECE4E02

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

Course Objectives

1. To characterize the various materials, both conventional and modern, that are commonly used in civil engineering construction.

CONCRETE MATERIALS

- 2. To identify the various tests for quality control in the use of these materials.
- 3. To apply the various tests involved in the concrete, bricks and stones.
- 4. To classify the modern materials which are used in concrete.
- 5. To know the applications of laminar composites, Fibre textiles and Geo synthetics.
- 6. To relate the properties and characteristics of different admixtures.

Course Outcomes

After completing the course, the students will be able to

- 1. Recognize the tests involved in the concrete, bricks and stones.
- 2. Distinguish the properties of different ingredients of concrete.
- 3. Analyse the properties and characteristics of different admixtures.
- 4. Compare the testing methods of fresh and harden concrete.
- 5. Evaluate the modern materials which are used in concrete.
- 6. Assess the Applications of laminar composites, Fibre textiles and Geo synthetics.

UNIT I: STONES, BRICKS AND CONCRETE BLOCKS

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacture of clay bricks – Tests on bricks – Compressive Strength - Water Absorption – Efflorescence –Bricks for special use – Refractory bricks – Cement and Concrete hollow blocks – Lightweight concrete blocks – CodePractices

UNIT II: LIME, CEMENT, AGGREGATES AND MORTAR

Lime – Preparation of lime mortar – Cement. Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration - Compressive strength – Tensile strength – Soundness and consistency – Setting time – Aggregates – Naturalstone aggregates – Industrial byproducts – Crushing strength – Impact strength – Flakiness – Abrasion Resistance – Grading – Sand – Bulking – Code Practices

UNIT III: CONCRETE

Concrete Ingredients – Manufacture – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction – Principles of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proportioning

- IS method - High Strength Concrete and HPC - Other types of Concrete - Code Practices

UNIT IV: TIMBER AND OTHER MATERIALS

Timber – Market forms – Industrial timber- Plywood - Veneer – Thermocole – Panels of laminates – Steel – Aluminum and Other Metallic Materials - Composition – uses – Marketforms – Mechanical treatment –

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2023-2024 Semester-IV

3H-3C

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Paints - Varnishes - Distempers - Code Practices.

UNIT V: MODERN MATERIALS

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibretextiles – Geo synthetics for Civil Engineering applications.

Total Periods : 45

TEXT BOOK:

1. M. S. Shetty, Concrete Technology (Theory and Practice), S. Chand & CompanyLtd., 2003.

REFERENCE BOOK:

1. R. K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.

CO-PO MAPPING

Cos	PO	PO1	PO1	PO1	PS	PS	PS								
COS	1	2	3	4	5	6	7	8	9	0	1	2	01	02	03
CO1	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO2	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO3	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO4	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO5	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO6	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
Avg	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-

Semester-IV

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23BECE4E03

ENVIRONMENTAL SOIL POLLUTION 3H-3C

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

Course Objectives

- 1. Describe the nature of soil and physical-chemical properties of soils.
- 2. Describe the chemical analysis of soils, distribution of metals in soils and controlling the process distribution.
- 3. Examine the chemical mass transfer mechanism and biological process of contaminant in soils.
- 4. Assess the various ground improvement techniques in the waste management.
- 5. Evaluate the characterization of contaminated site and various remedial measures.
- 6. To Assess the chemical and and biological process of contaminant in soils

Course Outcomes

After completing the course, the students will be able to

- 1. Describe the behavior of various soils and their physical-chemical characteristics related to soil pollution.
- 2. Describe the chemical analysis of soils, distribution of metals in soils and controlling the process distribution.
- 3. Assess the chemical and and biological process of contaminant in soils.
- 4. Examine the various ground improvement techniques in the waste management.
- 5. Evaluate the contaminated site to take various remedial measures and their design procedures.

UNIT I: PHYSICS AND CHEMISTRY OF SOIL

Soil formation - Composition -Soil fabric -Mass-volume relationship - Index properties and soil classification -Hydraulic and consolidation characteristics - Chemical properties - Surface charge and point of zero charge - Anion and Cation exchange capacity of clays - Specificsurface area -Bonding in clays- Soil pollution- Factors governing soil-pollutantinteraction.

UNIT II: INORGANIC AND ORGANIC GEOCHEMISTRY

Inorganic geochemistry - Metal contamination - Distribution of metals in soils - Geochemical processes - Chemical analysis of metal in soil - Organic geochemistry - Organic contamination – Distribution and Process controlling of NAPLs in soils - Chemical analysis of NAPLs in soils.

UNIT III: CONTAMINANT FATE AND TRANSPORTING SOIL

Transport processes -Advection -Diffusion -Dispersion -Chemical mass transfer processes -Sorption and desorption -Precipitation and dissolution -Oxidation and reduction - Acid base reaction -Complexation -Ion exchange -Volatilization -Hydrolysis -Biological process microbial transformation of heavy metals.

UNIT IV: GROUND IMPROVEMENT TECHNIQUES IN WASTE MANAGEMENT 9

Role of Ground Improvement-Drainage and Ground Water Lowering-Electro osmotic Methods Diaphragm walls-Thermal and Freezing methods – In situ Densification - Deep Compaction -Dynamic Compaction -Blasting - Sand piles and pre-loading -Stone Columns and lime piles- Earth reinforcement - Rock bolts Cables and guniting – Geo textiles as reinforcement Filtration -Drainage and Erosion control.

UNIT V: SOIL REMEDIATION TECHNOLOGIES

Contaminated site characterization - Containment - Soil vapour extraction - Soil washing -Solidification and Stabilization - Electro-kinetic remediation - Thermal desorption - Vitrification -Bioremediation - Phytoremediation - Soil fracturing –Bio stimulation – Bio augmentation -Chemical oxidation and reduction

Total Periods : 45

TEXT BOOKS:

1. Calvin Rose, An Introduction to the Environmental Physics of Soil, Water and WaterSheds, Cambridge University Press, 2004.

2. Paul Nathanail C. and Paul Bardos R, Reclamation of Contaminated Land, JohnWiley& Sons Limited, 2004.

REFERENCE BOOKS:

1. Hari D. Sharma and Krishna R. Reddy, Geo-Environmental Engineering : SiteRemediation, Water Contaminant and Emerging Water Management Technologies,John Wiley & Sons Limited, 2004.

2. William J. Deutsch, Groundwater Geochemistry : Fundamentals and Applications to Contamination, Lewis Publishers, 2010.

3. Marcel Vander Perk, Taylor & Francis, Soil and Water Contamination fromMolecularto Catchment Scale, 2006.\

CO-PO MAPPING

Cos	PO	PO1	PO1	PO	PS	PS	PS								
COS	1	2	3	4	5	6	7	8	9	0	1	12	01	02	03
CO1	3	-	-	1	-	2	1	-	2	-	2	-	2	-	-
CO2	3	-	-	1	-	2	1	-	2	-	2	-	2	-	-
CO3	3	-	-	1	-	2	1	-	2	-	2	-	2	-	-
CO4	3	-	-	1	-	2	1	-	2	-	2	-	2	-	-
CO5	3	-	-	1	-	2	1	-	2	-	2	-	2	-	-
Avg	3	-	-	1	-	2	1	-	2	-	2	-	2	-	-

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2023-2024

Semester-IV

23BECE4E04 SOLID AND HAZARDOUS WASTE MANAGEMENT 3H-3C

Instruction Hours/week: L: 3 T: 0 P: 0 Total:**100** Marks: Internal:40 External:60

End Semester Exam:3 Hours

Course Objectives:

- 1. To impart basic knowledge about the solid and hazardous waste management.
- 2. To make the students categorize the waste and reduce the source reduction.
- 3. To develop a idea for them in processing the waste by knowing the wastecharacterization.
- 4. To extend the sense broadly about collection, storage and up to transportation level.
- 5. Formulate them to do the apt processing for disposal from the waste emerged out to he environment.
- 6. To design the different elements of waste management systems.

Course Outcomes:

After completing the course, the students will be able to

- 1. Understand the characteristics of different types of solid and hazardous wastes and the factors affecting variation.
- 2. Define and explain important concepts in the field of solid waste management
- 3. Suggest suitable technical solutions for treatment of municipal waste.
- 4. Understand the role legislation and policy drivers play in stakeholders' response to the waste and apply the basic scientific principles for solving practical waste management challenges.
- 5. Design the different elements of waste management systems.
- 6. Design the different elements of waste management systems.

UNIT I: SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK 9

Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, nuclear wastes - lead acid batteries, electronic wastes, plastics and fly ash – Elements of integrated waste management and roles of stakeholders - Financing and Public Private Participation for waste management- Integrated solid waste management.

UNIT II: WASTE CHARACTERIZATION AND SOURCE REDUCTION

9

Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer

responsibility - Recycling and reuse.

UNIT III: STORAGE, COLLECTION AND TRANSPORT OF WASTES

Handling and segregation of wastes at source – storage and collection of municipal solidwastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes –hazardous waste manifests and transport

UNIT IV: WASTE PROCESSING TECHNOLOGIES

Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies – methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous wastes- treatment of biomedical wastes - Health considerations in the context of operation of facilities.

UNIT V: WASTE DISPOSAL

Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfillbioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps-remediation of contaminated sites.

Total Periods : 45

TEXT BOOKS:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-Graw Hill International edition, New York, 1993.

2. P.M.Cherry, "Solid and Hazardous waste management", CBS publishers and distribution PVT Ltd, 2016, 1st edition. 10.

3. M.S.Bhatt, Asherefilliyan, "Solid waste management – An Indian perspective ", Synergybooks India 2012.

REFERENCE BOOKS:

1. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi,2014.

2. John Pitchtel, Waste Management Practices, CRC Press, Taylor and Francis Group, 2014

3. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and "Environmental Resources Management, Hazardous waste Management", Mc-Graw Hill International edition, New York, 2010.

4. William A. Worrell, P. Aarne Vesilind, Solid Waste Engineering, Cengage Learning, 2012.

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CO-PO MAPPING

Con	PO	PO1	PO1	PO	PS	PS	PS								
Cos	1	2	3	4	5	6	7	8	9	0	1	12	01	02	03
CO1	3	I	1	-	-	2	1	-	2	-	2	-	-	2	-
CO2	3	I	1	-	-	2	1	-	2	-	2	-	I	2	-
CO3	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
CO4	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	1	-	-	2	1	-	2	-	2	-	-	2	_



2023-2024

23BECE5E01

STRUCTURAL ANALYSIS I

Semester-V 3H-3C

134

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

Course Objectives:

- 1. To equip the students with comprehensive methods of structural analysis with emphasis on analysis of elementary structures.
- 2. To know the different methods for determination of deflection of statically determinate beams, frames & pin jointed trusses.
- 3. To gain knowledge about moving loads and influence lines.
- 4. To analyze the forces in cables under concentrated and uniformly distributed loads.
- 5. To know more about the complete analysis and designing the structure.
- 6. To do calculation about the determinate and non- determinate structures.

Course Outcomes:

After completing the course, the students will be able to

- 1. Apply unit load method and strain energy method for determination of deflection of statically determinate beams, frames & pin jointed trusses.
- 2. Analyze statically indeterminate structures using strain energy method and method of consistent deformation.
- 3. Know about moving loads and influence lines.
- 4. Know about Statically determinate and indeterminate suspension bridges and arches.
- 5. Analyze the forces in cables under concentrated and uniformly distributed loads.
- 6. Analyze determinate and non- determinate structures.

UNIT I: PRINCIPLE OF VIRTUAL WORK – UNIT LOAD METHOD 9

Betti's theorem – Maxwell's law of reciprocal deflections - principle of least work - application of unit load method and strain energy method for determination of deflection of statically determinate beams, frames - pin jointed trusses (simple numerical problems) Concepts of temperature effects and lack of fit. (No numerical problems) Statically indeterminate structures: Degree of static and kinematic indeterminacies – Introduction to force and displacement method (step by step procedure).

UNIT II: MOMENT DISTRIBUTION METHOD&TRUSS ANALYSIS 9

Analysis of determinate truss-Methods of joints and sections(Numerical problems) Elastic theorems and energy principles - strain energy due to axial load, bending moment, shearand torsion - strain energy method, Castigliano's method for deflection (Derivations only)

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UNIT III: STRAIN ENERGY METHODS

Analysis of beams, frames and trusses with internal and external redundancy - (Simple problems with maximum two redundant) Concepts of effect of pre strain, lack of fit, temperature changes and support settlement(No numerical problems).

UNIT IV: MOVING LOADS AND INFLUENCE LINES

Introduction to moving loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams and over hanging beams - analysisfor different types of moving loads single concentrated load - several concentrated loads, uniformly distributed load on shorter and longer than the span.

UNIT V: ARCHES

Arches - Types of arches - Analysis of three hinged, two hinged and fixed arches - Parabolic and circular arches - Settlement and temperature effects.

Total Periods: 45

TEXT BOOKS:

1. BhaviKatti, S.S. (2008), "Structural Analysis - Vol. 1 Vol. 2", Vikas Publishing HousePvt. Ltd., New Delhi

2. Ghali.A, Nebille, A.M. and Brown, T.G. (2013) "Structural Analysis" A unified classical and Matrix approach" 6th edition. Spon Press, London and New York.

3. Gambhir. M.L., (2011), "Fundamentals of Structural Mechanics and Analysis"., PHILearning Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

- 1. Nilson, A. H. (2004) Design of Concrete Structures. 13th edition. McGraw Hill.
- 2. Mc Cormac, J.C., Nelson, J.K (2003), Jr., Structural Steel Design. 3rd edition. PrenticeHall, N.J.
- 3. Nawy, E. G. Pre stressed Concrete: A Fundamental Approach, Prentice Hall, NJ, (2003).
- 4. Related Codes of Practice of BIS
- 5. Smith, J. C., Structural Analysis, Harpor and Row, Publishers, New York.
- 6. W. McGuire, R. H. Gallagher and R. D. Ziemian.(2000) "Matrix Structural Analysis", 2nd Edition, John Wiley and Sons.
- 7. NBC, National Building Code, BIS(2017).
- 8. ASCE, (2002), Minimum Design Loads for Buildings and Other Structures, ASCE7-
- 02, American Society of Civil Engineers, Virginia.
- 9. Punmia. B.C., (2004), Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", Laxmi Publications.
- 10. Vaidyanathan, R. and Perumal, P. (2003), "Comprehensive structural Analysis Vol.I &II", Laxmi Publications, New Delhi.

CO-PO MAPPING

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Cos	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
C01	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO2	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO3	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO4	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO5	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
CO6	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-
Avg	3	-	-	-	-	2	1	-	2	-	2	2	2	2	-



23BECE5E02

Semester-V

3H-3C

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

Course Objectives

1. Understand the history and the various reinforced earth techniques that are suitable for different soils and in different structures.

EARTH REINFORCEMENT

- 2. Assess the stability, mode of failure and design of earth retaining wall.
- 3. Express the site characterization, risk assessment of contaminated site and suitable remediation methods.
- 4. Assess the geo synthetics techniques for roads and slopes construction and its stability.
- 5. Assess the use of Geo synthetics in drainage requirements and landfill designs.
- 6. To express the site characterization, risk assessment of contaminated site and suitable remediation f methods.

Course Outcomes

After completing the course, the students will be able to

- 1. Identify the appropriate reinforced earth techniques for different soils and indifferent structures.
- 2. Assess the various mode of failure and stability of earth retaining wall and design of earth retaining wall.
- 3. Express the characterization and risk assessment of contaminated site in order todevelop the appropriate remediation of methods.
- 4. Assess the stability and construction of roads and slopes with the application of geosynthetics techniques.
- 5. Assess the concept of geo synthetics reinforcement in the application ofdrainage and landfill.
- 6. Assess the stability, mode of failure and design of earth retaining wall.

UNIT I: BASICS OF REINFORCED EARTH CONSTRUCTION

Historical Background - Components, Mechanism of earth reinforcement - Advantages and Disadvanta reinforced earth Construction - Sandwich technique for clayey soil- Requirements, testing &evaluation of reinforcements.

UNIT II: DESIGN OF REINFORCED EARTH RETAINING WALLS

Design of Reinforced earth retaining wall - Internal and external stability - Selection of materials - Typical problems - Modes of failure of foundation - Determination of force induced in reinforcement ties – Location of surface, tension failure and pull out resistance- Bearing capacity improvement in soft soils.

UNIT III: SOIL NAILING TECHNIQUES

Introduction, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, -construction sequence components of system, design aspects.

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UNIT IV: GEOSYNTHETICS FOR ROADS AND SLOPES

Roads - Applications to Temporary and Permanent roads - Role of Geo synthetic in enhancing properties of road -Control of mud pumping - Enhancing properties of subgrade - Design requirements Slopes - Causes for slope failure - Improvement of slope stability with Geo synthetic - Drainage requirements - Construction technique - Simple Numerical Stability Checking Problems on Reinforced Slopes.

UNIT V: GEOSYNTHETICS - FILTER, DRAIN AND LAND FILLS

Filter and Drain - Conventional granular filter design criteria, Design criteria of Geo synthetic and filter – Soil retention – Geo synthetic permeability, anti clogging, survivability and durability - Landfills - Typical design of Landfills - Landfill liner and cover - EPA Guidelines - Barrier walls for existing landfills and abandoned dumps.

