Study & Evaluation Scheme of

Master of Technology In Structural Engineering

[Applicable for 2020-22]

Version 2020.

[As per CBCS guidelines given by UGC]

Approved in BOS	Approved in BOF	Approved in Academic Council
29/07/2020	22/08/2020	13/09/2020 Vide Agenda No. 4.3.1

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Website: www.quantumuniversity.edu.in

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22 KM Milestone, Dehradun-Roorkee Highway, Roorkee (Uttarakhand)

Study & Evaluation Scheme

Study Summary

Name of the Faculty	Faculty of Technology
Name of the School	Quantum School of Technology
Name of the Department	Department of Civil Engineering
Program Name	Master of Technology Structural Engineering
Duration	2 Years
Medium	English

Evaluation Scheme

Type of Papers	Internal Evaluation (%)	End Semester Evaluation (%)	Total (%)
Theory	40	60	100
Practical/ Dissertations/Project Report/ Viva-Voce	40	60	100
Internal Evaluation Components (Theory Papers)			
Mid Semester Examination	60 Marks		
Assignment –I	30 Marks		
Assignment-II	30 Marks		
Attendance	30 Marks		
Internal Evaluation Components (Practical Papers)			
Quiz One	30 Marks		
Quiz Two	30 Marks		
Quiz Three	30 Marks		
Lab Records/ Mini Project	30 Marks		
Attendance	30 Marks		
End Semester Evaluation (Practical Papers)			
ESE Quiz	40 Marks		
ESE Practical Examination (write-up)	20 Marks		
Viva- Voce	20 Marks		
Practical performance	20 Marks		

Structure of Question Paper (ESE Theory Paper)

The question paper will consist of 5 questions, one from each unit. Student has to Attempt all questions. All questions carry 20 marks each. Parts a) and b) of question Q1 to Q5 will be compulsory and each part carries 2 marks. Parts c), d) and e) of Q1 to Q5 Carry 8 marks each and the student may attempt any 2 parts.

Important Note:

1. *The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy). The standard of question paper will be based on mapped BL level complexity of the unit of the syllabus, which is the basis of CO attainment model adopted in the university.*

2. Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.

3. There shall be continuous evaluation of the student and there will be a provision of real time reporting on QUMS. All the assignments will evaluated through module available on ERP for time and access management of the class.

Program Structure – Master of Technology in Structural Engineering

Introduction

Master of Technology in Structural engineering syllabus is broad and multidisciplinary consists of various courses in Structural Engineering, Environmental Engineering, Geotechnical Engineering, Transportation Engineering, Construction Engineering, Urban and Community Planning apart from supporting courses in Basic Sciences, Humanities, and Agricultural Engineering.

The Master of Technology in Structural engineering subjects are designed in such a way that students grasp all the knowledge related to Structural Engineering. Towards enhancing employability and entrepreneurial ability of the graduates the Quantum University increase the practical content in the courses wherever necessary.

In order to harness regional specialties and to meet region-specific needs the Quantum University modify the content of syllabus as per the regional demands

Curriculum (2020-22) Version 2020.01

Quantum School of Technology

Master of Technology in Structural engineering **– PC: 01-4-05**

BREAKUP OF COURSES

Sr. No	CATEGORY	CREDITS
1	Program Core (PC)	27
2	Program Electives (PE)	15
3	Project/Dissertation	15
4	Seminar	06
5	General Proficiency	03
TOTAL NO. OF CREDITS		66

SEMESTER-WISE BREAKUP OF CREDITS

Sr. No.	CATEGORY	SEM	SEM	SEM	SEM	TOTAL
1	Program Core	15	08	04	-	27
2	Program Electives	-	06	09	-	15
3	Projects/Dissertation	-	-	04	11	15
4	Seminar	02	02	02	-	06
5	GP	01	01	01	-	03
	TOTAL	18	17	20	11	66

Minimum Credit Requirement

M. Tech: 66 Credits

SEMESTER 1

Course Code	Category	Course Title	L	T	P	C	Version	Course Prerequisite
CE4101	PC	Structural Analysis-A Matrix Approach	3	1	0	4	1.0	Nil
CE4102	PC	Advance Construction Techniques	3	0	0	3	1.0	Nil
CE4103	PC	Advanced Design of Concrete Structures	3	1	0	4	1.0	Nil
CE4104	PC	Bridge Design	3	1	0	4	1.0	Nil
	PE	Program Elective I	3	0	0	3	1.0	Nil
CE4170	FW	Seminar I	2	0	0	2	1.0	Nil
GP4101	GP	General Proficiency	0	0	0	1		
TOTAL			17	3	0	21		

Contact Hrs. 20

SEMESTER II

Course	Category	Course Title	L	T	P	C	Version	Course
CE4201	PC	Advanced Design of Steel Structures	3	2	0	4	1.0	Nil
CE4202	PC	Design of Pre-stressed Concrete Structures	3	0	0	3	1.0	Nil
CE4240	PC	RCC Design Lab	0	0	2	1	1.0	Nil
	PE	Program Elective II	3	0	0	3	1.0	Nil
	PE	Program Elective III	3	0	0	3	1.0	Nil
CE4270	FW	Seminar II	2	0	0	2	1.0	Nil
GP4201	GP	General Proficiency	0	0	0	1		
TOTAL			14	2	2	17		

Contact Hrs. 18

SEMESTER-III

Course	Category	Course Title	L	T	P	C	Version	Course
CE4340	PC	Foundation and Steel Design Lab	0	0	2	1	1.0	Nil
ME4307	PC	Research Methodology	2	0	0	2	1.0	Nil
ME4340	PC	Research Methodology Lab	0	0	2	1	1.0	Nil
	PE	Program Elective IV	3	0	0	3	1.0	Nil
	PE	Program Elective V	3	0	0	3	1.0	Nil
CE4370	FW	Project	0	0	8	4		
CE4371	FW	Seminar	2	0	0	2		
GP4301	GP	General Proficiency	0	0	0	1		
Total			10	0	12	17		

Contact Hrs. 22

SEMESTER-IV

Course	Category	Course Title	L	T	P	C	Version	Course
CE4470	FW	Dissertation	0	0	4	11		
Total			0	0	4	11		

Contact Hrs. 04

PROGRAM ELECTIVE (PE) COURSES

Elective	Course	Course Title	L	T	P	C	Version	Course
I	CE4105	Finite Element Analysis	3	0	0	3	1.0	Nil
	CE4106	Concept of Ductile Detailing	3	0	0	3	1.0	Nil
	CE4107	Construction Machinery and Equipment's	3	0	0	3	1.0	Nil
II	CE4209	Design of Tall Buildings	3	0	0	3	1.0	Nil
	CE4210	Theory of Plates and Shells	3	0	0	3	1.0	Nil
	CE4211	Fire Resistance of Structures	3	0	0	3	1.0.	Nil
III	CE4212	Safety of Structures	3	0	0	3	1.0	Nil
	CE4213	Soil Structure Interaction	3	0	0	3	1.0	Nil
	CE4214	Environment Impact Assessment	3	0	0	3	1.0	Nil
IV	CE4304	Advanced Foundation Engineering	3	0	0	3	1.0	Nil
	CE4305	Computer Application in Design	3	0	0	3	1.0	Nil
V	CE4306	Advanced Concrete	3	0	0	3	1.0	Nil
	CE4307	Plastic Analysis	3	0	0	3	1.0	Nil

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our university.

The following is the course module designed for the M. Tech Structural Engineering program:

Core competency: Students will acquire core competency in M. Tech Structural Engineering and in allied subject areas.

Skilled communicator: The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

Critical thinker and problem solver: The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic& advance knowledge and concepts of civil engineering.

Sense of inquiry: It is expected that the course curriculum will develop an inquisitive characteristic among the students through appropriate questions, planning and reporting experimental investigation.

Skilled project manager: The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled project manager by acquiring knowledge about mathematical project management, writing, planning, study of ethical standards and rules and regulations pertaining to scientific project operation.

Ethical awareness/reasoning: A graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.

Lifelong learner: The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available techniques/books/journals for personal academic growth as well as for increasing employability opportunity.

Value Added Course (VAC): A value added audit course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world.

Skill Enhancement Course: This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

Open Elective (OE): Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in IV, V and VI semesters. Each student has to take Open Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

Program Course (PC): This is a compulsory course but audit that does not have any choice and may be of 3 credits. Each student of M. Tech Structural engineering program has to compulsorily pass the Environmental Studies and Human values & professional Ethics

C. Program Outcomes of M. Tech Structural Engineering

Program Outcomes (POs)

The curriculum and syllabus have been structured in such a way that each of the courses meets one or more of these outcomes. Program outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge and behaviors that students acquire as they progress through the program. Further each course in the program spells out clear course outcomes (COs) which are mapped to the program outcomes.

Engineering Post Graduate will be able to:

Program: M. Tech-Structural Engineering		
PO-01	**Engineering knowledge**	Exhibit in-depth knowledge in engineering specialization.
PO-02	**Problem analysis**	Think critically and analyze complex engineering problems to make creative advances in theory and practice.
PO-03	**Design/Development Of Solutions**	An ability to design solutions for engineering problems and to design a component, system, or process that meet the specified needs with appropriate consideration for the public health and safety, along with the cultural, societal, and environmental considerations.
PO-04	**Conduct Investigations of Complex Problems**	Use research methodologies, techniques and tools, and will contribute to the development of technological knowledge
PO-05	**Modern tool usage**	Apply appropriate techniques, modern engineering tools to perform modeling of complex engineering problems with knowing the limitations.
PO-06	**The Engineer and society**	Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.
PO-07	**Environment and sustainability**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge for sustainable development to articulate a comprehensive world view that integrates diverse approaches to sustainability
PO-08	**Communication**	Communicate complex engineering problems with the engineering community and society, write and present technical reports effectively
PO-09	**Ethics**	Exhibit professional and intellectual integrity, ethics of research and scholarship and will realize the responsibility towards the community
PO-10	**Individual and Team work**	An ability to analyses the local and global impact of computing on individuals, organizations, and society.
PO-11	**Project Management and Finance**	Demonstrate knowledge and understanding of engineering and management principles and apply the same with due consideration to economic and financial factors.
PO-12	**Life-long learning**	Engage in life-long learning with a high level of enthusiasm and commitment to improve knowledge and competence continuously

Program Specific Outcomes (PSOs)

At the end of this programme, Post Graduates will be able to:

PSO 1: Analyze the complex engineering problems by applying engineering knowledge in the area of Structural Engineering
PSO 2: Provide engineering solutions to meet the specified needs with appropriate consideration for comfort, safety, social and environmental aspects.

Program Educational Objectives (PEOs)

In their careers, our post graduates will be able to:

PEO 1: Analyze and solve Structural Engineering problems using modern engineering tools in industry or in research.
PEO 2: Play key role in collaborative multidisciplinary scientific research with due consideration to economic and financial factors for leading a successful career in industry or to pursue higher education or being an entrepreneur.
PEO 3: Engage in life-long learning with professional code of conduct.

F. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning:

Role Play & Simulation: Role- play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

Video Based Learning (VBL) & Learning through Movies (LTM): These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

Field/Live Projects: The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

Industrial Visits: Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

MOOCs: Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs. University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval. Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

a) It will necessary for every student to take at least one MOOC Course throughout the programme.

b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.

c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.

d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.

e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.

f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.

g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

Special Guest Lectures (SGL) & Extra Mural Lectures (EML): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

Student Development Programs (SDP): Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

Industry Focused programmes: Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice-based insight to the students.
Special assistance program for slow learners & fast learners: write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners?

Induction program: Every year 3 weeks induction program is organized for 1st year students and senior students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

Mentoring scheme: There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

Competitive exam preparation: Students are provided with one class in every week for GATE/ Competitive exams preparation.

Extra-curricular Activities: Organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

Career & Personal Counseling: Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change. Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.

Participation in Flip Classes, Project based Learning (A2 Assignment), Workshops, Seminars & writing & Presenting Papers: Departments plan to organize the Flip Classes, Project based Learning (A2 Assignment), workshops, and Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. This participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non-credit course.

Formation of Student Clubs, Membership & Organizing & Participating events: Every department has the departmental clubs with the specific club's name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

Capability Enhancement & Development Schemes: The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

Library Visit & Utilization of QLRC: Students may visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.

Detailed Syllabus (Semester wise /course wise)

SEMESTER 1

CE4101	**Title: Structural Analysis- A Matrix Approach**	**L T P C** **3 1 0 4**
Version No.	**1.0**	
Course Prerequisites	**Nil**	
Objectives	Analysis a structure by more convenient method	
Expected Outcome	Students will be able to solve complex problems with different end conditions.	
Unit No.	**Unit Title**	**No. of hours (per Unit)**
Unit I	**Matrix Algebra and Indeterminacy**	8
Introduction to matrix methods - banded and semi banded matrices, Algorithms for solution of matrix equations. Degree of freedom - Static indeterminacy and kinematic indeterminacy and their determination. Stiffness and flexibility matrices. Solution of linear simultaneous equations with and without prescribed displacements.		
Unit II	**Introduction to Matrix Methods of Analysis**	7
Direct stiffness method. Assembly of stiffness matrix from element stiffness matrix - Computer algorithm for assembly of stiffness matrix - Flexibility matrices. Method of analysis using stiffness and flexibility Matrices.		
Unit III	**Analysis of Continuous Beams**	7
Analysis for continuous beams of two and three spans with different end conditions by using Stiffness Method and flexibility method.		
Unit IV	**Analysis of Two Dimensional Portal Frames**	7
stiffness and flexibility method of analysis of 2D portal frames with different end conditions-plotting of bending moment diagrams		
Unit V	**Analysis of Two-Dimensional Pin jointed Trusses**	7
Computation of joint displacement and member forces by stiffness and flexibility method		
Text Books	1. Pundit and Gupta, “Structural Analysis”, McGraw Hill 2. C.S. Reddy, “Structural Analysis”McGraw Hill	
Reference Books	1. M. C. Guire and Gallagher, R.H. ,“Matrix Structural analysis” John Wiley and sons 2. C.K. Wang,“Intermediate Structural Analysis” John Wiley and sons	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4101

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students will be able to analyze the concept of Matrix Methods of Analysis	2	Em
CO2	Students will be able to analyze the Continuous Beams using Stiffness method and flexibility method.	2	S
CO3	Students will be able to analyze Two Dimensional Portal Frames with different end conditions-plotting of bending moment diagrams	2	S
CO4	Students will be able to analyze Two-Dimensional Pin jointed Trusses by stiffness and flexibility method.	2	En
CO5	Students will be able to analyze the concept of Matrix Methods of Analysis	1	None

CO-PO Mapping for CE4101

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.8	3	3	3	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