Total Periods : 45

TEXT BOOKS:

1. Koerner. R.M, "Design with Geo synthetics", Prince Hall Publications, 2017.

2. Koerner. R.M. &Wesh, J.P, "Construction and Geotechnical Engineering using synthetic fabrics", Wiley Inter Science, New York, 2005.

REFERENCE BOOKS:

1. Hidetoshi Octial, Shigenori Hayshi& Jen Otani, "Earth Reinforcement Practices", Vol. I,

A.A. Balkema, Rotterdam, 1992.

2. Bell F.G, "Ground Engineer's reference Book", Butter worths, London, 1987.

3. Ingold, T.S, "Reinforced Earth", Thomas, Telford, London, 1982.

4. Siva kumar Babu G. L., "An introduction to Soil Reinforcement and Geosynthetics", Universities Press, Hyderabad, 2006.

5. Swami Saran, "Reinforced Soil and its Engineering Applications", I. K.InternationalPvt. Ltd, New Delhi, 2017.

6. Venkattappa Rao, G., & Suryanarayana Raju., G. V.S, "Engineering withGeo synthetics", Tata McGraw Hill publishing Company Limited., New Delhi, 1990.

7. Sarsby R W- Editor, "Geo synthetics in Civil Engineering", Wood head PublishingLtd& CRC Press, 2007



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CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PS O3
CO1	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
CO2	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
CO3	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
CO4	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	1	-	-	2	1	-	2	-	2	-	-	2	-



Semester-V

AIR AND NOISE POLLUTION AND ITS CONTROL **23BECE5E03 3H-3C**

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hours

Course Objectives:

- To impart knowledge on the principles and design of control of indoor/ particulate / 1. gaseous air pollutant and its emerging trends.
- 2. To apply sampling techniques and Suggest suitable air pollution prevention equipment's and techniques for various gaseous and particulate pollutants.
- To apply air pollution monitoring and modeling 3.
- 4. To induce operational considerations under the processing and control monitoring.
- To apply sampling techniques of gaseous contaminants. 5.
- To control noise pollution by specific measurements, standard and preventive measures. 6.

Course Outcomes:

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

- Apply sampling techniques and Suggest suitable air pollution prevention equipment's and 1. techniques for various gaseous and particulate pollutants.
- 2. Apply air pollution monitoring and modeling
- 3. Induce operational considerations under the processing and control monitoring.
- 4. Apply sampling techniques of gaseous contaminants.
- Control noise pollution by specific measurements, standard and preventive measures. 5.
- Gain the knowledge on the principles and design of control of indoor/particulate / gaseousair 6. pollutant and its emerging trends.

UNIT I: INTRODUCTION

Structure and composition of Atmosphere - Sources and classification of air pollutants Effects of air pollutants on human health, vegetation & animals, Materials & Structures – Effects of air Pollutants on the atmosphere, Soil & Water bodies – Long- term effects on the planet – Global Climate Change, Ozone Holes - Ambient Air Quality and Emission Standards

- Air Pollution Indices - Emission Inventories.

UNIT II: AIR POLLUTION MONITORING AND MODELLING

Ambient and Stack Sampling and Analysis of Particulate and Gaseous Pollutants - Effectsof meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Transport & Dispersion of Air Pollutants - Modeling Techniques - AirPollution Climatology.

UNIT III: CONTROL OF PARTICULATE CONTAMINANTS

Factors affecting Selection of Control Equipment – Gas Particle Interaction, – Workingprinciple, Design and performance equations of Gravity Separators, cyclones, Fabric filters, Particulate Scrubbers, Electrostatic Precipitators - Operational Considerations - Process Controland Monitoring - Costing of APC equipment - Case studies for stationary and mobilesources.

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UNIT IV: CONTROL OF GASEOUS CONTAMINANTS

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Biofilters – Process control and Monitoring - Operational Considerations - Costing of APC Equipment – Case studies for stationary and mobile sources.

UNIT V: AUTOMOBILE AND NOISE POLLUTION

Vehicular Pollution: Automobile emission- Types of emissions- Exhaust emissions, evaporative emissions, crank-case emissions- Prevention and control of vehicular pollution. Noise Pollution: Sources and Effects of Noise Pollution – Measurement – Standards –Controland Preventive measures. Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control.

Total Periods:45

141

TEXT BOOKS:

1. Anjaneyulu D, "Air pollution and control technologies", Allied Publishers, Mumbai, 2002.

2. Khitoliya R K, "Environmental Pollution", 2/e, S. Chand Publishing, 2012.

REFERENCE BOOKS:

1. Rao C.S, "Environmental pollution control engineering", Wiley Eastern Ltd., NewDelhi, 1996.

- 2. Rao M.N, and Rao H.V.N, "Air Pollution Control" Tata-McGraw-Hill, New Delhi, 1996.
- 3. David H.F Liu, Bela G.Liptak, "Air Pollution", Lewis Publishers, 2000.
- 4. Mudakavi, J R, "Principles and Practices of Air Pollution Control and Analysis" IKInternational, 2010.
- 5. Air Pollution act, India, 1998.

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	2	-	-	2	1	-	2	-	2	-	-	2	-
CO2	3	-	2	-	I	2	1	I	2	-	2	-	-	2	-
CO3	3	Ι	2	-	I	2	1	I	2	-	2	-	-	2	I
CO4	3	-	2	-	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	2	-	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	2	-	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	2	-	-	2	1	-	2	-	2	-	-	2	-

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23BECE5E04	Construction Ma	aterials and Technology	3H-3 C
Instruction Hours/week: I	L: 3 T: 0 P: 0	Marks: Internal:40 External:60	Total:100

End Semester Exam: 3 Hours

Course Objectives

- 1. To characterize the various materials, both conventional and modern, that are commonlyused in civil engineering construction.
- 2. To identify the various tests for quality control in the use of these materials.
- 3. To apply the various tests involved in the concrete, bricks and stones.
- 4. To classify the modern materials which are used in concrete.
- 5. To know the applications of laminar composites, Fibre textiles and Geo synthetics.
- 6. To relate the properties and characteristics of different admixtures.

Course Outcomes

After completing the course, the students will be able to

- 1. Recognize the tests involved in the concrete, bricks and stones.
- 2. Distinguish the properties of different ingredients of concrete.
- 3. Analyse the properties and characteristics of different admixtures.
- 4. Compare the testing methods of fresh and harden concrete.
- 5. Evaluate the modern materials which are used in concrete.
- 6. Assess the Applications of laminar composites, Fibre textiles and Geo synthetics.

UNIT I STONES - BRICKS - CONCRETE BLOCKS - LIME

Stone as building material – Criteria for selection – Tests on stones – Bricks – Classification – Manufacturing of clay bricks - Tests on bricks - Compressive strength - Water Absorption - Efflorescence - Lime -Preparation of lime mortar – Concrete hollow blocks – Lightweight concrete blocks.

UNIT II OTHER MATERIALS

Timber – Market forms – Plywood – Veneer – False ceiling materials – Steel – Mechanical treatment – Aluminum – Uses – Market forms – Glass – Ceramics – Refractories – Composite Materials – Types and applications - FRP - Fibre textiles - Geomembranes and Geotextiles for earth reinforcement.

UNIT III CONSTRUCTION PRACTICES & SERVICE REQUIREMENTS

Types of Foundations - Shallow and Deep Foundations - Stone Masonry - Brick Masonry - Plastering and Pointing – Cavity Walls – Diaphragm Walls – Formwork – Centering and Shuttering – Shoring – Scaffolding - Underpinning - Roofing - Flooring - Joints in concrete - Contraction/Construction/Expansion joints - Fire Protection – Thermal Insulation – Ventilation and Air conditioning – Acoustics and Sound Insulation – Damp Proofing.

UNIT IV CONSTRUCTION EQUIPMENTS

Selection of equipment for earthwork excavation, concreting, material handling and erection of structures -Dewatering and pumping equipment.

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2023-2024 Semester-V

UNIT V CONSTRUCTION PLANNING

Introduction to construction planning – Scheduling for activities – Critical path method (CPM) and PERT network modelling and time analysis – Case illustrations.

Total Periods : 45

143

TEXTBOOKS

1. Varghese.P.C, Building Materials, Second Edition PHI Learning Ltd., 2015.

2. Arora S.P and Bindra S.P Building construction, Dhanpat Rai and sons, 2013.

REFERENCES:

1. Varghese.P.C, Building Construction, Second Edition PHI Learning ltd., 2016.

2. Punmia ,B.C Building construction , Laxmi publication (p)ltd..,2008.

3. Peurifoy R.L., Schexnayder, C.J., Shapira A., Schmitt.R., Construction Planning Equipment and Methods, Tata McGraw-hill, 2011.

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	1	-	-	2	1	-	2	-	-	2	-	2	-
CO2	3	I	1	-	-	2	1	-	2	-	-	2	-	2	-
CO3	3	-	1	-	-	2	1	-	2	-	-	2	I	2	-
CO4	3	-	1	-	-	2	1	-	2	-	-	2	-	2	-
CO5	3	-	1	-	-	2	1	-	2	-	-	2	-	2	-
CO6	3	-	1	-	-	2	1	-	2	-	-	2	-	2	-
Avg	3	-	1	-	-	2	1	-	2	-	-	2	-	2	-

Semester-VI

		Semester vi
23BECE6E01	Structural Analysis-II	3Н-3С

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

Course Objectives:

- 1. To introduce the students to advanced methods of analysis like matrix methods, Plastic analysis and FE method and also analysis of space structures.
- 2. To analysis plane stress, plane strain and displacement function by finite element method.
- 3. To Calculation the deflection of trusses, beams and frames by using unit load method.
- 4. To analysis of element by global stiffness matrix method.
- 5. To make the students understand the matrix method and its application clearly.
- 6. To do design the trusses, beams and frames.

Course Outcomes:

After completing the course, the students will be able to

- 1. Understand indeterminate structure and methods of analysis by flexible method.
- 2. Analyze the element by global stiffness matrix method
- 3. Analyze the stress, strain and displacement by finite element method.
- 4. Calculation the deflection of trusses, beams and frames by using unit load method.
- 5. Analyze the space truss using method of tension coefficients.
- 6. Apply influence line for indeterminate beams.

UNIT I: FLEXIBILITY METHOD

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

UNIT II: STIFFNESS MATRIX METHOD

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames (with redundancy limited to two)

UNIT III: FINITE ELEMENT METHOD

Introduction – Discretization of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain – Triangular elements



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UNIT IV: PLASTIC ANALYSIS OF STRUCTURES

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

UNIT V: SPACE AND CABLE STRUCTURES

Analysis of Space trusses using method of tension coefficients – Beams curved in planSuspension cables – suspension bridges with two and three hinged stiffening girders

Total Periods :45

TEXT BOOKS:

1. Punmia. B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", LaxmiPublications. 2004

2. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 Vol. 2", Vikas Publishing House Pvt.Ltd.,New Delhi.2008

REFERENCE BOOKS:

Negi L.S. &Jangid R.S.,(2003) "Structural Analysis", Tata McGraw HillPublications, New Delhi.
 Ghali.A, Nebille, A.M. and Brown, T.G.(2013) "Structural Analysis" A unified classical and Matrix approach" 6th edition. Spon Press, London and New York.

3. Pandit G.S. & Gupta S.P.(2004) "Structural Analysis - A Matrix Approach", TataMcGrawHill.

4. William Weaver Jr. & James M. Gere, (2004)"Matrix Analysis of FramedStructures", CBS Publishers and Distributors, Delhi,

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	РО 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	1	-	-	2	1	-	2	-	1	-	2	-	-
CO2	3	-	1	-	-	2	1	-	2	-	1	-	2	-	-
CO3	3	-	1	-	-	2	1	-	2	-	1	-	2	-	-
CO4	3	-	1	-	-	2	1	-	2	-	1	-	2	-	-
CO5	3	-	1	-	-	2	1	-	2	-	1	-	2	-	-
CO6	3	-	1	-	-	2	1	-	2	-	1	-	2	-	-
Avg	3	-	1	-	-	2	1	-	2	-	1	-	2	-	-

CO-PO MAPPING

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Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

Course Objectives

- 1. Understand the behavior of soils for the geo environmental applications.
- 2. Describe the characterization of soil mineralogy, ground water flow and the contaminant transport for the different soil conditions.
- 3. Express the concept of waste contaminant transport and the design principles.
- 4. Describe the different remedial measures for the contaminant systems.
- 5. Describe the electrical and thermal, and centrifuge methods of evaluation of for the advanced soil characterization.
- 6. To understand the characteristics of soils for the impact of ground contamination on geoenvironment.

Course Outcomes

After learning the course the students should be able to:

- 1. Understand the characteristics of soils for the impact of ground contamination on geoenvironment.
- 2. Describe the classification of soil mineralogy, ground water flow and contaminant transport for the design of remedial systems.
- 3. Express the design principles of waste contaminant transport.
- 4. Describe the different contaminant systems and their remedial measures.
- 5. Describe the he advanced soil characterization for the evaluation of contaminant systems.
- 6. Remedial measures for the contaminant systems

UNIT I: FUNDAMENTALS OF GEO ENVIRONMENTAL ENGINEERING

Scope of geo environmental engineering - Multiphase behavior of soil -Role of soil ingeo environmental applications - Environmental interactions-Sources and type of ground contamination - Impact of ground contamination on geo environment - case histories.

UNIT II: SOIL-WATER-CONTAMINANT INTERACTION

Soil mineralogy characterization - Soil-water interaction - Forces of interaction between soil particles - Concepts of unsaturated soil -Importance of unsaturated soil in geo environmental problems - Measurement of soil suction - Water retention curves -Ground waterflow – Sources of ground water contaminants - Contaminants transport.

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UNIT III: WASTE CONTAINMENT SYSTEM

Evolution of waste containment facilities and disposal - Site selection based on environmental impact assessment - Different role of soil in waste containment -Different components of waste containment system and its stability issues - Property evaluation for checking soil suitability - Design of waste containment facilities.

UNIT IV: LINES AND COVERS FOR WASTE DISPOSAL

Rigid and flexible liners - Leachate and gas collection system- Engineered land fills (including basal liner and cover liner systems) - components – design criteria. Hydrological design for ground water pollution control. Soil contamination and remediation technology.

UNIT V: ADVANCED SOIL CHARACTERIZATION

Contaminant analysis - Water content and permeability measurements -Electrical and thermal property evaluation -Use of GPR for site evaluation - Introduction to geotechnical centrifuge modeling.

Total Periods :45

TEXT BOOKS:

1. Rowe R.K., "Geotechnical and Geo environmental Engineering Handbook" KluwerAcademic Publications, London, 2000.

2. Reddi L.N. and Inyang, H. I., "Geo environmental Engineering, Principles and Applications" Marcel DekkerInc. New York, 2000.

REFERENCE BOOKS:

1. Bagchi,A., "Design of landfills and integrated solid waste management" John Wiley&Sons, Inc., USA, 2004.

2. Fredlund D.G. and Rahardjo, H., "Soil Mechanics for Unsaturated Soils" Wiley-Inter science, USA, 2003.

3. Hillel D., "Introduction to Environmental Soil Physics" Academic Press, NewYork, 2003.

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	1	-	-	2	1	-	2	-	1	-	-	2	-
CO2	3	-	1	-	-	2	1	-	2	-	1	-	-	2	-
CO3	3	-	1	-	-	2	1	-	2	-	1	-	-	2	-
CO4	3	-	1	-	-	2	1	-	2	-	1	-	-	2	-
CO5	3	-	1	-	-	2	1	-	2	-	1	-	-	2	-
CO6	3	-	1	-	-	2	1	-	2	-	1	-	-	2	-
Avg	3	-	1	-	-	2	1	-	2	-	1	-	-	2	-

CO-PO MAPPING



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B.E Civil Engineering			2023-2024
			Semester-VI
23BECE6E03	Transport of v	water and Waste water	3H-3C
Instruction Hours/weel	k: L: 3 T: 0 P: 0	Marks: Internal:40 Extern	nal :60 Total :100
		End Semeste	er Exam:3 Hours

Course Objectives:

- 1. To understand and apply the principle of hydraulics in water transportation and distribution and wastewater collection and conveyance.
- 2. To educate the students in detailed design concepts related to water transmission mains, water distribution system, sewer networks and storm water drain and computer application on design
- 3. To design water supply mains taking into account all the design parameters.
- 4. To analyze a water supply distribution network.
- 5. Design of water and sewage network and solve operational problems in transmission using software.
- 6. To estimate the quantity of storm drainage and design a proper storm drainage for speedy draining of storm water from the city area.

Course Outcomes:

After successful completion of course, the students are able to

- 1. Design water supply main, distribution network and sewer for various field conditions Trouble shooting in water and sewage transmission
- 2. Select an appropriate pipe material, necessary pipe appurtenances and able to locate he leaking mains for the water distribution system.
- 3. Estimate the quantity of storm drainage and design a proper storm drainage for speedy draining of storm water from the city area.
- 4. Design a sewer network for the proper disposal of the sewage generated from thecity limits to treatment plant.
- 5. Collect, analyze and usage of data in the relevant tools and Employ modern advanced computing tools in environmental studies.
- 6. Design a sewer network for the proper disposal of the sewage generated from the city limits to treatment plant.

UNIT I: GENERAL HYDRAULICS AND FLOW MEASUREMENT

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Fluid properties; fluid flow – continuity principle, energy principle and momentum principle; frictional head loss in free and pressure flow, minor heads losses, Carrying Capacity–Flow measurement.

UNIT II: WATER TRANSMISSION AND DISTRIBUTION

Need for Transport of water and wastewater-Planning of Water System –Selection of pipe materials, Water transmission main design- gravity and pumping main; Selection of Pumps-characteristics- economics; Specials, Jointing, laying and maintenance, water hammer analysis; water distribution pipe networks Design, analysis and optimization – appurtenances – corrosion prevention – minimization of water losses – leak detection Storage reservoirs.

UNIT III: WASTEWATER COLLECTION AND CONVEYANCE

Planning factors – Design of sanitary sewer; partial flow in sewers, economics of sewerdesign; Wastewater pumps and pumping stations- sewer appurtenances; material, construction, inspection and maintenance of sewers; Design of sewer outfalls-mixing conditions; conveyance of corrosive wastewaters.

UNIT IV: STORM WATER DRAINAGE

Necessity- - combined and separate system; Estimation of storm water run-off Formulation of rainfall intensity duration and frequency relationships- Rational methods.

UNIT V: CASE STUDIES AND SOFTWARE APPLICATIONS

Use of computer software in water transmission, water distribution and sewer design –EPANET 2.0, LOOP version 4.0, SEWER, BRANCH, Canal ++ and GIS based software's.

TEXT BOOKS:

1. "Manual on water supply and Treatment", CPHEEO, Ministry of UrbanDevelopment, Government of India, New Delhi, 1999.

2. Bajwa, G.S. "Practical Handbook on Public Health Engineering", Deep Publishers, Shimla, 2003

3. "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of UrbanDevelopment, Government of India, New Delhi, 1993.

REFERENCE BOOKS:

1. Frank R. Spellman, "Water& Wastewater Conveyance", CRC Press 1 st edition, 2016.

2. "Water transmission and distribution", by American Water works associations 4 th

edition,2010.

CO-PO MAPPING

Cos	PO	PO1	PO1	PO1	PS	PS	PS								
	1	2	3	4	5	6	7	8	9	0	1	2	01	02	03
CO1	3	-	-	1	-	2	1	-	2	-	2	-	-	2	-
CO2	3	-	-	1	-	2	1	-	2	_	2	_	-	2	-
CO3	3	-	-	1	-	2	1	-	2	-	2	-	-	2	-
CO4	3	-	-	1	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	-	1	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	-	1	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	-	1	-	2	1	-	2	-	2	-	-	2	-

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Total Periods :45

B.E Civil Engineering			2023-2024
			Semester-VI
23BECE6E04	Building Const	truction Practice	3H-3 C
Instruction Hours/wee	k: L: 3 T: 0 P: 0	Marks: Internal:40	External:60
Total:100			

Course Objectives

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

1. Select suitable materials for buildings and adopt suitable construction techniques.

End Semester Exam: 3 Hours

- 2. Select suitable techniques used in super and sub structure construction.
- 3. Select the type of foundation need for a structure.
- 4. Find the different construction techniques available.
- 5. Supervision of different types of masonry
- 6. Applying different construction techniques in underwater construction

Course Outcomes

After completing the course, the students will be able to

- 1. In investigation of soil condition, Deciding and design of suitable foundation for different structures
- 2. In supervision of different types of masonry
- 3. In applying different construction techniques in underwater construction
- 4. In explaining erection techniques for high rise structures.
- 5. Select suitable materials for buildings and adopt suitable construction techniques.
- 6. Select suitable techniques used in super and sub structure construction.

UNIT I: BUILDING MATERIALS

Stone as building material; Requirement of good building stones, dressing of stones, Deterioration and Preservation of stone work. Bricks; Classification, Manufacturing of clay bricks, Requirement of good bricks. Field and laboratory tests on bricks; compressive strength, water absorption, efflorescence, dimension and war page. Cement Concrete blocks, StabilizedMud Blocks, Sizes, requirement of good blocks. Mortar: types and requirements. Timber as construction material Fine aggregate: Natural and manufactured: Sieve analysis, zoning, specify gravity, bulking, moisture content, deleterious materials. Coarse aggregate: Natural and manufactured: Importance of size, shape and texture. Grading of aggregates, Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests.

UNIT II: FOUNDATION AND MASONRY

Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation, types of foundation. Masonry: Definition and terms used in masonry. Brick masonry, characteristics and requirements of good brick masonry. Requirements of good stone masonry, Classification, characteristics of different stone masonry, Joints in stone masonry. Types of walls; load bearing, partition walls, cavity walls.

UNIT III: CONSTRUCTION PRACTICES

Specifications, details and sequence of activities and construction co-ordination - SiteClearance - Marking

- Earthwork masonry stone masonry Bond in masonry concrete hollow block masonry flooring
- damp proof courses construction joints movement and expansion joints pre cast pavements -

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Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabricationand erection of steel trusses – frames – braced domes – laying brick — weather and water proof – roof finishes – acoustic and fire protection.

UNIT IV: SUB STRUCTURE CONSTRUCTION

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation

UNIT V: SUPER STRUCTURE CONSTRUCTION

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors - Erection of articulated structures, braced domes and space decks;

TEXT BOOKS:

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.

2. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015

REFERENCE BOOKS:

1. National Building Code, Bureau of Indian Standards, New Delhi, 2017.

2. Chudley, R., Construction Technology, ELBS Publishers, 2007.

3. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011

4. Nunnally, S.W. Construction Methods and Management, Prentice Hall,2006

Punmia, B.C., Khandelwal, K.K., Project Planningwith PERT and CPM, Laxmi Publications, 2016.

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	-	1	-	2	1	-	2	-	-	1	-	-	-
CO2	3	-	-	1	-	2	1	-	2	-	-	1	-	-	-
CO3	3	-	-	1	-	2	1	-	2	-	-	1	-	-	-
CO4	3	-	-	1	-	2	1	-	2	-	-	1	-	-	-
CO5	3	-	-	1	I	2	1	I	2	I	I	1	-	-	-
CO6	3	-	-	1	-	2	1	-	2	-	-	1	-	-	-
Avg	3	-	-	1	-	2	1	-	2	-	-	1	-	-	-

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23BECE6E05	Structural M	Iechanics	3H-3 C
Instruction Hours/week: I	L: 3 T: 0 P: 0	Marks: Internal:40	External:60 Total:100

Instruction Hours/week: L: 3 T: 0 P: 0

End Semester Exam: 3 Hours

Course Objectives

- 1. The main objective is to enable the student to have a good grasp of calculating various structural material properties under direct loading condition
- 2. Analyze Statically Determinate structures like Beam, Column & Truss.
- 3. To analysis of determinate structures under action of transverse loading along with analysis of members under direct loading is to be studied.
- 4. To know behavior of structure under different loading conditions is needed to understand so that design can do by the engineer.
- 5. To analysis of Industrial Trusses is also incorporated to give an idea of typical structure to the students.
- 6. To enables the student to analyse Steel & Concrete Structures used in Civil Engineering construction.

Course Outcomes

After completing the course, the students will be able to

- 1. Study the external effects on the body due to action of force system.
- 2. Understand the design that can be done by the engineer.
- 3. Analysis of determinate structures under action of transverse loading, along with, analysis of members under direct loading is to be studied.
- 4. Analysis of industrial trusses is also incorporated to give an idea of typical structure to the students.
- 5. Analyze steel & concrete structures used in civil engineering construction.
- 6. Analyze Statically Determinate structures like Beam, Column & Truss.

UNIT I: DIRECT STRESS & STRAIN

Different types of Structures and Loads - Direct Stress, linear Strain, Hook's Law Numerical Problems on Direct Stress & Linear Strain. Stress Strain curve of Mild Steel. Modulus of Elasticity. Yield, Breaking & Ultimate Stress and factor of Safety along with numerical problems - Lateral Strain and Poission's ratio with numerical problems - Basics Concepts of Shear Stress, Shear Strain & Shear Modulus - Bulk Modulus, volumetric Strain along with numerical Problems - Differentiate between Sudden, Gradual & Impact loads Define Strain Energy, Proof Resilience for Sudden, Gradual & Impact load along with numerical problems

UNIT II: PRINCIPAL STRESSES AND STRAIN:

Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear - Mohr's circle of stresses - Principal stresses and strains – Analytical and graphical solutions.

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UNIT III: S.F & B.M IN BEAM

Statically Determinate Beam Like Cantilever, Simply Supported & Over Hang Beam - Shear Force and Bending Moment and its relationship - Sagging & Hogging Bending Momentand its importance -Point of Contra-flexure & its importance - S.F & B.M Diagram for Cantilever, Simply Supported & Over Hang Beam subjected to Point Load and U.D.L

UNIT IV: BENDING & SHEAR STRESSES IN BEAM

Bending Theory Equation Bending stress, Sectional Modulus, Neutral Axis Apply Bending theory to statically determinate beams having rectangular or circular section - Shear Stress equation Shear Stress Distribution Diagram for Solid &Hollow Rectangular and CircularSection Apply Shear Stress Equation & Draw Shear Stress Distribution Diagram for I, H, T, Channel & Angle Section.

UNIT V: ANALYSIS OF TRUSS

Perfect& Imperfect Truss various trusses for different spans and application - Analysis of Triangle, Howe, North Light & Fan trusses under Panel Point Loads using Graphical & Method of Joint.

Total Periods :45

153

TEXT BOOKS:

1. S. Ramamrutham and R. Narayan, Strength of materials Publisher: Bharath- A28KED5E1JUIJA (2002)

REFERENCE BOOKS:

- 1. R.S Khurmi ,Theory of Structures (SI Units), S Chand; Twelfth edition (2020)
- 2. Timo Shanko, Strength of Material, D.Van Nostard Company Ltd(1988)

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	-	3	-	2	3	-	2	-	1	-	-	2	-
CO2	3	-	-	3	-	2	3	-	2	-	1	-	-	2	-
CO3	3	-	-	3	-	2	3	-	2	-	1	-	-	2	-
CO4	3	-	-	3	-	2	3	-	2	-	1	-	-	2	-
CO5	3	-	-	3	-	2	3	-	2	-	1	-	-	2	-
CO6	3	-	-	3	-	2	3	-	2	-	1	-	-	2	-
Avg	3	-	-	3	-	2	3	-	2	-	1	-	-	2	-

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B.E Civil Engineering			2023-2024
			Semester-VI
23BECE6E06	Ecological Eng	ineering	3H-3 C
Instruction Hours/wee	ek: L: 3 T: 0 P: 0	Marks: Internal:	40 External:60 Total:100
		End	Semester Exam:3 Hours

Course Objectives:

- 1. To impart knowledge on the principles of ecological engineering that strengthenthe functions of ecosystems,
- 2. To restore devastated ecosystems, and utilize the functions of ecosystems todevelop ecological engineering designs for environmental management.
- 3. Analyze water quality modeling based on dispersion, mixing, the amount of dissolved oxygen presents in water and assessing its performance.
- 4. To design the Ecological Engineering Processes Self-organizing and its processes.
- 5. To discover the Eco technology for Waste Treatment Ecological engineers.
- 6. To realize Eco technology for Waste Treatment Ecological engineers and ecotechnology

Course Outcomes:

After successful completion of course, the students are able to

- 1. Identify the application, development and evolution of ecology.
- 2. Knowledge of system approach in ecological Engineering and estimate the sources separation systems, aqua cultural system and agro systems.
- 3. Analyze the ecological processes self-organizing the design process.
- 4. Balance the Case studies of Integrated Ecological Engineering
- 5. Realize eco technology for waste treatment ecological engineers and eco technology balance the case studies of integrated ecological engineering.
- 6. Understand the basic concepts involved in ecological system and assess theecological modeling based on population dynamics.

UNIT I: ECOSYSTEMS & ECOTECHNOLOGY

Aim, scope and applications of ecology – Development and evolution of ecosystems –Principles and concepts pertaining to communities in ecosystem – Energy flow and material cycling in ecosystems – productivity in ecosystems.

UNIT II: SYSTEMS APPROACH IN ECOLOGICAL ENGINEERING

Principles, components and characteristics of systems – Classification of systems – Structural and functional interactions of environmental systems – Environmental systems as energy systems – Mechanisms of steady-state maintenance in open and closed systems – Modeling and Eco technology – Elements modeling – Modelling procedure – Classification ofecological models- Applications of models in Eco technology – Ecological economics.

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UNIT III: ECOLOGICAL ENGINEERING PROCESSES SELF-ORGANIZING DESIGNAND PROCESSES 9

Multi seeded microcosms – Interface coupling in ecological systems – Concept of energy – Determination of sustainable loading of ecosystems.

UNIT IV: ECOTECHNOLOGYFOR WASTE TREATMENT ECOLOGICALENGINEERS

Classification of eco technology – Principles of ecological engineering. Eco sanitation-Principles and operation of soil infiltration systems – Wetlands and ponds – source separationsystems – Aqua cultural systems – Agro ecosystems – Detritus based treatment for solid wastes –Applications of ecological engineering for marine systems.

UNIT V: CASE STUDIES

Case studies of Integrated Ecological Engineering Systems and their commercialprospects.

TEXT BOOKS:

1. Jorgensen, S.E. Ecological Engineering: Principles and Practice. CRC Press, 2003.

2. Mitsch, J.W. and Jorgensen, S.E. Ecological Engineering – An Introduction to Ecotechnology, John Wiley & Sons, New York, 1989.

REFERENCE BOOKS:

1. Mitsch, W.J. Ecological Engineering and Ecosystem Restoration, Wiley 2nd Ed., 2003.

2. White I.D., Mottershed, D.N. and Harisson, S.J. Environmental systems - AnIntroductory text, Chapman Hall, London, 1994.

CO-PO MAPPING

Cos	PO 1	PO 2	РО 3	PO 4	PO 5	PO 6	РО 7	PO 8	РО 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	-	2	-	2	1	-	2	-	2	-	-	2	-
CO2	3	-	-	2	-	2	1	-	2	-	2	-	-	2	-
CO3	3	-	-	2	-	2	1	-	2	-	2	-	-	2	-
CO4	3	-	-	2	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	-	2	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	-	2	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	-	2	-	2	1	-	2	-	2	-	-	2	-

Total Periods :45

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3H-3C

Semester-VI

23BECE6E07

Construction Project Planning and Systems

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

Course Objectives

- 1. To analyze and apply the project planning systems and techniques
- 2. To plan, organize and manage the production and business processes of lesser or medium complexity within the business systems (civil engineering and public utility companies, local government offices)
- 3. To develop detailed appreciation for construction planning and scheduling
- 4. To apply their learned knowledge as it pertains to upper level construction management skills and procedures.
- 5. To update their knowledge on time and cost overruns and their corrective measures.
- 6. To apply their learned knowledge as it pertains to Project monitoring skills.

Course Outcomes

At the end of this course the student is expected to have learnt how to

- 1. Plan construction projects, schedule the activities using network diagrams,
- 2. develop detailed appreciation for construction planning and scheduling
- 3. Apply their learned knowledge as it pertains to upper level construction management skills and procedures.
- 4. Update their knowledge on time and cost overruns and their corrective measures.
- 5. Apply their learned knowledge as it pertains to Project monitoring skills.
- 6. Identify and understand the safety concepts of quality control.

UNIT I: PROJECT PLANNING SYSTEMS

Definition of Projects; Stages of project planning: pre-tender planning, pre- construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data.

UNIT II: PLANNING TECHNIQUES

Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion. Allocation of Resources- materials, equipment, staff, labour and finance; resource levelling and optimal schedules; Project organisation, documentation and reporting systems

UNIT III: CONTRACTS MANAGEMENT

Importance of Contracts Management; Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower:

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planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and levelling. Common Good Practices in Construction.

UNIT IV: PROJECT MONITORING

Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management;

UNIT V: QUALITY CONTROL

Concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

Total Periods:45

157

TEXT BOOKS:

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.

2. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, PearsonEducation India, 2015

REFERENCE BOOKS:

1. National Building Code, Bureau of Indian Standards, New Delhi, 2017.

- 2. Chudley, R., Construction Technology, ELBS Publishers, 2007.
- 3. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
- 4. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
- 5. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, LaxmiPublications, 2016.