CE4102	Title: Advance Construction Techniques	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give an experience in the implementation of new technology concepts which are applied in field of advanced construction	
Expected Outcome	Student will learn new methodology involved in construction technology	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Pile Foundations	8
Introduction, uses, selection of pile, types of piles, pile spacing, group of piles, efficiency of group of piles, pile cap and pile shoe, load tests on piles, pile driving, pulling of piles, loads on piles, causes of failures of piles, pile Driving formulas.		
Unit II	Coffer Dams	7
Definition, uses, selection of coffer dams, types of coffer dams, design features of coffer dams; leakage Prevention, economic height.		
Unit III	Caissons	7
Definition, uses, construction material, types of caissons, loads on caisson, design features of caissons, Floating of caissons, cutting edges, sinking of caisson, tilting of caisson, caisson diseases.		
Unit IV	Control of Ground Water in Excavations	7
Methods- pumping, well points, bored wells, electro-osmosis, injections with cement, clays and chemical, freezing process, vibro-flotation Planning of earthquake resistant building, Construction of walls –provision Of corner reinforcement, Construction of beams and columns. Base isolation		
Unit V	Construction of Earthquake Resistant Buildings	7
Planning of earthquake resistant building, Construction of walls –provisionof corner reinforcement, Construction of beams and columns. Base isolation		
Text Books	1. B.C. Punamia, “Building Construction” , Laxmi Publications, New Delhi 2. S.C. Rangwala, , “Building Construction” Charotar Publication Pvt Ltd. Anand	
Reference Books	1. R. Chudley,“Construction Technology" , Longman Group Limited, London, IstEdition 2. S.S. Ataev, “Construction Technology”, Mir Publishers, Moscow	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4102

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	The students will be able to understand the importance of pile foundation, types of piles, testing of piles, causes of failures of piles.	2	Em
CO2	The students will be able to understand the concept of coffer dams, its design and selection criterion.	2	S
CO3	The students will be able to understand the various types of loads on caissons, its design feature, construction materials used.	2	S
CO4	The students will be able to understand the various methods to Control of Ground Water in Excavations.	2	En
CO5	The students will be able to understand the Planning and Construction of Earthquake Resistant Buildings.	1	None

CO-PO Mapping for CE4102

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2	3	3	3	3	2	2	2	2	2	2	2	2	2

CE4103	Title: Advanced Design of Concrete Structures	L T P C 3 1 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To understand the design concept of complicated structures	
Expected Outcome	After learning the course, the students should be able to: Design and detail of various structural elements for RC framed structure up to G+3.Design and detail RC structures like Water Tank and Flat slab.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Continuous Beams and Curved Beams	8
Introduction to Continuous Beams - Effective span, Span/Depth ratio, Bending moment and shear Forces, Design examples. Introduction to curved beams - Analysis of bending and torsional moments in a circular beam, Moments in semicircular beams supported on three columns, Design examples.		
Unit II	Design of Flat Slab	7
Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs- Check for one way and two way shears, Limitations Of Direct design method, Introduction to Equivalent frame method.		
Unit III	Bunkers and Silos	7
Different between bunkers and silos, Design of square or rectangular bunkers, Design of circular Bunkers, Design examples, Design of silos, Silos for storage of cement.		
Unit IV	Elevated Water Tanks	7
Types of overhead water tanks, Intz type tank, Design example of Intz type water tank, Design of Conical or funnel shaped overhead tanks.		
Unit V	Portal Frames	7
Introduction - Analysis and design of portal frames, Design examples.		
Text Books	1. S.Ramamrutham, “Design of Reinforced Concrete Structures”DhanpatRai Publishing Company 2. S. R. Karve and V. L. Shah,“Illustrated Design of Reinforced Concrete Buildings”Structures Publishers.	
Reference Books	1. Varghese A. V.“Advanced Reinforced Concrete”,Prentice Hall of India. 2. , Sinha S. N.Tata, “Reinforced Concrete Design ” ,Mc-Graw Hill, Delhi	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4103

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	To understand the design concept Continuous Beams and Curved Beams	2	Em
CO2	students will able to design of flat slab	2	S
CO3	student will able understand and design concept of bunker and silos	2	S
CO4	student will able to design the elevated water tank	2	En
CO5	student will understand and design the portal frames	1	None

CO-PO Mapping for CE4103

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2.4	3	3	3	3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4

CE4104	Title: Bridge Design	L T P C 3 1 0 4
Version No.	1.1	
Course Prerequisites	Nil	
Objectives	To identify the different types of bridges: arch, suspension, truss, beam, cantilever and cable stayed. Discover how the different types of bridges fail and What modifications can be made to the bridge to increase its strength?	
Expected Outcome	The course will impart sufficient knowledge necessary to design bridge.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction and Investigation for Bridges	8
Components of bridge - Classification - Need for investigation - Bridge site - Data collection – Design discharge - linear waterway - economical span - scour depth - traffic projection - choice of bridge type.		
Unit II	Load on Bridges	7
Indian Road Congress (IRC) bridge codes - dimensions - dead and live loads - impact effect - wind and seismic forces - longitudinal and centrifugal forces - hydraulic forces - earth pressure - temperature Effect and secondary stresses.		
Unit III	Slab and T- Beam Bridges	7
Design of slab bridges - skew slab culverts - box culverts. T - beam bridges - Pigeaud curves - Courbon's theory - Hendry Jaegar method - analysis and design of T - beam bridges.		
Unit IV	Long Span Bridges	7
Hollow girder bridges - balanced cantilever bridges - continuous girder bridges - rigid frame bridges - arch bridges - bow string girder bridge, .Prestressed concrete bridges - composite prestressed concrete Super structures - erection of precast girders - continuous construction - recent trends, Cable Stayed Bridge.		
Unit V	Bearings and Sub-Structure	7
Design of bearings for slab, Design of piers - abutments - trestles, Joints - expansion joints		
Text Books	1. Johnson Victor. D, “Essentials of Bridge Engineering”, Oxford and IBH Publishing Co. Pvt. Ltd.New Delhi,	
Reference Books	1. Raina .V.K. “Concrete Bridge Practice” ,Tata McGraw Hill Publishing Co.New Delhi 2. ,Krishna Raju .N, “Design of Bridges,” Oxford and IBM Publishing Co, Bombay	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4104

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	The student will able to understand the introduction and investigation of bridge	2	Em
CO2	The Students will be able to analyzing various loads on bridge	2	S
CO3	The students will be able to design the Slab and T Beam	2	S
CO4	The students will be able to design long span bridge	2	En
CO5	The students will be able to understand the various type of bearing	1	None

CO-PO Mapping for CE4104

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2.6	3	3	3	3	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6

CE4105	Title: Finite Element Analysis	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Analysis of complex structures	
Expected Outcome	After this course, student is expected to analyze complex structures in two and Three dimensions.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	8
Basic concepts of elasticity, introduction to stiffness method– Element approach for the analyses of beams, Trusses and frames, direct stiffness method for the analysis of trusses.		
Unit II	Introduction to Finite Element Analysis	7
General description of finite element method, Basic steps involved in FEM, difference between FEM and finite difference method. Discreatisation of structures – Finite elements used for one dimensional, two Dimensional and three dimensional problems. Nodes, element aspect ratio, boundary conditions –numbering of nodes, mesh refinement, properties of stiffness matrix.		
Unit III	Shape Functions	7
Coordinate systems natural and normalized, convergence criterion, compatibility requirements, geometric Invariance shape functions – polynomial displacement functions for one, two and three dimensional elements.		
Unit IV	Finite Element Formulation Using Energy Concepts	7
Energy concepts, theorem of minimum potential energy, principle of virtual work, R-R Method		
Unit-V	Finite Element Analysis of Structural Elements Using Direct Method.	7
Finite Element Method for the analysis of simply supported beams and trusses.		
Text Books	1. O.C. Zienkicwiez, "The finite Element Method" ,.Tata-McGraw Hill Co. Delhi 2. G.N. Reddy, "An introduction to Finite element method"MC-Graw Hill publication	
Reference Books	1. P. Seshu, "Textbook of finite element analysis", PHI Publication	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020 13-09-2020	
Date of approval by the Academic Council	29-07-2020 13-09-2020	