CO-PO MAPPING

Cos	PO 1	PO 2	РО 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	1	1	-	2	1	-	2	-	2	-	-	2	-
CO2	3	-	1	1	-	2	1	-	2	-	2	-	-	2	-
CO3	3	-	1	1	-	2	1	-	2	-	2	-	-	2	-
CO4	3	-	1	1	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	1	1	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	1	1	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	1	1	-	2	1	-	2	-	2	-	-	2	-



Course Objectives

- 1. Demonstrate an ability to evaluate and/or design whole or parts of projects, taking into account not only the financial and economic issues but also the social and environmental impacts affecting the sustainability of infrastructure.
- 2. Promote an approach to project evaluation that is based on an appreciation of the needs of society, the potential for sustainable development
- 3. To recognition the problems that may result from poorly conceived or poorly implemented projects and programs.
- 4. To know the construction method which is used in the sustainable environment.
- 5. To know the cutting edge rating systems in detail, including its evolution, objectives, criteria, levels of certification benefits, and shortcomings
- 6. To know a series of case studies representing diverse project types, sizes, certification levels, and climate regions

Course Outcomes

After taking this class students should be able to:

- Understand rating systems and compares key features such as cost, ease of use, and 1. building performance
- Know the construction method which is used in the sustainable environment. 2.
- Know the cutting edge rating systems in detail, including its evolution, objectives, criteria, 3. levels of certification benefits, and shortcomings
- Know a series of case studies representing diverse project types, sizes, certification levels, 4. and climate regions
- 5. Know what are "lessons learned" of sustainable construction through LEED case studies
- 6. Understand the concept of sustainable development or sustainability in the built environment

UNIT I: TYPES OF FOUNDATIONS AND CONSTRUCTION METHODS

Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with block work walls).

UNIT II: MODULAR CONSTRUCTION METHODS

Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.

UNIT III: CUTTING EDGE OF SUSTAINABLE CONSTRUCTION

Identification of cutting edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity.

UNIT IV: SUSTAINABILITY IN BUILT ENVIRONMENT

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The fundamental concepts of sustainable development in the built environment; the environmental - resources issues and industrial - construction metabolism with examples. Environmental ethics and environmental justice; ecological - environmental economics including Life Cycle Costing; building assessment (frameworks) and ecolabels. Energy systems, energy, entropy, energy conservation and renewable energy; Life Cycle Assessment, embodied energy, energy, and materials.

UNIT V- LEED CONSTRUCTION MANAGEMENT

Examination of the current LEED for New Construction rating system, and case studyanalysis of highly successful recent "green construction projects" through student team assignments and presentations. Preparation for the LEED Green Associate professional licensing exam.

TEXT BOOKS:

1. Sustainable Construction: Green Building Design and Delivery. Third Edition, Charles J.Kibert, New York: John Wiley & Sons, 2012.

2. Working Toward Sustainability: Ethical Decision Making in a Technological World,CJKibert et al, New York: John Wiley & Sons, 2011.

REFERENCE BOOKS:

- 1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
- 2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
- 3. Chudley, R., Construction Technology, ELBS Publishers, 2007.
- 4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
C01	3	-	3	-	-	2	1	-	2	-	2	-	-	2	-
CO2	3	-	3	-	-	2	1	-	2	-	2	-	-	2	-
CO3	3	-	3	-	-	2	1	-	2	-	2	-	-	2	-
CO4	3	-	3	-	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	3	-	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	3	-	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	3	-	-	2	1	-	2	-	2	-	-	2	-

CO-PO MAPPING

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Design of Concrete Structures- I Semester-VI 3H-3C

Instruction Hours/week: L: 3 T: 0 P: 0

Course Objectives

23BECE6E09

- 1. To provide the students with the knowledge of the behavior of reinforced concrete structural elements in flexure, shear, compression and torsion
- 2. To enable them to design essential elements such as beams, columns, slabs stair cases and footings under various loads
- 3. To analyze and design for deflection and crack control of reinforced concrete members.
- 4. To know the short term and long-term deflections.
- 5. Use IS code of practice for the design of concrete elements
- 6. Understand the structural behavior of reinforced concrete elements in bending, shear, compression and torsion.

Course Outcomes

After completing the course, the students will be able to

- 1. Apply the fundamental concepts of limit state method
- 2. Understand the structural behavior of reinforced concrete elements in bending, shear, compression and torsion.
- 3. Design beams, slab, stairs, and columns and draw the reinforcement details.
- 4. Analyze and design for deflection and crack control of reinforced concrete members.
- 5. Design the short term and long-term deflections.
- 6. Use IS code of practice for the design of concrete elements

UNIT I: INTRODUCTION- PLAIN AND REINFORCED CONCRETE

Properties of concrete and reinforcing steel-Objectives of design-Different designphilosophies- Working Stress and Limit State method of design-Introduction to BIS code- Types of limit states characteristic and design values-partial safety factors-types of loads and their factors. Limit State of Collapse in Bending-assumptions-stress-strain relationship of steeland concrete- analysis of singly reinforced rectangular beams-balanced-under reinforced-overreinforced sections-moment of resistance codal provisions

UNIT II: LIMIT STATE OF COLLAPSE IN SHEAR AND BOND

Shear stresses in beams types of reinforcement-shear strength of RC beam-IS code recommendations for shear design-design of shear reinforcement examples Bond and development length - anchorage for reinforcement bars - code recommendations regarding curtailment of reinforcement.

UNIT III: DESIGN OF SINGLY REINFORCED BEAMS

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Basic rules for design- design example of simply supported beam- design of cantileverbeam detailing Analysis and design of doubly reinforced beams – detailing, T-beams- terminology- analysis of T beams- examples - Design for torsion-IS code approach- examples.

UNIT IV: DESIGN OF SLABS

Introduction- one-way and two-way action of slabs - load distribution in a slab- IS recommendations for design of slabs- design of one-way slab- cantilever slab- numerical problems – concepts of detailing of continuous slab –code coefficients.

UNIT V: TWO- WAY SLABS

Simply supported and restrained slabs – design using IS Code coefficientsReinforcementdetailing Limit State of Serviceability- limit state of deflection- short term and long-term deflection-IS code recommendations- limit state of cracking- estimation of crack width- simple numerical examples

Total Periods :45

TEXT BOOKS:

1. Pillai S.U & Menon D-Reinforced Concrete Design, Tata McGraw HillPublishingCo.,2005.

2. Punmia, B. C, Jain A.K and, Jain A.K, RCC Designs, Laxmi Publications Ltd., 10e, 2015

REFERENCE BOOKS:

1. Varghese P.C, Limit State Design of Reinforced Concrete, Prentice Hall of IndiaPvtLtd, 2008.

2. Relevant IS codes (I.S 456, I.S 875, SP 34)

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
C01	3	-	1	-	-	2	1	-	2	-	-	-	-	2	-
CO2	3	-	1	-	-	2	1	-	2	-	-	-	-	2	-
CO3	3	-	1	-	-	2	1	-	2	-	-	-	-	2	-
CO4	3	-	1	-	-	2	1	-	2	-	-	-	-	2	-
CO5	3	-	1	-	-	2	1	-	2	-	-	-	-	2	-
CO6	3	-	1	-	-	2	1	-	2	-	-	-	-	2	-
Avg	3	-	1	-	-	2	1	-	2	-	-	-	-	2	-

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B.E Civil Engineering			2023-2024
			Semester-VI
23BECE6E10	Design of Steel St	tructures	3H-3C
Instruction Hours/week: L: 3 T: 0	P:0 Ma	arks: Internal:40 Extern	al:60 Total:100
		End Semester	r Exam:3 Hours

Course Objectives

- 1. To introduce the limit state design of steel structural components subjected tobending, compression and tensile loads including the connections.
- 2. To enable design of structural components using timber.
- 3. To discuss the connections practically.
- 4. To assess loads on truss and design on purlins
- 5. To design structural components using timber and plate girders.
- 6. To design columns under axial loads using specifications.

Course Outcomes

After completing the course, the students will be able to

- 1. Design bolted and welded connections
- 2. Design tension members and beams using the is specifications
- 3. Design columns under axial loads using is specifications
- 4. Design beams and plate girders.
- 5. Assess loads on truss and design purlins.
- 6. Design structural components using timber.

UNIT I: INTRODUCTION TO STEEL AND STEEL STRUCTURES

Properties of steel, structural steel sections. Introduction to design: Design loads and loadcombinations, limit state design concepts. Connections bolted and welded (direct loads)

UNIT II: TENSION MEMBERS

Types of sections – net area- design of tension members- concept of shear lag-use oflug angleconnections in tension members

UNIT III: COMPRESSION MEMBERS

Design of struts- solid and built- up columns for axial loads-- design of lacingsand battens-column bases- slab base – gusseted base

UNIT IV: DESIGN OF ROOF TRUSSES

Types-design loads and load combinations assessment of wind loads- design of purlins. Moment resistant/Eccentric connections (in plane and out of plane) 9

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UNIT V: DESIGN OF TIMBER STRUCTURES Types of timber - classification - allowable stresses-design of beams-flexure, shear, bearing and deflection considerations Design of columns. Design of comparity heart excitations and the stresses are the stresses of the stresses o

Types of timber - classification - allowable stresses-design of beams-flexure, shear, bearing and deflection considerations-Design of columns. Design of composite beam sections with timber and steel.

Total Periods :45

TEXT BOOKS:

1. P. Dayaratnam., Design of Steel Structures, Wheeler Publishing, 2003

2. Punmia B. C., Jain A. K. and Jain A. K., Design of Steel Structures, LaxmiPublicationsLtd, 2017

REFERENCE BOOKS:

- 1. Raghupathi, Steel Structures, Tata McGraw Hill, 2006
- 2. Ramchandra S and Virendra Gehlot, Design of Steel Structures Vol. II, Standard Book House, 2007.

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	-	1	-	2	-	-	2	-	2	-	-	2	-
CO2	3	-	-	1	-	2	-	-	2	-	2	-	-	2	-
CO3	3	-	-	1	-	2	-	-	2	-	2	-	-	2	-
CO4	3	-	-	1	-	2	-	-	2	-	2	-	-	2	-
CO5	3	-	-	1	-	2	-	-	2	-	2	-	-	2	-
CO6	3	-	-	1	-	2	-	-	2	-	2	-	-	2	-
Avg	3	-	-	1	-	2	-	-	2	-	2	-	-	2	-

2023-2024

21	2	C
,11	-3	C

Instruction Hours/week: L: 3 T: 0 P: 0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hours

Course Objectives

23BECE6E11

- 1. To gain the knowledge of resources available near construction site.
- 2. To gain detailed knowledge of contract parameters.
- 3. To developed a more detailed appreciation for construction planning and scheduling
- 4. To apply their learned knowledge as it pertains to upper level construction management skills and procedures

Contracts Management

- 5. To evaluate the best practices associated with the development of contract parameters.
- 6. To understand the legal aspects of acts governing the contracts

Course Outcomes

After completing the course, the students will be able to

- 1. Apply project Procurement management concepts in a project environment.
- 2. Describe techniques used to procure resources within a project's scope and techniques to reduce procurement risks.
- 3. Evaluate the best practices associated with the development of contract parameters.
- 4. Understand the legal aspects of acts governing the contracts
- 5. Understand the basics of the bid process, important points in a tender document, and unbalanced contracts.
- 6. Resources available near construction site.

UNIT I: CONTRACT MANAGEMENT:

Introduction, Importance of Contracts, Overview of Contract Management, Overview of Activities in Contract Management; Planning and People- Resource Management; Types ofContracts, Parties to a Contract; Contract Formation, Formulation of Contract, Contract Start-Up,Managing Relationships; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price.

UNIT II: CONTRACT PARAMETERS

Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Notices under contracts; Conventional and Alternative Dispute Resolution methods.

UNIT III: VARIOUS ACTS GOVERNING CONTRACTS

Contract Administration and Payments- Contract Administration, Payments; Contract Management in Various Situations- Contract Management in NCB Works, Contract Management in ICB Works Contracts, Contract of Supply of Goods- Design, Supply and Installation Contracts, Contract Management in Consultancy,

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UNIT IV: BID PROCESS AND BID EVALUATION

Bid process, important points in a tender document, and unbalanced contracts. Materialcovered includes: Request For Proposal and problems Different types of proposals Design Conditions and Standard Component List-Tender document - Unbalanced proposals. Exercises: Evaluating Unit Prices Premium Portion Of The Overtime Rate Handling Bid Questions.

UNIT V: MANAGING RISKS AND CHANGE

Managing Risks, Managing Change; Contract Closure and Review- Ending a Contract, Post-Implementation Review; Legal Aspects in Contract Management- Contract ManagementLegal View, Dispute Resolution, Integrity in Contract Management; Managing Performance- Introduction, Monitoring and Measurement.

TEXT BOOKS:

1. R. K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.

2. M. S. Shetty, Concrete Technology (Theory and Practice), S. Chand & CompanyLtd., 2003.

3. Sustainable Construction: Green Building Design and Delivery. Third Edition, Charles J.Kibert, New York: John Wiley & Sons, 2012.

REFERENCE BOOKS:

1. Working Toward Sustainability: Ethical Decision Making in a Technological World,CJKibert et al, New York: John Wiley & Sons, 2011.

- 2. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
- 3. National Building Code, Bureau of Indian Standards, New Delhi, 2017.

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CO3	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
CO4	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
CO5	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
CO6	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
Avg	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-

CO-PO MAPPING



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Semester-VI

23BECE6E12Environmental Impact Assessment and Life Cycle Analyses3H-3CInstruction Hours/week: L: 3 T: 0 P: 0Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives:

- 1. To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment.
- 2. To develop the EIA models and life cycle assessment.
- 3. To provide knowledge related to the broad field of environmental risk assessment.
- 4. To learn the important processes that control contaminant transport and tools that can beused in predicting and managing human health risks.
- 5. To standardize the environment from the impact risks.
- 6. To know the remediation techniques and development of predictive models.

Course Outcomes:

After completing the course, the students will be able to

- 1. Understand the necessity to study the impacts and risks that will be caused by projects orindustries and the methods to overcome these impacts.
- 2. Know about the legal requirements of Environmental and Risk Assessment for projects.
- 3. Identify environmental attributes to be considered for the EIA study and Prepareenvironmental base map based on impact evaluation and analysis
- 4. Specify methods for prediction of the impacts and Conduct environmental audit.
- 5. Evaluate the audit data and prepare the report.
- 6. Know the remediation techniques and development of predictive models

UNIT I: ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Introduction, definitions and concepts, rationale and historical development of EIA, EIA for civil engineers. road components of EIA: Initial environmental examination, environmental impact statement, environmental appraisal, environmental impact factors and areas of consideration. Pertinent institutional information, unique pollution problems, existingvisual quality, public participation techniques. Composite consideration, potential cultural resources, potential visual impacts, geographical study area.

UNIT II: METHODOLOGIES

Measurement of environmental impact, organization, scope and methodologies of EIA pertinent environmental factors. Six generic steps, descriptive checklists, simple interaction matrix, stepped matrix, uniqueness ratio, habitat evaluation system. Public involvement techniques, comprehensive environmental impact study, various project types, archaeological properties, leachate testing, evaluation species, proposing agency, EIA Models. Status of EIA in India: EIA Regulations in India, TOR for Hydropower Projects and other projects. Case studies from hydropower projects, hazardous industries and mining.

UNIT III: ENVIRONMENTAL MANAGEMENT

Principles, problems and strategies; Review of political, ecological and remedial actions. Future strategies;

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multidisciplinary environmental strategies, the human, planning, decision- making and management dimensions. Environmental audit: Definitions and concepts, partial audit, compliance audit, methodologies and regulations.

UNIT IV: EMS AND STANDARDIZATION

Introduction to ISO and ISO 14000.EMAS regulations, wider application of system basedapproach. Local infrastructure development and environmental management: A system approach, Regional environmental management system, Conversion plan development and implementation strategies, Environmental management systems in local government.

UNIT V: LCA

Life cycle assessment; Triple bottom line approach; Industrial Ecology. Ecological footprinting, Design for Environment, Future role of LCA, Product stewardship, design, durability and justifiability, measurement techniques and reporting. Carbon trading Energy foot printing,Food foot printing and Carbon foot printing. GHG emissions, global warming, climate changeand Carbon credits, CDM, Initiatives in India; Sustainable development; Future scenarios.

TEXT BOOKS:

1. L. W. Canter, Environmental Impact Assessment, 2nd Ed., McGraw-Hill, 1997.

2. P. Judith and G. Eduljee, Environmental Impact Assessment for Waste Treatment and Disposal Facilities, John Wiley & Sons, 1994.

REFERENCE BOOKS:

1. C. H. Eccleston, Environment Impact Statements: A Comprehensive Guide to Project and Strategic Planning, John Wiley & Sons, 2000.

2. R. Welford, Corporate Environmental Management - Systems and Strategies, Universities Press, 1996..

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO 12	PS 01	PS O2	PS O3
CO1	3	-	-	-	3	-	1	-	2	-	-	-	-	2	-
CO2	3	-	-	-	3	-	1	-	2	-	-	-	-	2	-
CO3	3	-	-	-	3	-	1	-	2	-	-	-	-	2	-
CO4	3	-	-	-	3	-	1	-	2	-	-	-	-	2	-
CO5	3	-	-	-	3	-	1	-	2	-	-	-	-	2	-
CO5	3	-	-	-	3	-	1	-	2	-	-	-	-	2	-
Avg	3	-	-	-	3	-	1	-	2	-	-	-	-	2	-

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B.E Civil Engineering		2023-2024
		Semester-VII
23BECE7E01 3C	Design of Concrete Structures – II	3Н-

Instruction Hours/week: L: 3 T: 0 P: 0 Total:100

Marks: Internal:40 External:60

End Semester Exam:3 Hours

Course Objectives

- 1. To provide knowledge in the structural design of selected advanced structures of concrete and enable them to design reinforced concrete structures for real-world applications.
- 2. To design eccentrically loaded and slender columns using SP 16 design charts and different types of foundations
- 3. To design and detail cantilever retaining wall and understand the design principles of Counterfort retaining wall
- 4. To design and detail circular slabs and domes
- 5. To design rectangular and circular water tanks using IS code coefficients (IS 3370).
- 6. To gain knowledge of design of rectangular footing and combined footing.

Course Outcomes

- 1. Design eccentrically loaded and slender columns using SP 16 design charts and different types of foundations
- 2. Design and detail cantilever retaining wall and understand the design principles of Counterfort retaining wall
- 3. Design and detail circular slabs and domes
- 4. Design rectangular and circular water tanks using IS code coefficients (IS 3370).
- 5. Gain knowledge of design of rectangular footing and combined footing.
- 6. Analyze combined footing with rectangular and trapezoidal sections

UNIT I: ANALYSIS AND DESIGN OF SHORT COLUMNS

Eccentric loading Columns subjected to compression and uniaxial bending- design using SP16 charts for limit state Columns subjected to combined axial load and biaxial bending moments-code procedure for design- design using SP16 charts for limit state Slender columns-behavior of slender columns-braced and un-braced columns-design procedure- design using SP16 charts for limit state.

UNIT II: FOUNDATIONS

Classification-IS code provisions for design of isolated footings- design principles of rectangular footings-Design of rectangular footings-uniform thickness and sloped- eccentrically loaded rectangular footing of uniform thickness-detailing. Combined footings (design principles only)- analysis of combined footingsrectangular and trapezoidal.

UNIT III: RETAINING WALLS

Types- Cantilever retaining wall- earth pressure and forces acting-stability- proportioning-structural behavior of components -design example of cantilever retaining wall without surcharge-detailing Counterfort retaining wall- design principles of components and detailing (design not required)

UNIT IV: INTRODUCTION TO DESIGN OF WATER TANKS:

Design philosophy and requirements-joints- IS code recommendations Design of rectangular water tanks

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using IS code coefficients (IS 3370). Design of circular water tanks using- IS code coefficients (IS 3370).

UNIT V: CIRCULAR SLABS:

Stresses- reinforcements- simply supported, fixed and partially fixed subjected to uniformly distributed loads Design and detailing of spherical and conical domes.

Total Periods :45

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TEXT BOOKS:

1. N. Krishnaraju, Prestressed Concrete, Tata McGraw-Hill, 5e, 2012

2. Pillai S.U & Menon D – Reinforced Concrete Design, Tata McGraw Hill Book Co., 2009

REFERENCE BOOKS:

- 1. Punmia, B. C, Jain A.K and, Jain A.K, R C C Designs, Laxmi Publications Ltd., 10e, 2015
- 2. Relevant IS codes (IS 456, IS 875IS 1343, IS 3370, SP 16, SP 34)

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	РО 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
CO2	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
CO3	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
CO4	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
CO5	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
CO5	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-
Avg	3	-	-	3	-	2	1	-	2	-	-	-	-	2	-



Instruction Hours/week: L: 3 T: 0 P: 0Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives:

- 1. Understand the background of biological treatment processes.
- 2. Get required knowledge on design parameters and coefficients.
- 3. Acquire knowledge on the design of suspended growth treatment plants.
- 4. Apply knowledge of enzyme reaction kinetics to reactor design.
- 5. Study different work scenarios to determine the most effective options.
- 6. To examine the different equipment options required for each treatment

Course Outcomes:

After successful completion of course, the students are able to

- 1. Develop conceptual schematics required for biological treatment of wastewater.
- 2. Have a sound knowledge of microbiology fundamentals applied to biological treatments.
- 3. Correctly implement the procedures for determining kinetic and stochiometric parameters.
- 4. Analyze the different options applicable to different substrates.
- 5. Examine the different equipment options required for each treatment.
- 6. Study different work scenarios to determine the most effective options

UNIT I: INTRODUCTION

Microbiology fundamentals and kinetic and stoichiometric coefficients - Bacterial growth and biological oxidation - Kinetics and stoichiometric of biological growth

UNIT II: AEROBIC BIOLOGICAL TREATMENT

Fixed Cultures - Suspension cultures - Suspension cultures - Characteristics of the activated sludge process - Control parameters - Overproduction of sludge and oxygen consumption - Scums -Fixed cultures - percolators and bio discs - Nutrient (N and P) removal.

UNIT III: ANAEROBIC BIOLOGICAL TREATMENT

Biogas production, collection and use - Mechanism and phases of the anaerobic process Gas production, collection and use - Energetics and stiochiometric of the process - Anaerobic contact process and slurry filter - anaerobic digestion of slurry.

UNIT IV: ENERGETICS AND STOICHIOMETRIC

Activated sludge process - Balanced diet - C:N:P ratio - Presence of toxic substances -Operational difficulties – swelling - rising sludge.

UNIT V: CONTROL PARAMETERS

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TEXT BOOKS:

1. Metcalf and Eddy, "Waste Water Engineering – Treatment and reuse", TataMcGraw-Hill, New Delhi, 2003.

2. Arceivala S. J., "Waste Water Treatment and disposal, Marcel dekker publishers, 1981.

3. Larry D. Benefield and Clifford W. Randall, "Biological process design forWaste water Treatment", 1994.

REFERENCE BOOKS:

1. Howard S. Peavy, Donald R. Rowe and George Techobanoglous, "Environmental Engineering", McGraw – Hill co., 2013.

2. Arceivala S. J., "Wastewater Treatment and Pollution control", Tata Mc Graw Hill Co., New Delhi, 1998.

3. Linvil G. Rich., "Low-Maintenance, Mechanically simple wastewatertreatmentSystems", McGraw-Hill Co., 1980

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	-	1	-	-	2	3	-	2	-	-	-	-	2	-
CO2	3	-	1	-	-	2	3	-	2	-	-	-	-	2	-
CO3	3	-	1	-	-	2	3	-	2	-	-	-	-	2	-
CO4	3	-	1	-	-	2	3	-	2	-	-	-	-	2	-
CO5	3	-	1	-	-	2	3	-	2	-	-	-	-	2	-
CO6	3	-	1	-	-	2	3	-	2	-	-	-	-	2	-
Avg	3	-	1	-	-	2	3	-	2	-	-	-	-	2	-

2023-2024

Semester-VII

23BECE7E03Repair and Rehabilitation of Structures3H-3C

Instruction Hours/week: L: 3 T: 0 P: 0 Mar

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- 1. Students must gained knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.
- 2. To assessing damage to structures and various repair techniques
- 3. To know various types and properties of repair materials
- 4. To Analyse the damage to structures using various tests
- 5. To gain the importance and methods of substrate preparation
- 6. To know about various repair techniques of damaged structures, corroded structures

Course Outcomes

After completing the course, the students will be able to

- 1. Various distress and damages to concrete and masonry structures
- 2. The importance of maintenance of structures, types and properties of repair materials etc
- 3. Assessing damage to structures and various repair techniques
- 4. Various types and properties of repair materials
- 5. Damage to structures using various tests
- 6. The importance and methods of substrate preparation

UNIT I: MAINTENANCE AND REPAIR STRATEGIES

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II: STRENGTH AND DURABILITY OF CONCRETE

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete – Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion – Effects of cover thickness.

UNIT III: SPECIAL CONCRETES

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self-compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV: TECHNIQUES FOR REPAIR AND PROTECTION METHODS

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.



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UNIT V: REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Demolition Techniques – Engineered demolition methods – Case studies.

TEXT BOOKS:

1. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.

2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

3. Shetty M.S., "Concrete Technology –Theory and Practice", S.Chand and Company,2008.

REFERENCE BOOKS:

1. Ravishankar.K., Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and

2. Rehabilitation of Concrete Structures", Allied Publishers, 2004.

3. Gambhir.M.L., "Concrete Technology", McGraw Hill, 2013

4. R. K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.

5. M. S. Shetty, Concrete Technology (Theory and Practice), S. Chand & CompanyLtd., 2003.

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
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	-
CO6	3	-	-	-	-	2	1	-	-	-	3	-	-	3	-
Avg	3	-	-	-	-	2	1	-	-	-	3	-	-	3	-

CO-PO MAPPING

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2023-2024

Semester-VII

23BECE7E04	Instrumentation and Sense	or Technologies for Civil Engi	ineering
	Applic	3H-3C	
Instruction Hou	rnal:60 Total:100		

End Semester Exam:3 Hours

Course Objectives

- 1. To understand instrumentation, sensor theory and technology, data acquisition, digital signal processing, damage detection algorithm, life time analysis and decision making.
- 2. To understand theoretical and practical principles of design of sensor systems
- 3. To allow students to prepare, deploy and analyze observations from standard instruments.
- 4. Laboratory experiments shall be used on application of concepts introduced in the lectures.
- 5. To describe the requirements during the transmission of measured signals
- 6. To construct Instrumentation/Computer Networks
- 7. To suggest proper sensor technologies for specific applications

Course Outcomes

- 1. To analyze the errors during measurements
- 2. To specify the requirements in the calibration of sensors and instruments
- 3. To describe the noise added during measurements and transmission
- 4. To describe the measurement of electrical variables
- 5. To describe the requirements during the transmission of measured signals
- 6. To construct Instrumentation/Computer Networks

UNITI:FUNDAMENTALSOFMEASUREMENT,SENSINGANDINSTRUMENTATION9

Definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations.

UNIT II: SENSOR INSTALLATION AND OPERATION

Predict the response of sensors to various inputs, Construct a conceptual instrumentation and monitoring program, describe the order and methodology for sensor installation. Differentiate between types of sensors and their modes of operation and measurement. Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty.

UNIT III: TRANSDUCERS

Definition and classification - common transducers for measurement of displacement velocity, flow, liquid level, force, pressure, strain and temperature - basic principles and working of LVDT, electromagnetic and ultrasonic flow meters, piezoelectric force transducer, load cell, strain gauge- bridge configuration for four strain gauges, RTD, Thermistors, thermocouple, Needfor instrumentation system, data acquisition system.

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UNIT IV: DATA ANALYSIS AND INTERPRETATION

Fundamental statistical concepts- Data reduction and interpretation- Time domain signal processing-Discrete signals, Signals and noise, a few examples of statistical information calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range).

UNIT V: TUTORIALS FROM THE ABOVE MODULES

Demonstrating clearly the understanding and use for the sensors and instruments used for the problems posed and inferences drawn from the measurement and observations made along with evaluation report.

Total Periods : 45

TEXT BOOKS:

1. Alan S Morris , Measurement and Instrumentation Principles,3rd/e, Butterworth Heinemann.2001

2. David A. Bell, Electronic Instrumentation and Measurements 2nd/e, Oxford Press. 2007

REFERENCE BOOKS:

- 1. S. Tumanski, Principle of Electrical Measurement, Taylor & Francis. 2006
- 2. Ilya Gertsbakh, Measurement Theory for Engineers Springer. 2010

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PSO3
CO1	3	-	-	1	-	2	1	-	-	-	1	-	-	3	-
CO2	3	Ι	-	1	-	2	1	I	-	-	1	-	-	3	-
CO3	3	I	-	1	-	2	1	I	-	-	1	-	-	3	-
CO4	3	-	-	1	-	2	1	-	-	-	1	-	-	3	-
CO5	3	-	-	1	-	2	1	-	-	-	1	-	-	3	-
CO6	3	-	-	1	-	2	1	-	-	-	1	-	-	3	-
Avg	3	-	-	1	-	2	1	-	-	-	1	-	-	3	-

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End Semester Exam:3 Hours

Course Objectives

- 1. The main objective is to enable the student to have a good grasp of all the fundamental issues in these advanced topics in structural analysis, besides enjoying the learning process, and developing analytical and intuitive skills.
- 2. The basic concepts of structural analysis and matrix algebra
- 3. To demonstrations through many examples of how matrix methods can be applied to linear static analysis of skeletal structures.
- 4. To analyses of Plane and space trusses; beams and grids; plane and space frames by the stiffness method
- 5. To analysis of trusses by flexibility method.
- 6. Simple structures can be conveniently solved using a reduced stiffness formulation, involving far less computational effort.

Course Outcomes

- 1. The basic concepts of structural analysis and matrix algebra
- 2. Descriptions and demonstrations through many examples of how matrix methods can be applied to linear static analysis of skeletal structures.
- 3. Analyses of Plane and space trusses; beams and grids; plane and space frames by the stiffness method
- 4. Analysis of trusses by flexibility method.
- 5. Simple structures can be conveniently solved using a reduced stiffness formulation, involving far less computational effort.
- 6. Analysis of elastic instability and second-order response.

UNIT I: REVIEW OF BASIC CONCEPTS IN STRUCTURAL ANALYSIS

Review topics on Structural Analysis and Linear Algebra. structure; loads; (equilibrium, compatibility, force-displacement relations); levels of analysis; analysis of statically determinate structures; applications of principle of virtual work and displacement- based and force-based energy principles; deriving stiffness and flexibility coefficients.

UNIT II: REVIEW OF ANALYSIS OF INDETERMINATE STRUCTURES

Force methods: Statically indeterminate structures (method of consistent deformations; theorem of leastwork). Displacement Methods: Kinematically indeterminate structures (slope-deflection method; moment distribution method).

UNIT III: MATRIX CONCEPTS AND MATRIX ANALYSIS OF STRUCTURES

Matrix; vector; basic matrix operations; rank; solution of linear simultaneous equations; Eigen values and Eigen vectors. Introduction; coordinate systems; displacement and force transformation matrices; Contragradient principle; element and structure stiffness matrices; Element and structure flexibility matrices; equivalent joint loads; stiffness and flexibilityapproaches.

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UNIT IV: MATRIX ANALYSIS OF STRUCTURES WITH AXIAL ELEMENTS 9

Introduction: Axial stiffness and flexibility; stiffness matrices for an axial element, plane truss element and space truss element; One-dimensional axial structures: Analysis by conventional stiffness method (two DOF per element) and reduced element stiffness method (single DOF); Analysis by flexibility method; Plane trusses: Analysis by conventional stiffnessmethod (four DOF per element) and reduced element stiffness method (single DOF); Analysisby flexibility method; Space trusses: Analysis by conventional stiffness method (six DOF per element) and reduced element stiffness method (single DOF).

UNIT V: ANALYSIS OF ELASTIC INSTABILITY AND SECOND-ORDER EFFECTS 9

Effects of axial force on flexural stiffness: Review of buckling of ideal columns; flexural behaviour and stiffness measures for beam-columns - braced and un braced, under axial compression; Solution by slope deflection method: Slope deflection equations for prismatic beam columns using stability functions; modifications for pinned and guided-fixed- end conditions; fixed end moments in beam-columns; Solution by matrix method: Stiffness matrix for prismatic beam column element; estimation of critical elastic buckling loads; second-order analysis.

Total Periods : 45

TEXT BOOKS:

1. Punmia.B.C., (2004), Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", Laxmi Publications.

2. Vaidyanathan, R. and Perumal, P. (2003), "Comprehensive structural Analysis - Vol.I &II", Laxmi Publications, New Delhi.

REFERENCE BOOKS:

1. Devdas Menon, (2009), "Advanced Structural Analysis", Naros Publishing House,.

2. Amin Ghali, Adam M Neville and Tom G Brown, (2007) "Structural Analysis: AUnified Classical and Matrix Approach", Sixth Edition, Chapman & Hall

3. Devdas Menon, (2008) "Structural Analysis", Narosa Publishing House, A jointventure by IISc and IIT. **CO-PO MAPPING**

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO 12	PS O1	PS O2	PSO3
CO1	3	-	-	-	-	2	1	-	1	-	-	-	-	1	-
CO2	3	-	-	-	-	2	1	-	1	-	-	-	-	1	-
CO3	3	-	-	I	-	2	1	-	1	-	-	-	-	1	-
CO4	3	-	-	-	-	2	1	-	1	-	-	-	-	1	-
CO5	3	-	-	-	-	2	1	-	1	-	-	-	-	1	-
CO6	3	-	-	-	-	2	1	-	1	-	-	-	-	1	-
Avg	3	-	-	-	-	2	1	-	1	-	-	-	-	1	-

			Semester-VII
23BECE7E06	Rural Water Supply a	and Onsite Sanitation Systems	3H-3C
Instruction Hours	/week: L: 3 T: 0 P: 0	Marks: Internal:40 Externa	al :60 Total :100
		End Semester	Exam:3 Hours

Course Objectives:

- 1. To educate the students on the principles rural water supply and sanitation.
- 2. To learn about the development of water supply in rural areas.
- 3. To learn about environmental sanitation methods in rural areas.
- 4. Develop an understanding of the characteristics of water and wastewater that must be considered during design of a treatment plant.
- 5. Develop understanding of events governing the rural water supply and sanitation.
- 6. To plan and identify the removal of hazards by composting

Course Outcomes:

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

- 1. Identify and formulate problems for rural application.
- 2. Develop conceptual schematics required for the treatment of water and wastewater forrural application.
- 3. Function on a multi disciplinary team.
- 4. Identify pertinent criteria constraining the design of systems and processes.
- 5. Gain knowledge about water supply scheme in rural areas and environmental sanitationmethods and design in rural areas.
- 6. Identify the occupational hazards.