Course Outcome for CE4105

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the basic concept of beam, truss and frame structure	2	Em
CO2	Student will able to understand about the mess convergence for precise study	2	S
CO3	Student will able to understand the shape function related to analysis of practical concept	2	S
CO4	Student will able to understand about the energy and virtual work concept	2	En
CO5	Student analysis the problem related to the beam and truss	1	None

CO-PO Mapping for CE4105

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.2	3	3	3	3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2

CE4106	Title: Concept of Ductile Detailing	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To provide adequate toughness and ductility to resist severe earthquake shocks without collapse	
Expected Outcome	The student shall be in a position to design elements of reinforced concrete structures according to ductile detailing	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	8
Concept of Ductile Detailing, Flexural member, longitudinal reinforcement, Flexural detailing, Ductile Detailing, Flexural members, longitudinal reinforcement		
Unit II	Columns and Frame Members	7
Longitudinal reinforcement Transverse Reinforcement Ties or hoops overlapping hoops Cross ties Special Confining Columns and Joint Detailing Beam column joint Reinforcement details for Shear Wall		
Unit III	Toughness and Resilience	7
Distinction between Toughness and Resilience, Steps to enhance ductility and toughness in R C structures Horizontal earthquake force, Structural action under earthquake performances, fatigue		
Unit IV	Reinforcement and Hoops	7
Ductile Detailing of RC Elements Detailing, Increased values of a seismic effect for vertical and horizontal projections, Proposed changes in IS1893 (Fifth revision). Ductile Detailing of Frames for Seismic Forces: Introduction, General principles, Factors that increase ductility, Specifications for material for ductility, Ductile detailing of beams – Requirements.		
Unit V	Framed Structures	7
Design of cast-in-situ joints in frames Types, Design with proper detailing		
Text Books	1. P. C. Varghese, “Advanced Reinforced Concrete Design”, Prentice Hall of India, 2. N. Krishna Raju, “Advanced Reinforced Concrete Design” CBS Publishers and Distributors,	
Reference Books	1. Park andPaulay, “Reinforced Concrete”, Robert Publisher,. 2. Ashok.K. Jain, “Reinforced Concrete”, Nem Chand andBors.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4106

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the flexural detailing of ductile member	2	Em
CO2	Student will able to understand the column, beam column joint and detailing od shear wall	2	S
CO3	Student will able to understand the toughness and resilience of the RC structure	2	S
CO4	Student will able to understand the ductile detailing of structure under the dynamic loading	2	En
CO5	Student will able to analysis the filed problem related to the frame joint	1	None

CO-PO Mapping for CE4106

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.2	3	3	3	3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2

CE4107	Title: Construction Machinery and Equipment's	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To update the student with latest technology involved in construction industry	
Expected Outcome	The student shall be in a position to understand the use and working of Construction equipment's.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	8
Different Construction techniques equipment's used new technologies Mechanization in Construction: Importance of construction equipment's their classification, selection and contribution rate of production (Output), Owning and operating cost		
Unit II	Equipment Selection	7
Factors affecting selection of equipment - technical and economic, construction engineering fundamentals, Analysis of production outputs and costs, Characteristics and performances of equipment for Earth moving, Erection, Material transport, Pile driving, Dewatering, Concrete construction (including Batching, mixing, transport, and placement) and Tunneling.		
Unit III	Excavating Equipments	7
Selection, basic parts, operation, factors affecting output Tractors and related equipment, Bulldozers, Rippers, Scrapers Excavating Equipment, Power shovels, Draglines, Hoes, Clam shells and Trenching Machines. Engineering fundamentals: Related to performance of IC engines, rim pull, drawbar pull, Coefficient of traction, Gradability.		
Unit IV	Hauling and Conveying Equipment's	7
Belt conveyor system: Terminology, Classification, Components, Power requirement estimation and design. Hauling and lifting Equipment: Trucks, Wagons, and Cranes etc. Crushers , Air compressors, Drilling and Blasting Equipment's		
Unit V	Planning for Building Construction	7
Introduction, Site layout, lifting and support equipment, Delivery of structural components, steel erection, construction noise, noise mitigation, dust, vibrations, classification of forming system, form work design, form work economics, safety		
Text Books	1. Sharma S.C."Construction Equipment and Management" , Khanna Publishers, Delhi	
Reference Books	1. Deodhar, S.V,"Construction Equipment and Job Planning", Khanna Publishers Delhi,	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4107

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand construction equipment	2	Em
CO2	Students should be able to understand construction equipment selection	2	S
CO3	Students should be able to understand types Excavating Equipment	2	S
CO4	Students should be able to understand Hauling and Conveying Equipment	2	En
CO5	Students should be able to understand Planning for Building Construction	1	None

CO-PO Mapping for CE4107

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2	3	3	3	3	2	2	2	2	2	2	2	2	2

SEMESTER 2

CE4201	Title: Advanced Design of Steel Structures	L T P C 3 2 0 4
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To provide necessary tool for designing steel structures using IS Codes	
Expected Outcome	After the course students will be able to design industrial buildings and transmission line towers with proper connections	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	8
Beams subjected to biaxial bending - Built-up Purlins - Various types and design - Design of Wind girders- Beam-columns - With various support conditions-Design of foundations-with lateral forces		
Unit II	Connections	7
Bearing type joints - unstiffened and stiffened seat connections - moment resisting connection of brackets-Bolted and welded-semi-rigid connections.		
Unit III	Towers	7
Basic structural configurations - free standing and guyed towers - loads on towers - wind loads - foundation design - design criteria for different configurations and transmission line towers		
Unit IV	Industrial Buildings	7
Industrial buildings-braced and unbraced - Gable frames with gantry-Rigid industrial frames-Fire resistant Design-Fatigue resistant design.		
Unit V	Plastic Analysis	7
Theory of plastic bending - Plastic hinge concept - Mechanism method - Application to continuous beams and portal frames-Plastic moment distribution - Analysis of Gable frames - instantaneous centre of rotation - Connections		
Text Books	1. Subramanian. N,"Design of Steel Structures: Theory and Practice" Oxford university Press, U.S.A, 2. Duggal.S.K, " Design of Steel Structures", McGraw Hill New Delhi 3. B.C. Punamia, "Design of Steel Structures", Laxmi Publications.	
Reference Books	1. Dayaratnam. P, Chand. S,"Design of Steel Structures", Limited, New Delhi. 2. Structural Design in SteelJohn. E, Lothers,Prentice Hall	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4201

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to design the beam and column under wind load.	2	Em
CO2	Student will able to design the connection	2	S
CO3	Student will able to design the tower	2	S
CO4	Student will able to understand the design of industrial building	2	En
CO5	Student will able to analysis the plastic theory	1	None

CO-PO Mapping for CE4201

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.8	3	3	3	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