UNIT I: RURAL WATER SUPPLY

Issues of rural water supply –Various techniques for rural water supply- merits-National rural drinking water program- rural water quality monitoring and surveillance-operation and maintenance of rural water supplies

UNIT II: LOW COST WATER TREATMENT

Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems.

UNIT III: RURAL SANITATION

Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compactand simple wastewater treatment units and systems in rural areas- stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems- Effluent disposal.

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REFERENCE BOOKS:

TEXT BOOKS:

1. Eulers, V.M., and Steel, E.W., Municipal and Rural Sanitation, 6th Ed., McGrawHill Book Company, 1965.

2. Park, J.E., and Park, K., Text Book of Preventive and Social Medicine, Banarsidas Bhanot, 1972.

3. Wright, F.B., Rural Water Supply and Sanitation, E. Robert Krieger Publishing, Company, Huntington, New York, 1977.

4. Juuti, P., Tapio S. K., and Vuorinen H., Environmental History of Water: GlobalViewson Community Water Supply and Sanitation, IWA Publishing (Intl Water, Assoc), 2007.

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	-	-	-	2	1	-	2	-	2	-	-	2	-
CO2	3	-	-	-	-	2	1	-	2	-	2	-	-	2	-
CO3	3	-	-	-	-	2	1	-	2	-	2	-	-	2	-
CO4	3	-	-	-	-	2	1	-	2	-	2	-	-	2	-
CO5	3	-	-	-	-	2	1	-	2	-	2	-	-	2	-
CO6	3	-	-	-	-	2	1	-	2	-	2	-	-	2	-
Avg	3	-	-	-	-	2	1	-	2	-	2	-	-	2	-

CO-PO MAPPING

1. CPHEEO Manual on Water Supply and Treatment, Govt. of India 2003.

- 2. Manual on Sewerage and Sewage Treatment, Govt. of India 1999.
- 3. Metcalf & Eddy, Wastewater Engg. Treatment and Reuse, Tata McGraw Hill, NewDelhi2000.
- 4. Todd, D.K. Ground Water Hydrology, John Wiley & Sons, New York 2000.

UNIT IV: INDUSTRIAL HYGIENE AND SANITATION

specific issues and problems encountered in rural sanitation.

UNIT V: SOLID WASTE MANAGEMENT

Occupational Hazards- Schools- Public Buildings Hospitals- Eating establishments-Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants -Rural health - Other

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Total Periods:45

3.	Design for shear and torsion of pre-stressed concrete members
4.	Design end blocks and provide detailing of reinforcements
5	

Pre-Stressed Concrete Structures

1. To make students familiar with the concepts and design of typical pre-stressed concrete

Structural elements and to have a knowledge of the codal provisions.

5. Design composite members and other applications

2. Design pre stressed concrete members using codal provisions

2. To explain the torsion, shear and bending detail. 3. To analyze the ultimate strength of the materials.

5. To design composite members and their applications.

4. To know more about limit state structure.

After completing the course, the students will be able to

1. Analyze pre stressed concrete members

6. To analyze continuous members.

6. Design continuous members.

UNIT I: INTRODUCTION

Basic concept and principles of pre-stressed concrete, materials, prestressing systems -Analysis of prestress and bending stresses loss of pre-stress Stresses at transfer and service loads.

UNIT II: LIMIT STATE DESIGN CRITERIA

Inadequacy of elastic and ultimate load method, criteria for limit states, strength and serviceability. Design of sections for flexure codal provisions- ultimate strength in flexure

UNIT III: SHEAR AND TORSIONAL RESISTANCE

Design of shear reinforcement, design of reinforcement for torsion, shear and bending. Deflections of prestressed concrete members: Importance, factors, short term and long-term deflection. Codal provisions.

Instruction Hours/week: L: 3 T: 0 P: 0

23BECE7E07

Course Objectives

Course Outcomes

Marks: Internal:40 External:60 Total:100

3H-3C

2023-2024 Semester-VII

End Semester Exam: 3 Hours

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UNIT IV: ANCHORAGE ZONE STRESSES IN POST TENSIONED MEMBERS 9

Stress distribution in end block, anchorage zone reinforcement. Prestressed concrete poles and sleepers: Design of sections for compression and bending Partial pre-stressing- Definitions, principles and design approaches and applications

UNIT V: COMPOSITE BEAMS

Analysis and design – Ultimate strength – applications, Elementary idea of composite construction for tee beams in bridges. Statically Indeterminate structures: advantages of continuous member (Concepts and steps for analysis).

Total periods : 45

TEXT BOOK:

1. Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay1995.

REFERENCE BOOKS:

1. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH publishing Co.Pvt. Ltd., 1997.

2. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, NewDelhi, 1990

3. IS 1343 – 1998 IS Code Bureau of Indian Standards.

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	-	3	-	2	1	-	-	-	2	-	-	2	-
CO2	3	-	-	3	-	2	1	-	-	-	2	-	-	2	-
CO3	3	-	-	3	-	2	1	-	-	-	2	-	-	2	-
CO4	3	-	-	3	-	2	1	-	-	-	2	-	-	2	-
CO5	3	-	-	3	-	2	1	-	-	-	2	-	-	2	-
CO6	3	-	-	3	-	2	1	-	-	-	2	-	-	2	-
Avg	3	-	-	3	-	2	1	-	-	-	2	-	-	2	-

CO-PO MAPPING

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23BTFTOE01

PROCESSING OF FOOD MATERIALS 3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam: 3 Hour

Course Objectives

The goal of this course is for students to,

- 1. To explain the milling, extraction and manufacture of tremendous products from cereals, pulses and oil seeds.
- 2. To summarize the production and processing methods of fruits and vegetables.
- 3. To discuss the chemical composition, processing, production, spoilage and quality of milk and milk products.
- 4. To outline the overall processes involved in the production of meat, poultry and fish products.
- 5. To review the production and processing methods of plantation and spice products.

Course Outcomes

Upon completion of this course, students will be able to,

- 1. Discuss the basics of food processing.
- 2. Demonstrate the various processing technologies involved in fruits and vegetables, dairy, cereals, meat, fish, egg and plantation products.
- 3. Infer the basics on microbiology of food products.
- 4. Describe the process of manufacture of various food products.
- 5. Outline the various methods of food preservation.

UNIT I - CEREAL, PULSES AND OIL SEEDS TECHNOLOGY

Rice milling, Pulse milling, Wheat milling - Recent trends in milling process- Oil extraction - different methods in oil extraction - Methods of manufacture of Bread different processes of manufacture - types of breads - buns, biscuits, cakes and cookies -Pasta products - Tortilla - Method of manufacture.

UNIT II - FRUITS AND VEGETABLE PROCESSING

Production of Fruits and vegetables in India, Maturity standards, Cause for heavy losses, preservation treatments - Basics of Canning, Minimal processing and Hurdle technologyas applied to Vegetable and Fruit processing, Processing of fruit juices, Dehydration, Aseptic processing- Indian Food Regulation and Quality assuranceFruit Juice / pulp/ Nectar/Drinks, concentrates.

UNIT III – DAIRY PROCESSING

Basic dairy terminology, composition, General tests at reception, Dairy Processing -Method of manufacture of Standardized, toned and double toned milk, milkpowder -Equipments - Pasteurizers, homogenizers and pumps - Method of manufactureof dairy products - Ice-cream, Cheese, Paneer, Yoghurt - Pasteurization and microorganisms involved in spoilage of milk - Major pathogens, Plant construction, Sanitation management, Cleaning equipment.

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UNIT IV - MEAT, POULTRY AND FISH PROCESSING

Meat composition from different sources, Definitions and measurements, Carcass Processing, Meat Products, Processing of Poultry Products, Common pathogens, Sanitation management, Sanitizers for meat & poultry plants, Fish and otherMarine Products Processing, Sources of sea food contamination.

UNIT V - PLANTATION PRODUCT TECHNOLOGY

Processing of Tea, Coffee and Cocoa - Outline of the methods of manufacture of - green tea, black tea, instant tea, Instant coffee, Cocoa and Chocolate. Outline of themethods of processing of Pepper, cardamom, ginger, vanilla and turmeric. By products from plantation crops and spices.

TOTAL: 45

Text Books:

- 1. Srivastava R.P. and Kumar S. Fruit and Vegetable Preservation: Principles and Practices. International Book Distributing Co. Lucknow. 3rd Edition. 2010.
- 2. Chakraverty A., Mujumdar A.S., Raghavan G.S.V and Ramaswamy H.S. Handbook of Post- harvest Technology: Marcel Dekker Press. USA. 1st Edition. 2003.
- Sukumar De. Outlines of Dairy Technology. Oxford University Press. New Delhi. 23rd impression. 2016.
- 4. James G. Brennan. 2006. Food Processing Handbook. Wiley-VCH Verlag GmbH& Co. KGaA, Weinheim, Germany.

CO PO Mapping

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

23BTFTOE02

Instruction Hours/week: L:3 T:0 P:0

Course objectives

The goal of this course is for students,

- 1. To explain the basic concepts of food and nutrition.
- 2. To define the overall classification, function, and source of carbohydrates, lipidsand proteins.

NUTRITION AND DIETETICS

- 3. To summarize the availability, source, deficiency and physiological role of fat andwater-soluble vitamins.
- 4. To outline the role of health and nutritional importance of micro and macro minerals.
- 5. To discuss the recent trends and developments in nutrition.

Course outcomes

Upon successful completion of this, students will be able to

- 1. Explain the basics in the area of nutritional assessment in health and disease.
- 2. Outline the biological functions of various macromolecules in terms of food andhealth.
- 3. Discuss the balanced diet for healthy life to avoid or prevent the deficiency disorders.
- 4. Infer an appropriate diet, products that prevent vitamin deficiency disorders.
- 5. Identify the proper foods rich in minerals to live a healthy life.

UNIT I - HUMAN NUTRITION

Six classes of nutrients - Historical perspective of nutrient requirements - Assessment of nutritional status - recommended dietary allowances of macronutrients for all age groups - Assessment of protein quality - Malnutrition and related disorders -Balanced Diet. Factors influencing dietary intake: Food habits, food fads and fallacies, their influence on health and wellbeing.

UNIT II - BIOMOLECULES

Carbohydrates- Definition, classification, Functions, Sources of Carbohydrates, Deficiency. Lipids - Definition, classification, function, sources, Properties of fats and oils, Refined & Hydrogenated fats process. Proteins - Definitions, Classification, Function, Amino Acids, Sources of Proteins, Texturized proteins.

UNIT III - VITAMINS

Physiological role, bio-availability, requirements, sources and deficiency of FatSoluble Vitamins: Vitamin A, Vitamin D, E & K. f Water soluble vitamins: Vitamin C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B12, VitaminB6. Stability under different food processing conditions.

UNIT IV – MINERALS AND WATER

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hour

3H-3C

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Physiological role, bio-availability, requirements, sources and deficiency of Macro minerals: Calcium, Phosphorus Magnesium, Sodium, Potassium chloride. Micro minerals: Iron, Zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride - Chemistry and physical properties of free, bounded and entrapped water, water activity, quality parameters of drinking and mineral water.

UNIT V - RECENT TRENDS IN NUTRITION

Principles of dietary management in gout, rheumatism, AIDS/HIV - Cancer-risk factors, symptoms, dietary management, role of food in prevention of Cancer. Role of functional foods Health foods and novel foods, organically grown foods, personalized nutrition, recent concepts in human nutrition like nutrigenomics, nutraceuticals etc.

TOTAL: 45

Text Books:

- 1. Sunetra Roday. Food Science and Nutrition. Oxford Higher Education/Oxford University Press. 3rd edition 2018. (ISBN-13: 9780199489084).
- 2. Charis Galanakis. Nutraceutical and Functional Food Components. Academic Press, 1st Edition, 2017. (ISBN: 9780128052570).
- Ashley Martin. Nutrition and Dietetics. Syrawood Publishing House. 1st Edition, 2016. (ISBN:9781682860588).
- 4. Robert E. C. Wildman. Handbook of Nutraceuticals and Functional Foods. CRC Press, 2nd Edition, 2016. (ISBN-10: 9781498770637).
- 5. Srilakshmi. B. Nutrition Science. New Age International Pvt. Ltd, Publishers. 6th Edition. 2017. (ISBN-13: 9789386418883).

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

CO PO Mapping

23BTFTOE03

READY TO EAT FOODS

3H-3C

Instruction Hours/week: L:3 T:0 P:0 Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hour

Course Objectives

The goal of this course is for students to,

- 1. To outline the current status of snack food Industry.
- 2. To describe the production, processing and marketing trends of potato and tortilla chips.
- 3. To outline the overall processing of popcorn.
- 4. To explain the production and processing of fruits involved in snack food preparation.
- 5. To summarize the sensory analysis methods and packaging techniques of snack foods.

Course Outcomes

Upon completion of this course, students will be able to,

- 1. Outline the various manufacturing process in snack food industries.
- 2. Summarize the current production and marketing status of Snack foods.
- 3. Explain the advantages of Sensory Evaluation.
- 4. Describe packaging technologies in Snack Food Industries.
- 5. Demonstrate the equipments involved in the snack production processes.

UNIT I - INTRODUCTION TO SNACK FOODS

Introduction- Types – processing methods - Nutrition- Quality and standards for snack foods - GHP and GMP for snack food industries - Outline of snack food industry - Domestic Snack Food Market-Global Market.

UNIT II - POTATO AND TORTILLA CHIPS PROCESSING

Potato Production- selection and grading of potato - Potato snack Ingredients- Potato Analysis and Composition-Potato chip manufacturing process-Unit Operations-Other value added products from Potato. Tortilla chips - Raw Materials- Processing steps-Equipment involved-Reconstitution of Dry Maize Flour-Unit operations - Nutritional properties of potato and tortilla chips.

UNIT III - POPCORN PROCESSING

Introduction- Raw popcorn selection and preparation-Popping Methods-Home preparation of Popcorn-Equipments-Industrial manufacturing process- Flavorings and Applicators-Popcorn Packaging- Relative Nutrition- Marketing.

UNIT IV - FRUIT BASED SNACKS

Introduction-production and processing of fruit crops – fruit purees – fruit powders – canned fruit snacks – alcoholic preservation of fruit snacks – fruit candies – fruit bars – exotic fruits – Nutritions and health benefits of fruit snacks.

UNIT V - SENSORY EVALUATION AND PACKAGING

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Introduction- importance of sensory evaluation – Analytical methods -Sensory methods-Sensory Aspect of Processing- Limitations of sensory evaluation- Quality properties of Snack Foods and Packaging Materials-Automated Bag- Pouch Packaging- Cartoning Case Packing- Labelling requirements - Current Issues in Snack Foods Packaging.

TOTAL: 45

Text Books:

- Lusas, E. W and Rooney, L. W. Snack Foods Processing. CRC Press,1st Edition 2001.
- 2. Panda, H. The Complete Technology Book on Snack Foods, National Institute ofIndustrial Research, Delhi. 2nd Edition 2013.
- *3.* Sergio O Serna-Saldivar, Industrial Manufacture of Snack Foods, Kennedys Books Ltd. 2008.
- 4. Lusas, E. W and Rooney, L. W. Snack Foods Processing. CRC Press,1st Edition 2001.
- 5. Panda, H. The Complete Technology Book on Snack Foods, National Institute ofIndustrial Research, Delhi. 2nd Edition 2013.
- 6. Sergio O Serna-Saldivar, Industrial Manufacture of Snack Foods, Kennedys Books Ltd. 2008.

CO PO Mapping

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

23BTFTOE04AGRICULTURAL WASTE AND BYPRODUCTSUTILIZATION3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hour

Course Objectives

The goal of this course is for students,

- 1. To categorize the types of agricultural wastes.
- 2. To outline the production and utilization of biomass.
- 3. To explain the various parameters considered to be important in the designing of biogas units.
- 4. To discuss the methods employed in the production of alcohol from agricultural wastes / byproducts.
- 5. To summarize the overall aspects involved in the production of paperboards and particleboards from agricultural wastes.

Course Outcomes

Upon successful completion of this, students will be able to,

- 1. Outline the types of agricultural wastes.
- 2. Illustrate the collection and generation of value-added products from agricultural wastes
- 3. Demonstrate the techniques involved in the production and utilization of biomass.
- 4. Discuss the various parameters considered to be important in the designing ofbiogas units.
- 5. Illustrate the various methods employed in the production of alcohol from thebyproducts of agricultural wastes.
- 6. Discuss the appropriate materials to produce paperboards and particleboards from gricultural wastes.

UNIT I - TYPES OF AGRICULTURAL WASTES

Introduction and Background Agricultural Waste, Crop Waste, Agricultural Residues (annual crops), Technical terms, properties of agricultural waste- storage and handling

- rice by-products utilization-rice bran and germ, rice bran oil, economic products from agriculture waste/by-products.

UNIT II - BIOMASS PRODUCTION AND UTILIZATION

Biomass – types – production and utilization Technology used for the utilization of agricultural wastes: Biomass Gasifier, Nimbkar Agricultural Research Institute (NARI) Gasifier, Rice-Husk Based Gasifier, Heat and Steam from Sugarcane Leaf and Bagasse.

UNIT III - BIOGAS DESIGN AND PRODUCTION

Biogas: Definition, composition, history of biogas, Production of biogas – factors affecting the efficiency; types of biogas plant (floating drum type and fixed dome type) and their components (inlet, outlet, stirrer, slanting pipe, digester, gas holder and gas outer pipe), Selection and Design of biogas plant.

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UNIT IV - PRODUCTION OF ALCOHOL FROM WASTE MATERIALS 9

Production of Alcohol from waste materials: Introduction, Production methods, Cellulolysis (biological approach): Pretreatment, Cellulolytic processes (Chemical and Enzymatic hydrolysis), Microbial fermentation, Gasification process (thermochemical approach).

UNIT V – PRODUCTION OF PAPERBOARD AND PARTICLEBOARDS FROMAGRICULTURAL WASTE 9

Biodegradable packing materials: merits and demerits, Production and testing of Paperboards and Particleboards from Agricultural Waste: Introduction, History, Terminology and classification, Raw materials, Production steps- Pulping, Classifications of pulp, Bleaching, Plies, Coating, Grades.

TOTAL: 45

Text Books:

- 1. Efthymia Alexopoulou. Bioenergy and Biomass from Industrial Crops on Marginal Lands. Elsevier, 1st Edition, 2020. (ISBN: 9780128188644).
- Navanietha Krishnaraj Rathinam, Rajesh Sani. Biovalorisation of Wastes to Renewable Chemicals and Biofuels. Elsevier, 1st Edition, 2019. (ISBN: 9780128179529).
- 3. Simona Ciuta, Demetra Tsiamis, Marco J. Castaldi. Gasification of Waste Materials. Academic Press, 1st Edition, 2017. (ISBN: 9780128127162).
- Nicholas E. Korres, Padraig O'Kiely, John A.H. Benzie, Jonathan S. West. Bioenergy Production by Anaerobic Digestion: Using Agricultural Biomass and Organic Wastes. Routledge, 1st Edition, 2013. (ISBN-13: 9780415698405).
- 5. Albert Howard, Yashwant Wad. The Waste Products of Agriculture. Benediction Classics, 1st Edition, 2011. (ISBN-13: 9781849025).

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

CO PO Mapping
23BTFTOE05 DESIGN OF FOOD PROCESS EQUIPMENT 3H-3C

Instruction Hours/week: L:3 T:0 P:0 Marks: Internal:40 External:60 Total:100 End Semester Exam:3 Hour

Course Objective

The goal of this course is for students to,

- 1. To illustrate the types of materials used in the food processing equipments.
- 2. To discuss the materials and designing of different storage vessel.
- 3. To explain the importance of reaction vessel and their deskining techniques.
- 4. To explain the materials and designing of heat exchanger and evaporators.
- 5. To discuss the importance of dryers in food processing industries.

Course Outcome

Upon completion of this course, students will be able to,

- 1. Outline the materials suitable for the construction of equipment's.
- 2. Summarize the vessels used for food storage in the industries.
- 3. Classify types of reaction vessel used for different purposes.
- 4. Discuss the importance of heat exchanger in the designing of food processing equipment's.
- 5. Infer the significance of dryers in food processing.

UNIT I - MATERIALS

Metals and non-metals, design of pressure vessels – cylindrical shell –internal and external pressure - under continued loadings. Materials for fabrication, mechanical properties, ductility, hardness, corrosion, protective coatings, corrosion prevention linings equipment, choice of materials, material codes Numerical problem and design of pressure vessel.

UNIT II - STORAGE VESSELS

Design of storage vessels – Rectangular Tank without stiffeners – with stiffeners – shell design – Numerical problem and design. Design of agitators and baffles. Design considerations: Stresses created due to static and dynamic loads, combined stresses, design stresses and theories of failure, safety factor, temperature effects, radiation effects, effects of fabrication method, economic considerations;

UNIT III - REACTION VESSELS

Design of Reaction vessels – materials -classification – jackets-Design of vessel shell with half coil – Design of vessel shell with jacket – Numerical problem and design.

Hazards in process industries, analysis of hazards, safety measures, safety measures in equipment design, pressure relief devices.

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UNIT IV - HEAT EXCHANGERS

Design of Heat exchangers – types – materials – Design pressure and temperature- shell design – tubes - Numerical problem. -Design of Equipment. Evaporator: Materials of concentration – types – design- consideration – Design of agitators – power requirements – Design based on Torque – critical speed.

UNIT V – DRYERS

Types - General considerations – Design of Tray dryer, Rotary Dryer, fluidized bed dryer, spray dryer, vacuum dryer, microwave dryer – Material Balance, Thermal energy Requirements, electrical energy Requirements, Performance Indices

TOTAL: 45

Text Books:

- 1. Maroulis Z.B. and Saravacos G.D. Food Process Design, Marcel Dekker Inc.ISBN- 0824743113, 2003.
- 2. Joshi M.V, "Process Equipment Design", Macmillan India Ltd., 1985.
- 3. Coulson, J.M. and Richardson, J. F, "Chemical Engineering " Butterworth-HeinemnnElsevier, ISBN-0750644451, 2002.

CO PO Mapping

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

23BEEEOE01RENEWABLE ENERGY SYSTEMS3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- 1. To gain the knowledge about environmental aspects of energy utilization.
- 2. To understand the basic principles of solar cells, photovoltaic conversion.
- 3. To understand the basic principles of wind energy conversion.
- 4. To gain the knowledge about hydro and ocean energy.
- 5. To understand the basic principles of Biomass, fuel cell, Geothermal powerplants and MHD.

Course Outcomes

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.	Apply
CO2	Selection, Operation and Operation of Solar PV System for different types of applications	Apply
CO3	Selection and Operation of Wind Turbine system	Understand
CO4	Selection and Operation of Hydroelectric Plant and Ocean Energy	Understand
CO5	Biomass Power Generation Types, Applicability and Limitations, Selection and Operation of Fuel Cell, Geo thermal plants and MHD	Understand

Mapping with Programme Outcomes

Cos	Р 01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P 01 0	PO 11	PO 12	P SO 1	PS O2
CO1	1	1	1	1	1	2	3	2	2	1	1	3	2	1
CO2	3	2	2	1	1	1	3	1	1	1	2	3	2	1
CO3	3	2	3	1	2	1	3	1	1	1	1	3	1	1
CO4	2	1	2	1	2	1	3	1	1	1	1	3	2	1
CO5	2	2	2	1	2	1	3	1	1	1	2	3	2	2
Avg	2.2	1.6	2	1	1.6	1.2	3	1.2	1.2	1	1.4	3	1. 8	1.2

UNIT I INTRODUCTION

Energy scenario - Different types of Renewable Energy Sources -Environmental aspects of energy utilization - Energy Conservation and Energy Efficiency - Needs and Advantages, Energy Conservation Act 2003.

UNIT II SOLAR ENERGY

Introduction to solar energy: solar radiation, availability, measurement and estimation–Solar thermalconversion devices and storage – solar cells and photovoltaic conversion –PV systems – MPPT. Applications of PV Systems – solar energy collectors and storage.

UNIT III WIND ENERGY

Introduction – Basic principles of wind energy conversion- components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT IV HYDRO ENERGY

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, oceanenergy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V OTHER SOURCES

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic(MHD) energy conversion.

SUGGESTED READINGS

- 1. Rai.G.D, Non-conventional sources of energy Khanna publishers, 2011
- 2. Khan.B.H, Non-Conventional Energy Resources , The McGraw Hills, Second edition,2012
- 3. John W Twidell and Anthony D Weir, Renewable Energy Resources, Taylor and Francis 3rdedition, 2015
- 4. Fundamentals and Applications of Renewable Energy | Indian Edition, by Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala, cGraw Hill; First edition (10 December 2020), ISBN-10 : 9390385636.

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HYBRID ELECTRIC VEHICLES

3H-3C

Instruction Hours/week: L:3 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- 1. To understand the basics of electric and hybrid electric vehicles, their architecture, technologies and fundamentals.
- 2. To familiarize the plug in hybrid electric vehicle architecture, design and component sizing and the power electronics devices used in hybrid electric vehicles.
- 3. To analyze various electric drives suitable for hybrid electric vehicles.
- 4. To discuss different energy storage technologies used for hybrid electric vehicles and their control.
- 5. To demonstrate different configurations of electric vehicles and its components, hybrid vehicle configuration by different techniques, sizing of components and design optimization and energy management.

Course Outcomes

At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Explain the basics of electric and hybrid electric vehicles,	Understand
	their architecture, technologies and fundamentals	
CO2	Analyze the use of different power electronics devices and	Apply
	electrical machines in hybrid electric vehicles.	
CO3	Explain the use of different energy storage devices used	Understand
	for hybrid electric vehicles, their technologies and control	
	and select appropriate technology	
CO4	Interpret working of different configurations of electric	Apply
	vehicles and its components, hybrid vehicle configuration.	
CO5	Analysis the performance of Energy Management	Apply
	strategies in HEVs.	

Cos	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO10	PO11	P O 12	P S O 1	P S O2
CO1	CO1	2	3	2	2	1	1	3	-	-	-	-	-	2	3
COI															
CO	CO2	1	3	2	2	3	-	3	-	-	-	-	-	3	3
2															
CO	CO3	2	3	2	2	2	2	3	-	-	-	-	-	3	3
3															
CO	CO4	1	3	3	3	3	1	3	-	-	-	-	-	3	3
4															

CO	CO5	1	3	3	3	3	1	3	-	-	-	-	-	-	3
5															
Avg	СО	1.4	3	2	2.4	1.8	1	3	-	-	-	-	-	2	3
														.2	

UNIT I INTRODUCTION

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drivetrains on energy supplies.

UNIT II HYBRID E1ECTRIC DRIVE-TRAINS

Basic concept of hybrid traction, introduction to various hybrid drivetrain topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III E1ECTRIC PROPU1SION UNIT

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC motor drives, Configuration and control of Induction motor drives, configuration and control of Permanent magnet motor drives, Configuration and control of Switch Reluctance motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Suggested Readings

- 1. C. mi, m. A. masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons,m011.
- 2. S. Onori, 1. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy managementStrategies", Springer, m015.
- 3. m. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "modern Electric, Hybrid Electric, and Fue1Ce11 Vehic1es: Fundamenta1s, Theory, and Design", CRC Press,m004.
- 4. T. Denton, "Electric and Hybrid Vehicles", Routledge, m016.

Websites

- 1. https://www.energy.gov/eere/e1ectricvehic1es/e1ectric-vehic1e-basics
- 2. https://swayam.gov.in/nd1_nocm0_ee18/preview

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23BEMEOE01BATTERY MANAGEMENT SYSTEM3 H - 3 C

Instruction hours / week L : 3 T : 0 P : 0 Marks: Internal : 40 External : 60 Total: 100

End Semester Exam: 3 Hours

COURSE OBJECTIVES:

The goal of this course is for the students to:

- 1. Demonstrate familiarity with alternative energy sources and their role in sustainability.
- 2. Analyze energy requirements for different hybrid and electric vehicles.
- 3. Examine the principles and components of lithium-ion batteries.
- 4. Explore advancements in battery technologies.
- 5. Apply knowledge of battery management systems and ensure safety in high-voltage batteries.

COURSE OUTCOMES:

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

- 1. Apply understanding of alternative energy and sustainability to electric transportation.
- 2. Analyze energy needs for hybrid and electric vehicles and select appropriate batteries.
- 3. Comprehend the operation and design of lithium-ion batteries.
- 4. Stay updated on advancements in battery technology.
- 5. Implement battery management systems and prioritize safety in high-voltage batteries.

UNIT – I ENERGY STORAGE SYSTEMS

General background on alternative energy sources and sustainability, Introduction to electricbasedtransportation, Overview of on-road vehicle electrification, EVs configuration, Energy and power requirements for various HEVs and EVs Vehicle performance and driving cycles.

UNIT – II LITHIUM BATTERIES

Li-ion batteries - Principle of operation, Battery components and design Electrode, cell and battery fabrications, Building block cells, battery modules and packs and applications. All solid-state batteries and future developments, Li-Sulphur battery, Li-Air battery, Sodiumbattery, Magnesium battery, Aluminium battery, Silicon battery.

UNIT – III HIGH TEMPERATURE BATTERIES FOR BACK-UP APPLICATIONS

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Advance Ni-MH batteries for transportation, Future prospects of Ni-MH batteries vs. lithium ion batteries, Zebra cell, Li-iron sulphide cells, Vanadium and iron-based batteries, Semi-fluid flow batteries for large scalegrid application, Ni-H2 cells for space applications.

UNIT – IV FUEL CELLS AND BATTERY RECYCLING TECHNOLOGY

Introduction to fuel cells, Proton-exchange membrane and alkaline fuel cells for transportation, Solid oxidefuel cells, Technology and economic aspects of battery recycling, Environmental effect and controlling of poisonous chemicals contamination.

UNIT - V BATTERY MANAGEMENT

Fundamentals of battery management systems and controls, Battery Thermal Management -Passive cooling, Active cooling -Liquids and air systems. Regulations and Safety Aspects of High Voltage Batteries, Code and Standards, Safe handling of LithiumBatteries, Safety of high voltage battery.

TOTAL: 45

TEXT BOOKS:

- Gerardus Blokdyk, Battery Management System A Complete Guide, Springer, 2019 Edition.
- Reiner Korthauer, Lithium-Ion Batteries: Basics and Applications, 1st Edition. Springer, 2018

REFERENCE BOOKS:

- 1. Alfred Rufer, Energy Storage: Systems and Components, 1st Edition, CRC Press, 2017.
- Arno Kwade and Jan Diekmann, Recycling of Lithium-Ion Batteries: The LithoRec Way (SustainableProduction, Life Cycle Engineering and Management), 1st Edition. Springer, 2018.

WEBSITES:

- 1. https://nptel.ac.in/courses/108/103/108103009/
- 2. https://web1.eng.famu.fsu.edu/~patelsa/Files/FinalReport.pdf

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2
CO1	-	-	-	-	-	2	2	-	-	-	-	-	3	-
CO2	3	3	2	-	-	-	-	-	2	-	2	-	3	-
CO3	3	3	2	-	2	-	-	-	2	-	-	2	3	-
CO4	-	-	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	3	2	2	2	2	2	2	2	2	2	2	3	-
Avg	1.8	1.8	1.2	0.4	0.8	0.8	0.8	0.4	1.2	0.4	0.8	1.2	3	-

B.E- Mechanical Engineering

2023-2024

23BEMEOE02

Instruction hours / week L: 3 T: 0 P: 0Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3 Hours

COURSE OBJECTIVE

The goal of this course is for the students to:

- 1. To provide in-depth knowledge on various techniques of non-destructive testing.
- 2. To acquaint the student with the need and awareness of the safety concepts.
- 3. To understand the importance of various safety techniques involved in industrial sector.
- 4. To introduce the concepts of accident zone and prepare reports related to it.
- 5. To develop an understanding of safety monitoring.

COURSE OUTCOME

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

- 1. Understand the need and awareness of the safety concepts.
- 2. Understand the various safety techniques involved in industrial sector.
- 3. Record and investigate the accident zone and prepare reports related to it.
- 4. Conduct basic safety inspections using strategies that they have developed.
- 5. Train about the education and training based on safety.

UNIT I CONCEPTS OF SAFETY ENGINEERING

Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety.

UNIT II TECHNIQUES OF SAFETY ENGINEERING

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Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

UNIT III ACCIDENT INVESTIGATION AND REPORTING

Concept of an accident, reportable and non-reportable accidents, unsafe act and condition – principles of accident prevention, Supervisory role- Role of safety committee – Accident causation models - Cost of accident. Overall accident investigation process - Response to accidents, India reporting requirement, Planning document, Planningmatrix, Investigators Kit, functions of investigator, four types of evidences, Records of accidents, accident reports

UNIT IV SAFETY PERFORMANCE MONITORING

Reactive and proactive monitoring techniques - Permanent total disabilities, permanent partial disabilities, temporary total disabilities -Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety "t" score, safety activity rate – problems.

UNIT V SAFETY EDUCATION AND TRAINING

Importance of training-identification of training needs-training methods – programme, seminars, conferences, competitions – method of promoting safe practice – motivation – communication – role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training. Modern safety equipment and technics – Case study.

TEXT BOOKS:

- 1. Accident Prevention Manual for Industrial Operations,3rd edition, N.S.C.Chicago, 2020 (digital).
- 2. Heinrich H.W. "Industrial Accident Prevention", 2ndedition, Tata McGraw-Hill, NewYork, 2017.

REFERENCE BOOKS:

- 1. Krishnan N.V, Safety Management in Industry,1st edition, Jaico Publishing House, Bombay, 2017.
- 2. John R Ridley, Safety at Work,3rd edition, Elsevier, 2019.