CE4202	Title: Design of Pre-Stressed Concrete Structures	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To understand the principle of prestressed concrete structures	
Expected Outcome	Analysis and design of prestressed members.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	General Principles of Prestressing	8
Pre–tensioning and post – tensioning –Prestressing by straight, concentric, eccentric, bent and parabolic tendons – Different methods and systems of prestressing like Hoyer system, Freyssinet system, MagnelBlaton system – Lee-Mc call system. Basic Concepts, Stresses at transfer and service loads, ultimate strength in flexure - code provisions in - deflection (short - long term) in (IS, BS, ACI).		
Unit II	Design of Tension Members	7
Design for shear, bond and torsion Design of End blocks - Design of Tension Members		
Unit III	Design of Compression Members And Losses of Prestress	7
Compression members with and without flexure elastic shortening of concrete, shrinkage of concrete, creepof concrete, relaxation of steel, slip in anchorage, bending of member and frictional		
Unit IV	Composite Beams	7
Composite construction with precast PSC beams and cast-in-situ R.C. Slab		
Unit V	Statically Indeterminate Structures	7
Advantages and disadvantages of continuous PSC beams -Analysis and design of prestressed member's continuous beams - Concept of linear transformation - concordant cable profile and cap cables.		
Text Books	1. Krishna Raju.N, "Prestressed Concrete", Tata McGraw Hill Publishing Co. New Delhi	
Reference Books	1. Rajagopalan .N, "Prestressed Concrete"Alpha Science International, Limited 2. Sinha .N.C, and Roy. S.K, "Fundamentals of Prestressed Concrete" S.Chandand Co.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies On	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4202

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	To understand the General Principles of Pre-stressing	2	Em
CO2	To analysis and Design of Tension Members	2	S
CO3	To perform analysis and Design of Compression Members and Losses of Prestress	2	S
CO4	To understand the concept of Composite Beams	2	En
CO5	To Analysis and design of prestressed members continuous beams	1	None

CO-PO Mapping for CE4202

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.6	3	3	3	3	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6

CE4240	Title: RCC Design Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To reduce the complexity of RCC Design	
Expected Outcome	Students will design structure using software	

List of Experiments

1. Introduction to analysis of structures.
2. Introduction to staad.pro
3. Structural modeling.
4. Other useful function to complete the geometry.
5. Property details
6. Member specification
7. Loading particulars
8. Seismic analysis
9. Wind load analysis
10. Analysis and post processing
11. R.C. design

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	29-07-2020
Date of approval by the Academic Council	13-09-2020

Course Outcome for CE4240

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the structural modelling and basic tools	2	Em
CO2	Student will able to analysis the structure against Earthquake load	2	S
CO3	Student will able to analysis the structure against wind load	2	S

CO-PO Mapping for CE4240

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.6	3	3	3	3	2.6	2. 6	2.6	2.6	2.6	2.6	2.6	2.6	2.6

CE4209	Title: Design of Tall Buildings	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study the behavior of tall buildings, their analysis and design	
Expected Outcome	This course will provide excellent knowledge necessary to analyze and design tall buildings including chimneys and cooling towers	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Structural Systems And Design Loads	8
Structural system for multistory buildings, Dead Load and Live Load Reduction, Construction Loads, Wind Load, Combination of loadings, Design philosophy- Limit state design.		
Unit II	Analysis and Design	6
Approximate Analysis, Detail Analysis and Reduction Techniques, Analysis of Member Forces, Drift, and Twist, Buckling Analysis, P-Delta Analysis, Translational and Torsional Instability, Design for Differential Movements, Creep and Shrinkage.		
Unit III	Chimneys	7
Design Factors, Thermal Stresses, Components, Platform and Safety Ladders, Steel Stacks, Refractory Linings, Caps and Foundations.		
Unit IV	Cooling Towers	7
Types, Components, Analysis and Design.		
Unit V	Transmission Towers	7
Types of Loads, Tower Configuration, Analysis and Design		
Text Books	1. V.L. Shah and Dr. S.R. Karve, "Illustrated Design of Reinforced Concrete Buildings Structures", Dr. William Weaver Publications. 2. U.H. Varyani, "Structural Design of Multi Storeyed Building" 3. B.C. Punamia, "Design of Steel Structures", Laxmi Publications.	
Reference Books	1. J.R. James andM.Gere, "Matrix Analysis of Framed Structures"	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4209

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	student will able to understand the Structural Systems And Design concept	2	Em
CO2	student will able to Analysis the structure to check there torsional instability	2	S
CO3	student will able to design of Chimneys	2	S
CO4	student will able to analysis and design of Cooling Towers	2	En
CO5	student will able to analysis and design of Transmission Towers	1	None

CO-PO Mapping for CE4209

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.8	3	3	3	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

CE4210	Title: Theory of Plates and Shells	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To understand the principal of Plate and Shell design theory.	
Expected Outcome	After the course students will get sufficient knowledge needed to design Plates And shells.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction to Plate Theory	8
Thin and Thick Plates, Small and Large Deflection Theory of Thin Plate, Assumptions in Analysis of Thin Plates, Slope Curvature Relations, Moment - Curvature Relations, Stress Resultants, Governing Differential Equations for Bending of Plates, Various Boundary Conditions.		
Unit II	Navier's and Levy's Solution	7
Rectangular Plates Subjected to Uniformly Distributed Load, Sinusoidal Load for Different Boundary Conditions.		
Unit III	Circular Plates	7
Analysis of Circular Plates under Axis-Symmetric Loading, Moment Curvature Relations, Governing Differential Equation in Polar Co-Ordinates, Simply Supported and Fixed Edges, Distributed Load, Ring Load, a Plate with Hole at Center.		
Unit IV	Introduction to Shell Structures	7
Classification of Shells on basis of Geometry, Thin Shell Theory, Equation of Shell Surfaces, Stress Resultants, Stress Displacement Relations, Compatibility and Equilibrium Equations.		
Unit V	Membrane Analysis	7
Equation of Equilibrium for Synclastic Shells, Solution for Shells Subjected to Self-Weight and Live Load, Cylindrical Shells -Equation of Equilibrium, Open Shells With Parabolic, Circular, Elliptical Directrix, Simple Problems, Shells With Closed Directrix-Circular, Elliptical-Simple Problems, Problems on Pipes Carrying Fluid/Liquid Under Pressure, Just Filled and Partly Filled		
Text Books	1. S P Timoshenko and S W Krieger,"Theory of Plates and Shells", Mc-Graw Hill	
Reference Books	1. R Szilard,"Theory and Analysis of PlatesClassical and Numerical Methods"	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4210

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the plate theory	2	Em
CO2	Student will able to analysis the plate on the basis of Napier's and levy's theory	2	S
CO3	Student will able to analysis the circular plate	2	S
CO4	Student will able to understand the shell analysis	2	En
CO5	Student will able to analysis the member an	1	None

CO-PO Mapping for CE4210

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.6	3	3	3	3	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6

CE4211	Title: Fire Resistance of Structures	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Interpret the intentions of code requirements for fire safety and understand the concepts of fire severity and fire resistance	
Expected Outcome	Design steel, concrete or timber structures to resist fire exposure	
Unit No.	Unit Title	No. of hours (per Unit))
Unit I	Classification of Buildings and Types of Production Processes	8
Types of construction and classification of buildings, Main building elements, Requirements of buildings, Combustibility and fire resistance		
Unit II	Calculation of Required Fire Resistance Limit of Building Structures	7
Initial condition for calculating fire resistance of structures, Duration of fire, Temperature of fire, Main points on the method of investigating temperature regimes of fires, Results of experimental investigations on fires, Simulation of temperature regimes of fires, Determination of fire in residential and public buildings, Determination of fire duration of fire in industrial buildings and warehouses		
Unit III	Methods of Testing Structures for Fire Resistance	7
Problems of testing for fire resistance, Set-up for testing fire resistance, Temperature regime of the tests, Test pieces of structures, Conditions of loading and supporting of structures.		
Unit IV	Fire Resistance of Reinforced Concrete and Wooden Structures	7
Change in the strength of reinforcement steel with increase of temperature, Change in the strength of concrete in compression with increase in temperature, Coefficients of thermal expansion of reinforcement bars and concrete, Axially loaded columns, Statically determinate elements subjected to bending stresses, Introduction to Fire Resistance for Wooden Structures.		
Unit V	Fire Resistance of Steel Columns	7
General, Cross sections of steel columns and other design data, Methods of protecting steel columns from heat, Limiting state of steel columns on heating, Heat insulating capacity of protection and fire resistance limit``s of columns, Calculation of fire resistance of steel columns,		
Text Books	1. Andrew H. Buchanan,"Structural Design for Fire Safety" John Wiley and Sons. Ltd	
Reference Books	1. John A."Fire Safety Engineering Design of structures" , Purkiss Butterworth Heinemann, 2. U.S BendevEtal, Amerind, "Fire Resistance of Buildings" Publishing Co. Pvt. Ltd	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4211

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to analysis the classification of building and its types of production process	2	Em
CO2	Student will able to design the fire resistance building	2	S
CO3	Student will able to understand the test for fire resistance structure	2	S
CO4	Student will able to design the fire resistant rcc and wooden structure	2	En
CO5	Student will able to analysis the fire-resistant column	1	None

CO-PO Mapping for CE4211

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.8	3	3	3	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8

CE4212	Title: Safety of Structures	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Understand the concepts involved in structural safety. Analyze a structure and Compute its inherent safety level.	
Expected Outcome	Design a structure so as to comply with a target safety level.	
Unit No.	Unit Title	Lecture/week
Unit: I	Concepts of Structural Safety	6
Principles of safety in design, Basic statistics- Graphical representation and data reduction techniques- Histogram, frequency polygon, Measures of central tendency- grouped and ungrouped data, measures of dispersion, measures of asymmetry. Curve Fitting and Correlation, Random events-Sample space and events,		
Unit II	Basic Statistics and Probability Theory	6
Venn diagram and event space, Measures of probability-interpretation, probability axioms, addition rule, multiplication rule, conditional probability, probability tree diagram, statistical independence, total probability theorem and Baye's theorem., probability density function, Mathematical expectation. Probability Distributions, Discrete distributions- Binomial and poison distributions, Continuous distributions- Normal, Log normal distributions		
Unit III	Probability Distributions for Resistance And Loads	6
Statistics of Properties of concrete, steel, Statistics of strength of bricks and mortar, Selection of Probabilistic model, probabilistic analysis of loads-dead loads, live loads, wind loads.		
Unit IV	Reliability Analysis and Simulation Techniques	6
Measures of reliability-factor of safety, safety margin, reliability index, performance function and limiting state. Reliability Methods-First Order Second Moment Method (FOSM), Point Estimate Method (PEM), and Advanced First Order Second Moment Method (HasoferLind's method).Simulation Techniques: Monte Carlo simulation- Statistical experiments, sample size and accuracy, Generation of random numbers- random numbers with standard uniform distribution, continuous random variables.		
Unit V	Reliability Based Design	6
Determination of partial safety factors, safety checking formats – LRFD format, CEB format, processes in reliability based design, IS Code provisions		
Text Books	1. Ranganathan, R. "Structural Reliability Analysis and design"- Jaico publishing house, Mumbai, India	
Reference Books	1. Ang, A. H. S., and Tang, W. H "Probability concepts in engineering planning and design". Volume –I, John Wiley and sons, Inc, New York. 2. Ang, A. H. S., and Tang, W. H. "Probability concepts in engineering planning and design"- Volume –II, John Wiley and sons, Inc, New York 3. Thoft-christensen, P., and Baker, M., J., "Structural reliability theory and its applications"- Springer-Verlag, Berlin, NewYork.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4212

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the concept of structural safety	2	Em
CO2	Student will able to understand the statistic and probabilistic theory	2	S
CO3	Student will able to apply the probability distribution for resistance and load	2	S
CO4	Student will able to analysis the reliability of structure	2	En
CO5	Student will able to design structure on the basis of relaiblity	1	None

CO-PO Mapping for CE4212

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.6	3	3	3	3	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6

CE4213	Title: Soil Structure Interaction	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give clear concepts of soil-foundation-structure interaction especially for finite beams/ plates placed on elastic foundation.	
Expected Outcome	Understand behavior of soil when interact with different structures	
Unit No.	Unit Title	Lecture/week
Unit: I	Soil- Foundation-Structure Interaction	6
Soil-foundation-structure interaction, Soil-fluid-structure interaction, Idealization of soil by linear and non-linear modified Winkler model, Elastic continuum model (isotropic and anisotropic), Two parameter elastic models- Heteny model, Pasternak model, Reissner model. **Soil parameters:** Interpretation of parameters encountered in various idealized soil models, two parameter elastic and Elastic continuum models		
Unit II	Finite Beams on Elastic Foundations	6
Finite beams on Winkler models, finite beams on two parameter elastic model, finite beams on homogenous Elastic continuum, finite difference solution to problems of beam on linear and non-linear Winkler's model.		
Unit III	Plates on Elastic Foundations	6
Rectangular and continuous plates on elastic foundations, plates carrying rows of equidistant columns, rectangular and circular plates on Winkler medium, Two parameter elastic medium and no elastic Continuum, finite difference solution of problems of rectangular plates on linear and non-linear elastic foundation.		
Unit IV	Oil Structure Interaction In Framed Structures	6
Structures with isolated foundation, spring analog approach, determinations of spring parameters, structures With continuous beams and rafts as foundation, finite element modeling, sub-structure technique of analysis, concept of relative stiffness, Interactive behavior of some framed structure.		
Unit V	Soil Pile Interaction	6
Laterally loaded single piles-Concept of coefficient of horizontal sub grade reaction, finite difference and finite element solution, soil-structure interaction of framed structures with pile foundation, Interaction of Other structures with soil foundation system, Tanks with annular ring foundations, chimneys, silos, cooling towers, underground subways and tunnels.		
Text Books	1. Selvadurai, A.P.S, "Elastic Analysis of Soil Foundation Interaction", Elsevier, 2. Poulos, H.G, and Davis, E. H, "Pile Foundation Analysis and Design", John Wiley.	
Reference Books	1. Scott, R.F, "Foundation Analysis", Prentice Hall, 2. "Structure Soil Interaction-State of Art Report", Institution of Structural Engineers. 3. R-88: Suggested Analysis and Design Procedures for Combined Footings and Mats	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4213

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the Soil- Foundation-Structure Interaction	2	Em
CO2	Student will able to understand Finite Beams on Elastic Foundations	2	S
CO3	Student will able to understand Plates on Elastic Foundations	2	S
CO4	Student will able to analysis the Oil Structure Interaction In Framed Structures	2	En
CO5	Student will able to understand the concept of Soil Pile Interaction	1	None

CO-PO Mapping for CE4213

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2.2	3	3	3	3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2

CE4214	Title: Environment Impact Assessment	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Develop understanding in choice of EIA parameters	
Expected Outcome	Student will able to generate EIA report	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: 1	Environment Impact Assessment	6
Introduction and scope utility of the EIA process expended and narrowed scope of EIA, impacts of Development activities, planning and management of impact studies.		
Unit II	Environmental Attributes	6
Environmental attributes environmental indices and indicators, environmental assessment, methods and techniques, matrices, network and checklist methods, prediction techniques for quality of environmental Attributes.		
Unit III	Evaluation and Assessment of Impact	6
Impact evaluation, assessment of impact on air, water, soil and ground water,noise, biological environment. Assessment of impact on socio-economic environment, evaluation methods, mitigation measures.		
Unit IV	Risk Assessment	6
Health risk assessment, hazard identification, toxicology and dose response characterization, exposure Characterization, risk characterization, uncertainty in estimates.		
UNIT V	Risk Evaluation	6
Risk evaluation, risk acceptance, basic principles of health risk management.		
Text Books	1. Kenneth, W., Warner, F.C. and Davis Wayne, T., "Air Pollution, Its Origin and control",Prentice Hall.	
Reference Books	1. Mishra, P.C., "Fundamentals of Air and Water Pollution".	
Mode of Evaluation	Internal and External Examinations	
Recommendatio n by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4214

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student should be able to able to carry out scoping and screening of developmental projects for environmental and social assessments	2	Em
CO2	Student should be able to able to explain different methodologies for environmental impact prediction and assessment	2	S
CO3	Student should be able to able to plan environmental impact assessments and environmental management plans	2	S
CO4	Student should be able to able to evaluate environmental impact assessment reports	2	En
CO5	Student should be able to able to understand the different the case studies	1	None

CO-PO Mapping for CE4214

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2.4	3	3	3	3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4

SEMESTER 3

CE4340	Title: Foundation and Steel Design Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give software base knowledge on structure design	
Expected Outcome	Student will know how to complete object-oriented intuitive 2D/3D graphic model generation	

List of Experiments

1. ISM Export. Anchor Bolt Library. Isolated Footing Enhanced Drawing.
2. Concrete Check Options. Bearing Capacity Type. Compression Development Length for Isolated Footing
3. Top Reinforcement Load Factors. Negative Load Combination Factors.
4. Soil Bearing and Self Weight Factors for Plant Mode. Sliding Check for Octagonal Footings.
5. Node to Node Dimensions. Multiple Load Case Selection. Pedestal Reinforcement Input.
6. Updates to Detailed Output Spreadsheet. Shear Design for Pedestals.
7. Isolated Footing Error Reporting.
8. Design for raft foundation(live example)

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	29-07-2020
Date of approval by the Academic Council	13-09-2020

Course Outcome for CE4340

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the load acting on foundation	2	Em
CO2	Student will able to analysis the bearing capacity of footing	2	S
CO3	Student will able to Design Pedestals for shear	2	S

CO-PO Mapping for CE4340

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.6	3	3	3	3	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	1.6

ME4307	Title: Research Methodology	L T P C 2 0 0 2
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	Understand some basic concepts of research and its methodologies Select and define appropriate research problem and parameters Write a research report and thesis	
Expected Outcome	To know about the types of research and also how to write a report and thesis.	
Unit No.	Unit Title	No. of hours (per Unit)
Unit I	Introduction	4
Objectives of Research – Limitations in Research – Qualities of a Good Research Worker – Criteria of Good Research – Limitations of Research Concept of Applied and Basic research – Quantitative and Qualitative Research Techniques – Need for theoretical frame work – Hypothesis development – Hypothesis testing with quantitative data. Research design – Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.		
Unit II	Experimental Design	5
Laboratory and the Field Experiment – Internal and External Validity – Factors affecting Internal validity. Measurement of variables – Scales and measurements of variables. Developing scales – Rating scale and attitudinal scales – Validity testing of scales – Reliability concept in scales being developed – Stability Measures.		
Unit III	Data Collection	5
Interviewing, Questionnaires, etc. Secondary sources of data collection. Guidelines for Questionnaire Design – Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data-Collection Methods and their utility. Sampling Techniques – Probabilistic and non-probabilistic samples. Issues of Precision and Confidence in determining Sample Size. Hypothesis testing, Determination of Optimal sample size.		
Unit IV	Multivariate Statistical Techniques	5
Data Analysis – Factor Analysis – Cluster Analysis, Discriminant Analysis, Multiple Regression and Correlation – Canonical Correlation – Application of Statistical(SPSS) Software Package in Research		
Unit V	Research Report	5
Purpose of the written report – Concept of audience – Basics of written reports. Integral parts of a report – Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report – Experimental, Results and Discussion – Recommendations and Implementation section – Conclusions and Scope for future work		
Text Books	1. C R Kothari, Research Methodology, New Age International 2. C. Murthy, Research Methodology, Vindra Publications Ltd.	
Reference Books	1. Donald Cooper and Pamela Schindler, Business Research Methods, TMGH 2. Alan Bryman and Emma Bell, Business Research Methods, Oxford University Press 3.Ranjit Kumar, Research Methodology, Sage Publications, London	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for ME4307

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the basic concept of research	2	Em
CO2	Student will able to understand Experimental Design	2	S
CO3	Student will able to understand Data Collection	2	S
CO4	Student will able to understand Multivariate Statistical Techniques	2	En
CO5	Student will able to understand Research Report	1	None

CO-PO Mapping for ME4307

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2	3	3	3	3	2	2	2	2	2	2	2	2	2

ME4340	Title: Research Methodology Lab	L T P C 0 0 2 1
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To learn to prepare reports and charts	
Expected Outcome	On successful completion of this course the student will have knowledge to analyses and prepare reports	

List of Experiments

1. Basics of Excel- data entry, editing and saving, establishing and copying formula.
2. Functions in excel, copy and paste and exporting to MS word document
3. Graphical presentation of data -Histogram, frequency polygon, pie-charts and bar diagrams.
4. SPSS, opening SPSS, layout, menu and icons analyzing the data using different statistical techniques.

Mode of Evaluation	Internal and External Examinations
Recommendation by Board of Studies on	29-07-2020
Date of approval by the Academic Council	13-09-2020

Course Outcome for ME4340

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to apply the basic formula on excel	2	Em
CO2	Student will able to use the tools of MS excel	2	S
CO3	Student will able to create presentation	2	S

CO-PO Mapping for ME4340

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2	3	3	3	3	2	2	2	2	2	2	2	2	2

CE4304	Title: Advanced Foundation Engineering	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give knowledge needed for design of retaining walls and different types of foundations like shallow, pile, well and machine foundations	
Expected Outcome	After this course, students will be able to design retaining walls, design of Various types of foundations like shallow, pile, well and machine foundations	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Soil Mechanics Principles and Soil Exploration	6
Role of civil engineer in the selection, design and construction of sub structure elements, brief review of soil mechanics principles used in foundation engineering Soil Exploration: Methods of soil exploration; boring, sampling, penetration tests, correlations between penetration resistance and soil design parameters, Proportioning of Foundation.		
Unit II	Earth Pressure and Retaining Walls	6
Earth pressure at rest, active and passive earth pressure, Rankine earth pressure theories, earth pressure due to surcharge, retaining walls, stability analysis of retaining walls, proportioning and design of retaining walls.		
Unit III	Foundations	6
Types of foundations, mechanism of load transfer in shallow and deep foundations, shallow foundations, Terzaghi's bearing capacity theory, computation of bearing capacity in soils, effect of various factors, and use of field test data in design of shallow foundations, Construction on weak soils.		
Unit IV	Deep Foundation	6
Pile Foundation: Types and method of construction, estimation of pile capacity, capacity and settlement of group of piles, proportioning of piles. Well Foundations: Methods of construction tilt and shift, remedial measures, bearing capacity, settlement and lateral stability of well foundation.		
Unit V	Machine Foundations	6
Types of machine foundations, mathematical models, response of foundation – soil system to machine excitation, cyclic plate load test, block resonance test, criteria for design.		
Text Books	1. Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age. 2. Das, B.M., "Principles of Foundation Engineering", PWS.	
Reference Books	1. V N S Murthy, "Advance Foundation Engineering", C B S 2. Couduto, Donald P., "Geotechnical Engineering – Principles and Practices", Prentice-Hall. 3. Mittal Satyendra and Shukla J. P., "Soil Testing For Engineers", Khanna Publishers 4. Mittal Satyendra, "An Introduction To Ground Improvement Engineering", SIPL Publishing House 5. Som, N.N. and Das, S.C., "Theory and Practice of Foundation Design", Prentice-Hall.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4304

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Students should be able to understand the concept of soil exploration	2	Em
CO2	Students should be able to analyze the earth pressure for retaining wall	2	S
CO3	Students should be able to understand the types of foundation	2	S
CO4	Students should be able to analyze the bearing capacity of foundation	2	En
CO5	Students should be able to understand the concept of well and machine foundation	1	None

CO-PO Mapping for CE4304

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2.4	3	3	3	3	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4

CE4305	Title: Computer Application In Design	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To familiarize the basics of CAD	
Expected Outcome	Various aspects of data storage, manipulation and expanding its capability	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Introduction	6
The Design process and role of CAD – Types and applications of design models –Computer representation of drawings – Three-dimensional modeling schemes – Wire frame and surface representation scheme – solid modelling.		
Unit II	Introduction to Cad Software	6
Writing interactive programs to solve design problems using C++ - systems customization - Features of various solid-modeling packages. for Shear Wall		
Unit III	Computer Aided Design	6
Development of programs in C++ design, drawing and plotting of crane and girder		
Unit IV	Entity Manipulation and Data Storage	6
Manipulation of the model – Model storage – Data structures – Data base considerations – object oriented representations - Organizing data for CIM applications – Design information systems.		
Unit V	Expanding the Capability of CAD	6
Parametric and variation modeling – Feature based modeling – Feature recognition - Design by features – Analysis – Rapid prototyping – AI in Design.		
Text Books	1. Ibrahim Zeid “CAD/ CAM - Theory and Practice” - McGraw Hill, International Edition,	
Reference Books	1. Chris McMahon and Jimmi Browne, “CAD CAM Principles, practice and Manufacturing Management”, Pearson Education Asia,	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4305

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the basic knowledge of modelling	2	Em
CO2	Student will able to understand Cad Software	2	S
CO3	Student will able to perform Computer Aided Design	2	S
CO4	Student will able to understand the Entity Manipulation and Data Storage	2	En
CO5	Student will able to understand the Expanding Capability of CAD	1	None

CO-PO Mapping for CE4305

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2.2	3	3	3	3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2

CE4306	Title: Advanced Concrete Technology	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To study the properties of concrete making materials, tests, mix design, special concretes and various methods for making concrete	
Expected Outcome	This course will provide good knowledge about concrete constituents, testing of Concrete, concreting methods and various types of concrete	
Unit No.	Unit Title	No. of hours (per Unit)
Unit: I	Concrete Making Materials	6
Aggregates classification, IS Specifications, Properties, Grading, Methods of combining aggregates, specified grading, Testing of aggregates. Cement, Grade of cement, Chemical Composition, Testing of concrete, Hydration of cement, Structure of hydrated cement, special cements. Water Chemical admixtures, Mineral admixtures		
Unit II	Tests on Concrete	6
Compression test, flexure test, Non-destructive test, fire resistant test, sound insulation test		
Unit III	Mix Design	6
Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and shrinkage – Durability of concrete		
Unit IV	Special Concrete	6
Light weight concrete, Fly ash concrete, Fiber reinforced concrete, Sulphur impregnated concrete, Polymer Concrete High performance concrete. High performance fiber reinforced concrete, Self-Compacting-Concrete, Geo Polymer Concrete, Waste material based concrete – Ready mix concrete		
Unit V	Concreting Methods	6
Process of manufacturing of concrete, methods of transportation, placing and curing. Extreme weather concreting, special concreting methods. Vacuum dewatering – Underwater Concrete.		
Text Books	1. Gambhir. M.L.," Concrete Technology", McGraw Hill Education, 2. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 3. Neville, A.M., "Properties of Concrete", Prentice Hall, London.	
Reference Books	1. Santhakumar.A.R. ;"Concrete Technology",Oxford University Press, 2. Shetty M.S., "Concrete Technology", S. Chand and Company Ltd. Delhi,	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4306

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the Concrete Making Materials	2	Em
CO2	Student will able to understand the comprehensive Tests on Concrete	2	S
CO3	Student will able to Design mix of concrete	2	S
CO4	Student will able to understand Special Concrete	2	En
CO5	Student will able to understand Concreting Methods	1	None

CO-PO Mapping for CE4306

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 5	2	3	3	3	3	2	2	2	2	2	2	2	2	2
Avg.	2.2	3	3	3	3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2

CE4307	Title: Plastic Analysis	L T P C 3 0 0 3
Version No.	1.0	
Course Prerequisites	Nil	
Objectives	To give general exposure about plastic behavior. Limit analysis theorems, Analysis and design of beams and frames.	
Expected Outcome	This course will provide good background for plastic analysis of structures. Design of Concrete Structures with minimum reinforcement.	
Unit No.	Unit Title	Lecture/week
Unit: I	Introduction	6
Analysis of Structures for Ultimate Load: Fundamental Principles – statical method of Analysis – Mechanism method of analysis – Method of analysis, Moment check – Carry over factor – Moment Balancing Method.		
Unit II	Design of Continuous Beams	6
Design of Continuous Beams: Continuous Beams of uniform section throughout – Continuous Beams with different cross-sections.		
Unit III	Secondary Design Problems	6
Influence of Axial force on the plastic moment – influence of shear force – local buckling of flanges and webs – lateral buckling – column stability.		
Unit IV	Design Of Connections	6
Requirement for connections – straight corner connections – Haunched connection – Interior Beam-Column connections		
Unit V	Design Of Steel Frames	6
Sinole span frames – simplified procedures for Sinole span frames – Design of Gable frames with Haunched Connection. Ultimate Deflections: Introduction – Deflection at ultimate load – Deflection at working load – Deflections of Beams and Sinole span frames.		
Text Books	1. V.K. ManickaSelvam.Fundamentals of Analysis and Structures,	
Reference Books	1. GK Lal and NV Reddy, NarosaIntroduction to Engineering plasticity Publishing House. 2. Chen and Han, Plasticity for structural engineers Cengage Learning.	
Mode of Evaluation	Internal and External Examinations	
Recommendation by Board of Studies on	29-07-2020	
Date of approval by the Academic Council	13-09-2020	

Course Outcome for CE4307

Unit-wise Course Outcome	Descriptions	BL Level	Employability (Em)/ Skill(S)/ Entrepreneurship (En)/ None (*Use , for more than One*)
CO1	Student will able to understand the basic concept of moment	2	Em
CO2	Student will able to Design of Continuous Beams	2	S
CO3	Student will able to Design secondary Problems	2	S
CO4	Student will able to Design Of Connections	2	En
CO5	Student will able to Design Of Steel Frames	1	None

CO-PO Mapping for CE4307

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)												Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	3	3	3	3	2	2	2	2	2	2	2	2	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	2.8	3	3	3	3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8