WEBSITES:

- 1. https://onlinecourses.nptel.ac.in/noc19_me40/preview
- 2. https://www.studocu.com/in/document/

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2	1	2	2	2	1	1	-	-	2	2	-
CO2	3	1	2	1	2	2	2	1	1	-	-	2	2	-
CO3	3	1	2	1	2	2	2	1	1	-	-	2	2	-
CO4	3	1	2	1	2	2	2	1	1	-	-	2	2	-
CO5	3	1	2	1	2	2	2	1	1	-	-	2	2	-
Avg	3	1	2	1	2	2	2	1	1	-	-	2	2	-

B.E- Mechanical Engineering

23BEMEOE03 NON-DESTRUCTIVE TESTING 3H-3CMarks: Internal: 40 External: 60 Total: 100

Instruction hours / week L: 3 T: 0 P: 0

End Semester Exam: 3 Hours

COURSE OBJECTIVE

The goal of this course is for the students to:

- 1. The main objectives of this course are to introduce the concept of non-destructive testing among the students and make them understand various types of nontraditional practices available for manufacturing industry.
- To provide in-depth knowledge on various techniques of non-destructive testing. 2.
- 3. To provide an overview of destructive and non-destructive tests and state their applications.
- 4. To study the features of NDT techniques for various products and to understand the established NDE techniques and basic familiarity of emerging NDE techniques.
- 5. To expose students to skills needed for selection of appropriate NDT technique(s) for new inspection jobs.

COURSE OUTCOME

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

- 1. Understand the codes, standards and specifications related to NDT.
- 2. Classify the destructive and non-destructive tests and state their applications.
- 3. Develop NDT techniques for various products.
- 4. Acquire skills needed for selection of appropriate NDT technique(s) for new inspection jobs.
- 5. Acquire sound knowledge of established NDE techniques and basic familiarity of emerging NDE techniques.

UNIT I **INTRODUCTION**

Properties of Engineering Materials - Types of Defects - Surface and Sub-Surface of a component - Characteristics of Ferrous, Non-ferrous and Alloys. Classification of Destructive testing and Non-Destructive testing – Uses and applications. Codes, Standards and Specifications of NDT (ASME, ASTM, AWS etc.). Importance and Scope of NDT, Non-destructive testing methods.

PENETRANT TESTING AND MAGNETIC PARTICLE UNIT II **INSPECTION** 9

Introduction to Penetrant Testing – Liquid Penetrants and Dye Penetrants - Apparatus required for LPT - An Illustration of Penetrant Testing, Application, Advantages and Disadvantages of Penetrants Testing.

Introduction to Magnetic Particle Inspection – MPT Equipments and devices - An Illustration of Magnetic Particle Inspection, Application, Advantages and Disadvantages of Magnetic Particle Crack Detection.

UNIT III ULTRASONIC FLAW DETECTION AND RADIOGRAPHY NSPECTION 9

Introduction to Ultrasonic Flaw Detection, UT Equipments and devices, An Illustration of Ultrasonic Flaw Detection, Application, Advantages and Disadvantages of Ultrasonic Flaw Detection.

Principle of Radiography Inspection, RT Equipments and devices Radiation sources, uses of x-rays and gamma rays Attenuation in the specimen, Radiographic imaging, Inspection Techniques, Application and limitations, Safety from Radiation.

UNIT IV EDDY CURRENT TESTING AND VISUAL TESTING METHODS 9

Introduction to Eddy Current Testing. ECT Equipments and devices, An Illustration of Eddy Current Testing Equipment, Application, Advantages and Disadvantages of Eddy Current Testing.

Introduction to visual testing method, Equipments required for VT - An Illustration of visual testing method, Application, Advantages and Disadvantages of visual testing method.

UNIT V NON-DESTRUCTIVE INSPECTION(NDI) AND ITS APPLICATIONS

9

Inspection of Raw Products, Inspection for In-Service Damage, Power Plant Inspection, Storage Tank Inspection, Automobile component Inspection, Jet Engine Inspection, Pressure Vessel Inspection, Bridge Inspection, Pipeline Inspection.

TEXT BOOKS:

- 1. Sadashiva. M Non Destructive Testing Paperback 15 July 2021.
- 2. Ramachandran. S and Anderson. A Non-Destructive Testing Kindle Edition 2018.

REFERENCE BOOKS:

1. J. Prasad and C. G. Krishnadas Nair - Non-Destructive Test and Evaluation of Materials Hardcover – 2017.

2. Lari and Kumar - Basics of Non - Destructive Testing Paperback - 1 January 2013.

WEBSITES:

- 1. https://ndttrainingonline.com
- 2. https://onlinendts.com/

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	2	2	-	-	2	-	2	2	2	-
CO2	3	2	2	1	2	2	-	-	2	-	2	2	2	-
CO3	3	2	2	1	2	2	-	-	2	-	2	2	2	-
CO4	3	2	2	1	2	2	-	-	2	-	2	2	2	-
CO5	3	2	2	1	2	2	-	-	2	-	2	2	2	-
Avg	3	2	2	1	2	2	-	-	2	-	2	2	2	-

2023-2024

23BEME7E04

OPERATIONS RESEARCH

3H-3C

Instruction hours / week L : 3 T : 0 P : 0 Marks: Internal : 40 External : 60 Total: 100

End Semester Exam : 3 Hours

COURSE OBJECTIVE

- 1. To provide students the knowledge of optimization techniques and approaches.
- 2. To enable the students apply mathematical, computational and communication skills needed for the practical utility of Operations Research.
- 3. To understand the Engineering and Managerial situations in Transportation.
- 4. To make the student acquire sound knowledge on sequences to perform operation among various alternatives.
- 5. To teach students about networking, inventory, queuing, decision and replacement models.

COURSE OUTCOME

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

1. Apply operations research techniques like L.P.P, scheduling and sequencing in industrial

optimization problems.

- 2. Evaluate transportation problems using various OR techniques.
- 3. Explain various OR models like Inventory, Queuing, Replacement, Simulation, Decision etc.

and apply them for optimization.

- 4. Use OR tools in a wide range of applications in industries.
- 5. Identify current topics and advanced techniques of Operations Research for industrial solutions.
- 6. Identify best techniques to solve a specific problem.

UNIT I INTRODUCTION TO OPERATIONS RESEARCH 9 Operations research and decision-making – types of mathematical models and constructing the model – Role of computers in operations research –Linear Programming Techniques: Formulation of linear programming problem, applications and limitations, graphical method, simplex method – The Big –M method – the two– phase method.

UNIT II TRANSPORTATION PROBLEMS

Least cost method, North west corner rule, Vogel's approximation method, modified distribution method, unbalance and degeneracy in transportation model, shortest route algorithm – dijkestra algorithm.

UNIT III ASSIGNMENT MODELS AND SCHEDULING

9

Assignment models - Hungarian algorithm, unbalanced assignment problems

- maximization case in assignment problems, traveling salesman problem.

Scheduling – processing n jobs through two machines, processing n jobs through three machines, processing two jobs through 'm' machines, processing n jobs through m machines.

UNIT IV INVENTORY CONTROL AND QUEUING THEORY

Variables in inventory problems, inventory models with penalty, shortage and quantity discount, safety stock, multi item deterministic model. Queuing Models: Queues – Notation of queues, performance measures, The M/M/1 queue, The M/M/mqueue, batch arrival queuing system, queues with breakdowns.

UNIT V PROJECT MANAGEMENT AND REPLACEMENT MODELS

Basic terminologies, constructing a project network, network computations in CPM and PERT, cost crashing Replacement Models: Replacement of Items due to deterioration with and without time value of Money, Group replacement policy, Staff replacement

SUGGESTED READINGS

- Kanti Swarup, Operations Research, 12th edition, Sultan Chand and Sons, New Delhi, 2010.
- Viswanathan N and Narahari Y, Performance Modeling of Automated Manufacturing Systems,2nd edition,Prentice Hall of India,New Delhi, 2005
- Prem kumar Gupta and Hira D.S, Operation Research, 1st edition, S Chand and Company Limited, NewDelhi, 2017

CO-PO MAPPING

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2
CO1	3	3	2	2	2	2	-	-	2	-	2	2	2	2
CO2	3	3	3	2	3	3	-	-	2	-	2	2	2	2
CO3	3	2	3	3	3	3	-	-	2	-	2	2	2	2
CO4	2	2	3	3	3	2	-	-	2	-	2	2	2	2
C05	3	3	2	2	2	2	-	-	2	-	2	2	2	2
Avg	2.8	2.6	2.6	2.6	2.6	2.4	-	-	2	-	2	2	2	2

B.E Electronics and Co	mmunication Engi	neering		2023-2024
23BEECOE01	REAL TIME	EMBEDDED SYST	EMS	3H-3C
Instruction Hours/wee	k: L:3 T:0 P:0	Marks: Inter	nal :40 Exte	ernal:60 Total:100
			End Ser	mester Exam:3 Hours

Course Objectives:

The goal of this course for students is

- 1. To introduce students to the embedded systems, its hardware and software.
- 2. To introduce devices and buses used for embedded networking.
- 3. To study about task management.
- 4. To learn about semaphore management and message passing.
- 5. To study about memory management.

Course Outcomes:

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

- 1. Explain the Embedded systems and its hardware and software.
- 2. Illustrate the devices and buses used for embedded networking.
- 3. Construct about task management.
- 4. Summarize semaphore management and message passing.
- 5. Demonstrate the memory management system.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEM

Introduction- Embedded systems description, definition, design considerations & requirements-Overview of Embedded System Architecture (CISC and RISC)-Categories of Embedded Systemsembedded processor selection & tradeoffs- Embedded design life cycle -Product specificationshardware / software partitioning- iterations and implementation- hardware software integration – product testing techniques–ARM7.

UNIT-II OPERATING SYSTEM OVERVIEW

Introduction–AdvantageandDisadvantageofUsingRTOS–Multitasking–Tasks-RealTimeKernels – Scheduler- Non-Preemptive Kernels – Preemptive Kernels – Reentrancy- Reentrant Functions– Round Robin Scheduling- Task Priorities- Static Priorities– Mutual Exclusion–Deadlock– Inter task

9

5. JanezPuhan, Operating systems, Embedded systems and Real-time systems, CIP - Cataloging

- Web links:
 - 1. https://nptel.ac.in/courses/10810505.
 - 2. https://onlinecourses.nptel.ac.in/noc21 cs98/preview.
 - 3. https://nptel.ac.in/courses/108102045.
 - 4. https://archive.nptel.ac.in/courses/106/105/106105193/

Karpagam Academy of Higher Education (Deemed to be University) Coimbatore -641021 206

UNIT-III TASK MANAGEMENT

Introduction-µ C/OS-II Features-Goals ofµ C/OS-II-Hardware and Software Architecture-KernelStructures: Tasks-Task States-Task Scheduling-Idle Task-Statistics Task-Interrupts Underu C/OS-II-Clock Tick-µ C/OS- II Initialization. Task Management: Creating Tasks-Task Stacks-StackChecking-Task'sPriority-SuspendingTask-ResumingTask.TimeManagement: Delaying aTask-Resuming a Delayed Task-System Time. Event Control Blocks-Placing a Task in the ECB Wait List-Removing a Task from an ECB wait List.

Communication-Message Mailboxes-Message Queues- Interrupts- Task Management-Memory

UNIT-IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING

Semaphore Management: Semaphore Management Overview- Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox–Waiting for a Message box–Sending Message to a Mailbox- Status of Mailbox. Message Queue Management: Creating Message Queue-Deleting a Message Queue-Waiting for a Message Queue-Sending Message to a Queue-Flushing a Queue.

UNIT-V MEMORY MANAGEMENT

Memory Management: Memory Control Blocks-Creating Partition-Obtaining a Memory Block-Returning a Memory Block. Getting Started with C/OS-II-Installing C/OS-II-Porting C/OS-II:Development Tools–Directories and Files–Testing a Port-IAR Workbench with C/OS-II-µ C/OS-II Porting on a 8051CPU- Implementation of Multitasking- Implementation of Scheduling and Rescheduling –Analyze the Multichannel ADC with help of µC/OS-II.

Suggested Readings:

- 1. JeanJ. Labrosse, Micro C/OS–II The Real Time Kernel, CMPBOOKS, 2009.
- 2. David Seal, ARM Architecture, Reference Manual, Addison-Wesley, 2008.
- 3. Steve Furbe, ARM System-on-Chip, Architecture, Addison-Wesley Professional, California, 2000.
- 4. K.C. Wang, Embedded and Real-Time Operating Systems, Springer, 2017.
- In Publication, 2015.

Management-Time Management-Clock Ticks.

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CO's-PO's & PSO's MAPPING

Cos	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
GQ 1	1	3	3	3	2	2	-	-	-	-	-	-	-	3	2
COI															
CO2	2	3	3	3	2	2	-	-	-	-	-	-	-	3	2
CO3	3	3	3	2	2	2	-	-	-	-	-	-	-	2	1
CO4	4	3	3	2	2	2	-	-	-	-	-	-	-	3	3
CO5	5	3	3	3	3	3	-	-	-	-	-	-	-	3	3
Avg	СО	3	3	2.6	2.2	2.2	-	-	-	-	-	-	-	2.8	2.2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

B.E Electronics and Cor	neering	2023-2024						
23BEECOE02	CONSUM	ER ELECTRONICS	3H-3C					
Instruction Hours/week	: L:3 T:0 P:0	Marks: Internal:40 External:60 Total:100						
		End Sem	nester Exam:3 Hours					

Course Objectives:

The goal of this course for students is

- 1. To study about various speakers and microphone.
- 2. To learn the fundamental of television systems and standards.
- 3. To learn the process of audio recording and reproduction.
- 4. To study various telephone networks.
- 5. To discuss about the working of home appliances.

Course Outcomes:

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

- 1. Explain working of various type of loud speakers.
- 2. Illustrate knowledge on various types of picture tubes.
- 3. Demonstrate the working of various optical recording systems.
- 4. Summarize various telecommunication networks.
- 5. Describe the working of various home appliances.

UNIT I LOUDSPEAKERS AND MICROPHONES

Introduction Loudspeaker, types of loud speakers, Loudspeaker characteristics, Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters – Introduction Microphone, Types of Microphone, Microphone Characteristics, Carbon Microphones, Dynamic Microphones and Wireless Microphones.

UNIT II TELEVISION STANDARDS AND SYSTEMS

Introduction to TV system - Components of a TV system–Scanning – types of scanning-interlacing– Colour TV Fundamentals - Additive Mixing- Subtractive Mixing- Need for Synchronization-Aspect Ratio-Video Bandwidth -Positive and Negative Transmission-Advantages of Negative Transmissioncomposite video signal - Colour TV system– Luminance and Chrominance signal- Monochrome and Colour Picture Tubes- Color TV systems– NTSC, PAL, SECAM.

UNIT III OPTICAL RECORDING AND REPRODUCTION

Introduction to Audio disc - Audio Disc- Processing of the Audio signal-Readout from the Disc - Reconstruction of the audio signal-Introduction to Video Disc recording -video disc mastering and replication - Video disc formats- Recording Systems-Playback Systems.

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UNIT IV TELECOMMUNICATION SYSTEMS

Introduction to telecommunication Systems – Modes of telecommunication system-line system characteristics – Radio system characteristics –Signaling- Station Interconnection - Telephone services-telephone networks–switching system principles–PAPX or PBX switching–Data Services - Circuit, Packet and Message Switching, Telephone Networks - LAN, MAN and WAN, Integrated Services Digital Network. Introduction to Mobile radio systems- Wireless Local Loop – the role of WLL – types of WLL - VHF/UHF radio systems- Limited range Cordless Phones –Introduction to cellular communication - cellular modems.

UNIT V HOME APPLIANCES

Introduction to home appliances – types of home appliances- Microwaves - Basic principle and block diagram of microwave oven -Washing Machine- electronic controller for washing machines - washing machine hardware and software –Introduction to air conditioners and refrigerators - Components of air conditioning systems – types of air conditioning systems- Refrigeration – Refrigeration systems – types of Refrigeration systems.

Suggested Readings:

- 1. S.P. Bali, Consumer Electronics, PearsonEducation, 2007.
- 2. J.S.Chitode, Consumer Electronics, Technical Publications, 2007.
- 3. Philip Hoff, Philip Herbert Hoff, Consumer Electronics for Engineers, Cambridge University Press, 1998.
- 4. R.G.Gupta, Audio & Video Systems, Tata McGraw hill Publishing Company Ltd, 2004.

Web links:

- 1. https://nptel.ac.in/courses/117105133
- 2. https://archive.nptel.ac.in/courses/117/104/117104127/
- 3. https://nptel.ac.in/courses/117102059
- 4. https://nptel.ac.in/courses/108101091

CO's-PO's & PSO's MAPPING

Cos	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	1	3	3	2	3	2	-	-	-	-	-	-	-	1	1
CO1															
CO2	2	3	3	3	2	2	-	-	-	-	-	-	-	1	1
CO3	3	3	3	2	2	2	-	-	-	-	-	-	-	2	2
CO4	4	3	3	3	3	2	-	-	-	-	-	-	-	3	2
CO5	5	3	3	3	3	2	-	-	-	-	-	-	-	2	2
Avg	СО	3	3	2.6	2.6	2	-	-	-	-	-	-	-	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation