Institutional Vision and Mission

Institutional Vision

- **To be a Leader in producing professionally competent engineers.**

Institutional Mission

- Imparting effective outcome based education,
- Preparing students through skill oriented courses to excel in their profession with ethical values
- Promoting research to benefit the society
- Strengthening relationship with all the stakeholders

Department Vision and Mission

	Department Vision and Mission
Vision	To develop graduates in the field of Civil Engineering with preeminence on Technical competency, research, employability, entrepreneurial skills and ethics.
Mission	Providing consistent, activities and programs for promoting academic excellence.
	Preparing students to serve the society with professional ethics.
	Encouraging the students for research, innovation and higher education.
	To strengthen our relationship with stake holders for overall development of the department.

Program Education Objectives

	Program Education Objectives
PEO1	Apply acquired skill in developing safe, sustainable, economical and environmentally sound solution to civil engineering problem (Domain Knowledge)
PEO2	Demonstrate technical competency by solving the problem diverse area of civil engineering (Core Competency)
PEO3	An ability to engage in lifelong learning for effective adaptation of technological developments (Lifelong Learning)
PEO4	Display leadership skills at workplace and function ethically in the professional world. (Professionalism)

Program Outcomes

PO-1 **Engineering knowledge:** Apply mathematical, scientific and technical knowledge to solve problems in Civil Engineering.

PO-2 **Problem analysis:** An ability to identify, formulate, review and solve Civil Engineering problems.

PO-3 **Design/development of solutions**: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturing and sustainability.

PO-4 **Conduct investigations of complex problems:** An ability to design and conduct experiments, as well as to analyze and interpret data in the domain of Civil Engineering.

PO-5 **Modern tool usage:** Apply emerging modern tools and software for modelling and solutions for civil engineering projects.

PO-6 **The engineer and society:** A knowledge of contemporary issues relevant to professional Civil Engineering practices.

PO-7 **Environment and sustainability:** The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

PO-8 **Ethics:** An understanding of professional and ethical responsibility.

PO-9 **Individual and team work**: Function effectively as an individual and as a team member in Civil Engineering projects encompassing multidisciplinary teams.

PO-10 **Communication**: Design and create project reports and associated documents, prepare presentations related to them and communicate both orally and in written form.

PO-11 **Project management and finance**: An ability to understand and apply the management principles along with engineering skill in their work to manage projects in Civil Engineering domain.

PO-12 **Life-long learning**: Engage in lifelong learning for updating oneself on Civil Engineering contemporary advancements.

Program Specific Outcomes (PSOs):

	Program Specific Outcomes
PSO1	An ability to get acquainted with the contemporary trends in civil engineering and thereby demonstrate proficiency in the fields of structural health monitoring, Remotes Sensing, GIS and GPS, Construction technology, and management.
PSO2	Understand and provide solutions to issues faced during professional practice such as the procurement and interaction with stakeholders during the construction phase of the work.

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Civil Engineering Dept.
Annasaheb Dange College of
Engineering & Technology, Ashta. 416 301

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An Autonomous Institute

Curriculum Structure

F.Y. M.Tech.

STRUCTURAL ENGINEERING

SEM I - SEM IV

Academic Year- 2017-18

DEPARTMENT OF CIVIL ENGINEERING

Teaching and Evaluation Scheme

F. Y. M. Tech: II Semester

Course code	Course	Teaching Scheme				Evaluation Scheme				
						Scheme	Theory (Marks)		Practical (Marks)	
		L	T	P	Credits		Max	Min. for Passing	Max	Min. for Passing
0CVSE510	Theory of Plates and Shells	3	1	-	4	ISE	20	40	--	--
						MSE	30			
						ESE	50			
0CVSE511	Finite Element Method	3	-	-	3	ISE	20	40	--	--
						MSE	30			
						ESE	50		--	--
0CVSE512	Design of Earthquake Resisting Structures	3	1	-	4	ISE	20	40	--	--
						MSE	30		--	--
						ESE	50		--	--
0CVSE513	Advanced Design of Steel Structures	3	1	-	4	ISE	20	40	--	--
						MSE	30		--	--
						ESE	50		--	--
0CVSE51*	Program Elective – II	3	1	-	4	ISE	20	40	--	--
						MSE	30		--	--
						ESE	50		--	--
0CVSE518	Structural Audit	2	-	-	2	ISE	20	40	--	--
						MSE	30		--	--
						ESE	50		--	--
0CVSE554	Structural Laboratory	-	-	2	1	ISE	---		50	20
						ESE	---	POE	50	20
0CVSE555	Seminar II	-	-	2	1	ISE	---		100	40
Total		17	4	4	23		600		200	
Total Contact Hours/Week: 26hrs										

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0CVSE50* :**Program Elective I**		0CVSE51*: **Program Elective II**	
Course Code	**Course Name**	**Course Code**	**Course Name**
0CVSE505	Advanced Design of Prestressed Members	0CVSE514	Advances in Concrete Composites
0CVSE506	Design of Foundation	0CVSE515	Analysis and Design of Multistoried Building
0CVSE507	Repairs and Rehabilitation of Structures	0CVSE516	Design of RCC Bridges
0CVSE508	Structural Optimization	0CVSE517	Design of Masonry Structures

Note: - Student has to go for Internship for 1 month in the vacation between Sem. II and Sem. III. The assessment will be done at the beginning of Sem. III

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First Year M. Tech. Civil Structural Engineering Se

0CVSE501, Theory of Elasticity and Plasticity

Course Details:	
Class	M. Tech, Sem.-I
Course Code and Course Title	0CVSE501, **Theory of Elasticity and Plasticity**
Prerequisite/s	Strength of Materials, Solid Mechanics
Teaching Scheme: Lecture/Tutorial	3/0
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To describe elastic behaviour of materials.
02	To explain stress-strain system at a point in material.
03	To illustrate theory of elasticity in plane strain and plain stress conditions, bending, and torsion.
04	To describe principle stresses in materials..
05	To discuss application of theory of plasticity in failure of materials
06	To illustrate theory of plasticity in practical applications in in analysis and design of structures

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE501_1	Explain behavior of material. (2^{nd}cognitive level)
0CVSE501_2	Explain stress strain behavior at a point in material. (2^{nd} cognitive level)
0CVSE501_3	Apply theory of elasticity in plane strain and plain stress conditions, bending, and torsion. (3^{rd} cognitive level)
0CVSE501_4	Apply theory of plasticity in failure of materials. (3^{rd} cognitive level)
0CVSE501_5	Apply theory of plasticity in practical applications in analysis and design of structures.(6^{th} cognitive level)

Course Contents:		
Unit 1	**Analysis of Stress and Strains** Concept of stress at a point, stress tensor, stress on inclined plane, stress equilibrium equations, stress invariants. The state of strain at a point, strain displacement relations, strain compatibility conditions and stress compatibility conditions.	07 Hrs.
Unit 2	**Constitutive Relationship** Generalized Hook's law for Isotropic, Orthotropic materials, plane stress, plane strain Concepts, Airy's stress function and application problems.	07 Hrs.

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Unit 3	**Polar Coordinate System** Relationship between Cartesian and Polar coordinate system, Equilibrium equations, bending of curved bar, Stress concentration problems.	**07 Hrs.**
Unit 4	**Axisymetric Problems and Failure analysis** Equilibrium equations, Cylinders subjected to internal and external pressure. Introduction to various failure theories	**07 Hrs.**
Unit 5	**Torsion** Assumptions and Torsion equation for general prismatic solid bars, warping of non-circular sections. Prandtl's stress function approach. Torsion of various cross-section bars.	**06 Hrs.**
Unit 6	**Plastic Bending of Beams** Elastic, perfectly plastic materials, plastic behavior of straight beams in bending, depth of plastic zone, residual stresses.	**06 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher
01	Theory of Elasticity	S. Timoshenko & J. N. Goodier	Tata Mc- Graw Hill, New York
02	Theory of Elasticity	Sadhu Sing	Khanna Publishers, Delhi
03	Theory of Plasticity	Sadhu Sing	Khanna Publishers, Delhi
04	Solid Mechanics	S. M. A. Kazimi	Tata McGraw Hill, New Delhi
05	Theory of Plasticity	Chakraborty J	Tata McGraw Hill Publishing Company Limited
06	Structural Mechanics with Introductions to Elasticity and Plasticity –	Venkatraman, Sharad A. Patel	McGrawHill Book Company, New York.
07	Structural Mechanics with introduction to Elasticity and Plasticity	Venkataraman and Patel	McGraw Hill, 1990.
08	Applied Elasticity	Sitharam T.G. and L. GovindaRaju	Interline Publishing, 2005
09	Solid Mechanics	S. M. A. Kazimi	Tata McGraw Hill, New Delhi
10	Theory of Plasticity	R. Hill	van Nastro De, USA

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First Year M. Tech. Civil Structural Engineering Sem. - I

0CVSE502, Advanced Structural Analysis

Course Details:	
Class	M. Tech., Sem.-I
Course Code and Course Title	0CVSE502, **Advanced Structural Analysis**
Prerequisite/s	Structural Analysis
Teaching Scheme: Lecture/Tutorial	03/01
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To construct the ILD for indeterminate structures.
02	To analyze the beams curved in plan
03	To analyze the beam – column joint for various types of loading and support conditions.
04	To analyze the structure by matrix approach methods.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE502_1	Construct of ILD for reactions, S.F. and B.M. for propped cantilever beam. Fixed beam Portal frames and arches. (6th cognitive level)
0CVSE502_2	Draw SFD, BMD and TMD for beams curved in plan for various loading and support condition.(3rd cognitive level)
0CVSE502_3	Develop the expressions for max. B.M., slope, deflection for beam –column subjected to point load, UDL, UVL with different support condition.(6th cognitive level)
0CVSE502_4	Develop element and global stiffness matrix.(6th cognitive level)
0CVSE502_5	Analyze structures for various loading by using stiffness matrix method.(4th cognitive level)

Course Contents:		
Unit 1	**Influence line diagrams** Muller Breslau's Principle, ILD for Continuous beams, Fixed beams, Two hinged arches.	**07 Hrs.**
Unit 2	**Beams curved in plan** Determinate and Indeterminate beams curved in plan.	**06 Hrs.**
Unit 3	**Beam columns** Governing differential equation, Analysis of beam columns subjected to different loadings and support conditions. Stiffness and carryover factors for beam columns.	**07 Hrs.**

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Unit 4	**Matrix methods of analysis**: Static and Kinematic indeterminacy, Concepts of stiffness and flexibility. Energy concepts. Principle of minimum potential energy and minimum complementary energy. Development of element flexibility and element stiffness matrices for truss and beam elements.	**06 Hrs.**
Unit 5	**Stiffness Method**: Displacement-transformation matrix using Stiffness Method, Development of global stiffness matrix for continuous beams, plane trusses and rigid plane frames (having not more than six co-ordinates – 6x6 stiffness matrix)	**06 Hrs.**
Unit 6	**Analysis using stiffness method**: Analysis of continuous beams, plane trusses and rigid plane frames by stiffness method (having not more than 3 coordinates – 3x3 stiffness matrix), effects of temperature change and lack of fit	**08 Hrs.**

Tutorials:

One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, and surprise test, declared test, seminar, final orals and any others. The teacher may add any of other academic activity to evaluate student for his/her in semester performance.t

Text &Reference Books:

Sr. No	Title	Author	Publisher
01	Analysis of Structures Vol.1	Vazirani and Ratwani	Khanna Publisher, Delhi.
02	Advanced Theory of Structures	Vazirani and Ratwani	Khanna Publisher, Delhi.
03	Theory of Elastic Stability	Timoshenko and Gere	East West Press Ltd.
04	Mechanics of Structures Vol. II & III	Junnarkar and Shah	Charotor Publ. House, Delhi.
05	Basic Structural Analysis	C. S. Reddy	Tata McGraw Hill, Delhi.
06	Structural Analysis	Negi and Jangid	Tata McGraw Hill, Delhi.
07	Matrix Analysis of Framed Structures	Gere and Weaver	CBS Publishing, Delhi.
08	Structural Analysis A matrix approach	Pandit and Gupta	Tata McGraw Hill, Delhi.

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First Year M. Tech. Civil Structural Engineering Sem. - I

0CVSE503, Advance Design of Concrete Structure

Course Details:	
Class	M.Tech SEM-I
Course Code and Course Title	0CVSE503, Advance Design of Concrete Structure
Prerequisite/s	0CVPC402, 0CVPC412
Teaching Scheme: Lecture/Tutorial	3/0
Credits	03
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To understand analysis and design of various types of slabs as per situation andLoading conditions.
02	To understand analysis and design of different types of footings as per superstructure and substructure (soil conditions).
03	To understand analysis and design of different types of water tanks as per situation and loading combinations.
04	To understand analysis and design of Silos and bunkers-lateral pressure.
05	To understand analysis and design Chimney.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE503_1	Analysis and design of various types of slabs as per situation and loading conditions. (4^{th} cognitive level)
0CVSE503_2	Analysis and design of different types of footings as per superstructure and substructure (soil conditions). (4^{th} cognitive level)
0CVSE503_3	Analysis and design of different types of water tanks as per situation and loading combinations. (4^{th} cognitive level)
0CVSE503_4	Analysis and design of Silos and bunkers-lateral pressure (4^{th} cognitive level)
0CVSE503_5	Analysis and design of Chimney (4^{th} cognitive level)

Course Contents:		
Unit 1	Analysis and design of flat slab, circular slab.	07 Hrs.
Unit 2	Analysis and design of grid slab,design of folded plates.	06 Hrs.
Unit 3	Analysis and design of combined footing & raft foundation.	06 Hrs.
Unit 4	Analysis and design of overhead water tank – Rectangular & circular with flat bottom. Design of staging for wind & seismic loads.	07 Hrs.
Unit 5	Silos and bunkers-lateral pressure as per Johnson's and Airy's theory, design	07 Hrs.

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	consideration for square, rectangularshapes design of hoppers.	
Unit 6	Chimney- Design factors thermal stresses its components platform and safety ladders steel stacks,refactory lining, caps and foundations.	07 Hrs.

Text Books and Reference Books:

Sr. No	Title	Author	Publisher
01	Reinforced concrete, Limit state design	Ashok K. Jain	New Chand & bros. Roorkee.
02	Advanced Reinforced Concrete design	P.C. Vargese	Prentice Hall of India, Delhi.
03	Advanced Reinforced Concrete design	N. Krishnaraju	CBS Publishers & Distributors, Delhi.
04	Fundamentals of reinforced concrete	N.C.Sinha,S.K.Roy	S.Chand&Co. Ltd,New Delhi.
05	Advanced R.C.C. design	S.S. Bhavikatti	New Age International publishers.
06	Tall chimneys: Design and Construction	S.N.Manohar	Tata Mcgraw-Hill.

I.S. Codes:

1. IS:456-2000 Indian Standard code of practice for plain and reinforced concrete , Bureau of Indian Standards, New Delhi.
2. IS:1893-2002 Indian Standard code of practice for criteria for earthquake resistant design of structure , Bureau of Indian Standards, New Delhi.
3. IS:3370 Indian Standard code of practice for concrete structures for storage of liquids , Bureau of Indian Standards, New Delhi.
4. I.S.2210 Indian Standard code of practice for Criteria for design of reinforced concrete shell structure and folded plates, Bureau of Indian Standards, New Delhi.
5. IS:4998(Part 1) :1992 Indian Standard code of practice for criteria for reinforced concrete chimney , Bureau of Indian Standards, New Delhi.

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First Year M. Tech. Civil Structural Engineering Sem.– I

0CVSE504, Structural Dynamics

Course Details:	
Class	B. Tech, Sem.-III
Course Code and Course Title	0CVSE504, Structural Dynamics
Prerequisite/s	OBSES110,0BSES209
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE I / MSE / ISE II / ESE	20/30/50

Course Objectives:	
01	To understand the behavior of structure under dynamic loading.
02	To Understand the theory of vibration.
03	To Model the structure mathematically.
04	To understand the design of earthquake resistant structures

Course Outcomes (COs):	
0CVSE504_1	To understand the fundamental theory of structural dynamics and equation of motion. **(2nd Cognitive level)**
0CVSE504_2	To analyses and study dynamics response of single and multi-degree-of freedom systems. **(3rd Cognitive level)**
0CVSE504_3	Applying concept of structural dynamics to seismic and wind induced vibrations and understanding the concept of modal analysis and mode combinations.**(3rd Cognitive level)**

Course Contents:		
Unit 1	**Vibration** Types of vibrations, types of exciting forces, degrees of freedom, equivalent stiffness, spring dashpot system and mathematical modeling, differential equation, formation of equations for different structures.	**07Hrs.**
Unit 2	**SDOFS** An un-damped and damped free & force vibration, equation of motions, periodic and impulsive loading, sin wave and rectangular pulse loading. Fourier series loading.	**07Hrs.**
Unit 3	**SDOF General loading** Duhamel's integral, application to simple loading cases, response to ground motion and transmissibility, non linear analysis by step by step method, numerical methods.	**07 Hrs.**

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Unit 4	**MDOFS** Free vibration, Forced vibration, fundamental frequencies and mode shapes, orthogonality of mode shapes, Eigen value problem.	**06Hrs**
Unit 5	**Numerical Methods of analysis** Fundamental mode analysis, Rayleigh method, Dunkerly's method, Holzers method, Iteration method.	**06Hrs.**
Unit 6	**Vibrations of Beams** Equations of motion, Initial conditions, Free & force vibration, Boundary conditions, Effect of axial force, shear deformation. Introduction about push over analysis.	**07Hrs.**

Reference Books:

Sr. No	Title	Author	Publisher
01	Dynamics of structures	R.W. Clough and J. Penzin	McGraw-Hill Pubication
02	Structural Dynamics	Roy Craig	Willey
03	Elements of Earthquake Engineering	Jaikrishna, A. R. Brijesh Chandra	South Asian Publishers Private, Limited.
04	Structural Dynamics	Roy Craig.	John-Wiley & Sons
05	Dynamics of Structures – Theory & Application to Earthquake Engineering-	A.K. Chopra.	Prentice Hall Publications
06	Dynamics of Structures	Mukhopadhyay	ANE Books
07	Structural Dynamics	Morio Paz	CBS Publication

Tutorial

A set of assignments based on above syllabus is to be submitted

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First Year M. Tech. Civil Structural Engineering Sem. - I

0CVSE505, Advanced Design of Prestressed Members

Course Details:	
Class	M. Tech, Sem.-I
Course Code and Course Title	0CVSE505, Advanced Design of Prestressed Members(Elective)
Prerequisite/s	Design of Prestressed Structures
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To explain the basic principles of Prestressing
02	To analyze and design circular systems, domes and slabs
03	To design Pre-stressed Bridges.
04	To design continuous beams, folded plates and shells.
05	To design tension and compression members

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
0CVSE505_1	Explain the basic principles of Prestressing. (2nd cognitive level)
0CVSE505_2	Analyze and design circular systems, domes and slabs. (4th cognitive level)
0CVSE505_3	Design Pre-stressed Bridges. (5th cognitive level)
0CVSE505_4	Design continuous beams, folded plates and shells (5th cognitive level)
0CVSE505_5	Design tension and compression members (5th cognitive level)

Course Contents:		
Unit 1	**Introduction** Pre-stressing systems and end anchorages, losses of pre-stress.	06 Hrs.
Unit 2	**Analysis** Analysis and deflections of beams of different cross sections for flexure, shear, bond and bearings, Cable layouts.	08 Hrs.
Unit 3	**Design** Circular systems, domes and slabs.	06 Hrs.
Unit 4	**Design** Pre-stressed Bridges, (Super-structure only).	06 Hrs.
Unit 5	**Design** Continuous beams, folded plates and shells.	08Hrs.
Unit 6	**Design** Tension and compression members.	06 Hrs.

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Tutorials:
One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, and surprise test, declared test, seminar, final orals and any others. The teacher may add any of other academic activity to evaluate student for his/her in semester performance.

Text &References Books:			
Sr. No	**Title**	**Author**	**Publisher**
01	Prestressed Concrete	N Krishna Raju	Tata Mcgraw Hill, New Delhi
02	Prestressed Concrete	Rajagopalan N	Narosa Publishing House, New Delhi
03	Prestressed Concrete	Pundit G S and GuptaS P	C B S Publishers, New Delhi
04	Prestressed Concrete	S. K. Mallik and A. P. Gupta	Oxford & IBH, New Delhi
05	Design of Prestressed Concrete Structures	Lin T Y and Burns N H	John Wiley and Sons, New York
06	Prestressed concrete Vol-I & Vol.-II	Y. Guyen	John Willey & Sons, New York-
07	Prestressed concrete theory & design	E. W. Bennet	Chapman & Hall, London
08	Design Handbook : Precast and Prestressed Concrete 6th	Leslie D. Martin; Christopher J. Perry	PCI
09	Design of Bridges,	N. Krishna Raju	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi

First Year M. Tech. Civil Structural Engineering Sem. - I

0CVSE506, Design of Foundation

Course Details:	
Class	F. Y. M. Tech, Sem.-I
Course Code and Course Title	0CVSE506,**Design of Foundation (Elective)**
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

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Course Objectives:	
01	To investigate different methods of soil exploration, sampling drilling and rock quality designation and behavior of different soils for slope stability, bearing capacity and foundation settlement and different factors affecting soil properties.
02	To analyze and design the shallow foundation and understand its selection criteria.
03	To classify, analyze and design different types of pile foundations for loading conditions and materials used.
04	To illustrate the uses of well foundations, caissons and sheet piles and their analysis.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE506_1	Determine the ultimate bearing capacity and dynamic bearing capacity (5^{th} cognitive level)
0CVSE506_2	Design the shallow foundation based on rigid analysis (6^{th} cognitive level)
0CVSE506_3	Design the raft foundation (6^{th} cognitive level)
0CVSE506_4	Determine the pile diameter, pile capacities for single pile and compute efficiency of pile group. (5^{th} cognitive level)
0CVSE506_5	Design well foundation and design of simple machine foundation. (6^{th} cognitive level)

Course Contents:		
Unit 1	Theories of failure of soil, Determination of ultimate bearing capacity, Dynamic bearing capacity. Different methods of design of shallow foundations for axial and eccentric load	**06 Hrs.**
Unit 2	Design of wall footing, strap footing, combined footing, (Rectangular & Trapezoidal)	**08 Hrs.**
Unit 3	Raft foundation, different types, Design considerations and various methods of analysis and design of raft foundation.	**08 Hrs.**
Unit 4	Determination of load carrying capacity of single pile, rock socketing, Negative skin friction, Design of axially loaded piles, design of pile groups and pile cap, under-reamed piles.	**06 Hrs.**
Unit 5	Analysis and design of drilled piers and well foundation	**06 Hrs.**
Unit 6	Dynamic response of soil, criteria for satisfactory machine foundation, framed and massive foundation, Analysis and design of simple machine foundations using I. S. Code. Vibration isolation	**06 Hrs.**

Tutorials:
One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, and surprise test, declared test, seminar, final orals and any others. The teacher may add any of other academic activity to evaluate student for his/her in semester performance.

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Text &References Books:			
Sr. No	Title	Author	Publisher
1.	Foundation Analysis & Design	Bowles J.E.	McGraw Hill Book
2	Theory & practice of Foundation Engineering	Goodman, L.J. Karol, R.H.	McMillan
3.	Dynamics of Bases & Foundation	D.D. Barkar	-
4.	Foundation Engineering Hand Book	Winterkorn H.F. Fang H.Y.	Van Nost and Reinfold
5.	Design of Raft Foundation	Kany M.	-
6.	Soil Dynamics	Shamsher	McGraw Hill

First Year M. Tech. Civil Structural Engineering Sem. - I

0CVSE507, Repairs and Rehabilitation of Structures

Course Details:	
Class	M.Tech. Sem.-I
Course Code and Course Title	0CVSE507, **Repairs and Rehabilitations of structures (Elective)**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To understand the concept of repairs and rehabilitation.
02	To understand cause of deterioration.
03	To understand repair and retrofitting techniques.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE507_1	Understand the concept repairs and rehabilitation of structures.
0CVSE507_2	List methods of repairs and rehabilitation.
0CVSE507_3	Apply the techniques of repairs and rehabilitation.
0CVSE507_4	Define earthquake damages and retrofitting.

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Course Contents:		
Unit 1	**Introduction to Maintenance and repairs** :Definitions: Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance, Importance of rehabilitation as a part of construction engineering. Preventive measures on various aspects, Inspection, Assessment procedure for evaluating a damaged structure cause of deterioration, testing techniques.	**08 Hrs.**
Unit 2	**Rehabilitation studies of buildings,** underground construction, bridges, streets and highways, sewage treatment plants – masonry work, R.C.C. works, and steel structures- types of distress. Numerical condition surveys for foundation, structural and functional deterioration, design criteria, materials and techniques.	**07 Hrs.**
Unit 3	**Repair & Retrofitting materials:** Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, fiber reinforced concrete.	**06 Hrs.**
Unit 4	**Repair & Retrofitting techniques:** Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and shotcreting , Epoxy injection, mortar repair for cracks, shoring and underpinning	**06 Hrs.**
Unit 5	**Repairs to Structures:** Repairs to overcome low member strength, Deflection, Cracking, corrosion, Chemical disruption, weathering, wear, fire, leakage, marine exposure	**06 Hrs.**
Unit 6	**Earthquake damages and retrofitting** of buildings, restoration, effects of earthquakes, response of buildings to earthquake motion, factors related to building damages due to earthquake, methods of seismic retrofitting, restoration of buildings.	**07 Hrs.**

Text Books andReference Books:

Sr. No	Title	Author	Publisher
01	Concrete structures, Materials, Maintenance and Repair.	Denison Campbell, Allen and Harold Roper.	Longman Scientific and technical UK
02	Repair of concrete structures	R. T. Allen and S. C. Edwards	Blakie and Sons, UK
03	Maintenance, Repair & Rehabilitation And Minor Works Of Buildings	P. C. Varghese	PHI Learning

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04	Learning from failures – Deficiencies in Design	Raikar, R.N.,	Constr...ion and Service – R & D Cent... (SDCPL), RaikarBhavan, Bombay.
05	Concrete Technology- Theory and Practice	M. S. Shetty	S. Chand and Company, New Delhi.
06	Earthquake resistant design of structures	Pankaj Agarwal, Manish Shrikande	PHI Le...ning

Tutorial
A set of Tutorial/ problems based on above syllabus is to be submitted

First Year M. Tech. Civil Structural Engineering Sem. - I

0CVSE508, Structural Optimization

Course Details:		
Class		M. Tech., Sem.-I
Course Code and Course Title		0CVSE508, **Structural Optimization**
Prerequisite/s		0CVSE502, Advanced Structural Analysis
Teaching Scheme: Lecture/Tutorial		03/01
Credits		04
Evaluation Scheme: ISE / MSE / ESE		20/30/50
Course Objectives:		
01	To learn principles of optimization	
02	To implement the optimization concepts for the structural engineering problems.	
03	To evaluate different methods of optimization.	

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE508_1	Describe Knowledge of design and development of problem solving skills (2^{nd} cognitive level)
0CVSE508_2	Describe the principles of optimization.(2^{nd} cognitive level)
0CVSE508_3	Design and develop analytical skills.(6^{th} cognitive level)
0CVSE508_4	Summarize the Linear, Non-linear and Geometric Programming(2^{nd} cognitive level)
0CVSE508_5	Describe the concept of Dynamic programming(2^{nd} cognitive level)

Course Contents:		
Unit 1	Introduction to optimization, engineering applications of optimization, Formulation of structural optimization problems as programming problems.	**06 Hrs.**
Unit 2	Optimization Techniques: Classical optimization techniques, single variable optimization, multivariable optimization with no constraints, unconstrained minimization techniques and algorithms constrained optimization solutions	**06 Hrs.**

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	by penalty function techniques, Lagrange multipliers techniques and feasibility techniques.	
Unit 3	Linear programming, standard form of linear programming, geometry of linear programming problems, solution of a system of linear simultaneous equations, pivotal production of general systems of equations, simplex algorithms, revised simpler methods, duality in linear programming.	06 Hrs.
Unit 4	Non-linear programming, one dimensional minimization methods, elimination methods, Fibonacci method, golden section method, interpolation methods, quadratic and cubic methods, Unconstrained optimization methods, direct search methods, random search methods, descent methods.	06 Hrs.
Unit 5	Constrained optimization techniques such as direct methods, the complex methods, cutting plane method, exterior penalty function methods for structural engineering problems. Formulation and solution of structural optimization problems by different techniques.	**08 Hrs.**
Unit 6	Geometric programming, conversion of NLP as a sequence of LP/ geometric programming. Dynamic programming: Dynamic programming conversion of NLP as a sequence of LP/ Dynamic programming.	**08 Hrs.**

Tutorials:
One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, and surprise test, declared test, seminar, final orals and any others. The teacher may add any of other academic activity to evaluate student for his/her in semester performance.

Text &Reference Books:

Sr. No	Title	Author	Publisher
01	Optimum Structural Design	Spunt	Prentice Hall
02	Optimization – Theory and Practice	S.S. Rao	Wiley Eastern Ltd.
03	Optimum Structural Design	Uri Krisch	McGraw Hill.
04	Operation Research	Richard Bronson	Schaum's Outline Series.
05	Structural optimization using sequential linear programming	Bhavikatti S.S.	Vikas publishing house.

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First Year M. Tech. Civil Structural Engineering Sem. - I

0CVSE509, Research Methodology

Course Details:	
Class	M. Tech, Sem.-I
Course Code and Course Title	0CVSE509, **Research Methodology**
Prerequisite/s	Nil
Teaching Scheme: Lecture/Tutorial	2/0
Credits	2
Evaluation Scheme: ISE/MSE/ESE	20/30/50

Course Objectives:	
01	To provide knowledge of basic concepts of research and its methodologies.
02	To prepare project proposal.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE509_1	Know the basic concepts of research. (1st Cognitive level)
0CVSE509_2	Select and define appropriate research problem and parameters for writing a research report and thesis. (1st Cognitive level)
0CVSE509_3	Explain measurement and Scaling Techniques. (2nd Cognitive level)
0CVSE509_4	Analysis of Variance and Co-variance. (4th Cognitive level)

Course Contents:		
Unit 1	**Introduction to Research** Meaning of research, types of research, process of research, Sources of research problem, Errors in selecting a research problem, Scope and objectives of research problem, formulation of research hypotheses. Search for causation.	**03 Hrs.**
Unit 2	**Developing a Research Proposal** Format of research proposal, Individual research proposal, Institutional research proposal, Significance, objectives, methodology, Funding for the proposal, Different funding agencies. Framework for the planning.	**04 Hrs.**
Unit 3	**Literature survey** Definition of literature and literature survey, need of literature survey, sources of literature, elements and objectives of literature survey, styles of literature survey, and strategies of literature survey.	**04 Hrs.**
Unit 4	**Data collection and analysis of data** Classification of data, benefits and drawbacks of data, evaluation of data, qualitative methods of data collection.	**06 Hrs.**

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	Testing of hypothesis- concepts and testing, analysis of variance techniques, introduction to nonparametric tests. Validity and reliability, Approaches to qualitative and quantitative data analysis.	
Unit 5	**Report writing** Need of effective documentation, importance of report writing, types of reports, report structure, report formulation, Plagiarism.	04 Hrs.
Unit 6	**Presentation of research** Research briefing, presentation styles, impact of presentation, elements of effective presentation, Writing of research paper, presenting and publishing paper, patent procedure.	03 Hrs.

Text & Reference Books:			
Sr. No	**Title**	**Author**	**Publisher**
1.	Research Methodology: concepts and cases	Deepak Chawla and NeenaSondhi	Vikas Publishing House Pvt. Ltd.
2.	Research Methods for Business	Sekaran	Wiley, India.
3.	Research Methodology: Methods and Trends	Dr. C. R. Kothari	New Age International Publishers.
4.	Research Methods in Education	Louis Cohen, Manion, Morrison, Rout ledge(Taylor &Francis Group)	Cambridge University Press India Pvt. Ltd.
5.	Research in Education	John Best and James Kahn	Prentice Hall of India Pvt. Ltd.

First Year M. Tech. Civil Structural Engineering Sem. - I

0CVSE551, Advanced Design of Concrete Structures Lab

Course Details:	
Class	M.Tech SEM-I
Course Code and Course Title	0CVSE551, **Advanced Design of Concrete Structures Lab**
Prerequisite/s	0CVPC402, 0CVPC412
Teaching Scheme: Lecture/Tutorial	0/2
Credits	01
Evaluation Scheme: ISE / MSE / ESE	50/--/--

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Course Objectives:	
01	To understand analysis and design of various types of slabs as per situation andLoading conditions.
02	To understand analysis and design of different types of footings as per superstructure and substructure (soil conditions.)
03	To understand analysis and design of different types of water tanks as per situation and loading combinations.
04	To understand analysis and design of Silos and bunkers-lateral pressure
05	To understand analysis and design Chimney.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE551_1	Analysis and design of various types of slabs as per situation and loading conditions. (4^{th} cognitive level)
0CVSE551_2	Analysis and design of different types of footings as per superstructure and substructure (soil conditions). (4^{th} cognitive level)
0CVSE551_3	Analysis and design of different types of water tanks as per situation and loading combinations. (4^{th} cognitive level)
0CVSE551_4	Analysis and design of Silos and bunkers-lateral pressure (4^{th} cognitive level)
0CVSE551_5	Analysis and design of Chimney (4^{th} cognitive level)

Course Contents:	
The lab work shall consist of following parts:	
Part I	Design of a flat slab.
Part II	Design of folded plates.
Part III	Design of combined footing and raft foundation.
Part IV	Design of overhead water tank.
Part V	Design of silos / bunkers.
Part VI	Design of R. C. C. Chimneys.
Note: • A Report based on above parts shall be submitted by each student.	

Text & Reference Books:			
Sr. No	**Title**	**Author**	**Publisher**
01	Reinforced concrete, Limit state design	Ashok K. Jain	New Chand & bros. Roorkee
02	Advanced Reinforced Concrete design	P.C. Vargese	Prentice Hall of India,

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			Delhi
03	Advanced Reinforced Concrete design	N. Krishnaraju	CBS Publishers & Distributors, Dehli
04	Fundamentals of reinforced concrete	N.C.Sinha,S.K.Roy	S.Chand&Co. Ltd,New Delhi
05	Advanced R.C.C. design	S.S. Bhavikatti	New Age International publishers.
06	Tall chimneys: Design and Construction	S.N.Manohar	Tata Mcgraw-Hill

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0CVSE552, Software Application Lab

Course Details:	
Class	M. Tech, Sem.-I
Course Code and Course Title	0CVSE552,**Software Application Lab- I**
Prerequisite/s	Design of Steel Structures, Design of Concrete Structures
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE/ESE	**50/50**

Course Objectives:	
01	To learn the basic modeling tools of any civil software. (Staad.Pro, SAP, ETAB).
02	To learn basics of modeling of, 2D and 3D, RCC and Steel Structures.
03	To learn basics of load application on structures.
04	To learn various design code provisions for different countries.
05	To learn application of seismic loads.
06	To learn modelling of foundation.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE552_1	Judge the quality of the numerical solution and improve accuracy inan efficient manner by optimal selection of solution variables (3rd cognitive level)
0CVSE552_2	Analyze complex structural systems, using analysis softwares including interfacing with CAD models. (4th cognitive level)
0CVSE552_3	Design various RCC and Steel structural components using softwares. (5th cognitive level)
0CVSE552_4	Design Multistoried RCC Buildings using codes of various countries. (5th cognitive level)
0CVSE552_5	Design foundations of complex structures. (5th cognitive level)

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Course Contents:	
The lab work shall consist of following parts:	
Part I	Design Structural Components: RCC and Steel beam, column and footing.
Part II	Design of RCC Multistoried building including seismic load. (Minimum 10 storied building).
Part III	Design of Steel Girder and Frames.
Part IV	Design of Foundation.
Part V	Design of RCC slabs and shells using higher order elements.
Note: • A Report based on above five parts shall be submitted by each student.	

Reference Books:

Sr. No	Title	Author	Publisher
01	Illustrated Design of Reinforced Concrete Buildings (Design of G+3 Storeyed Buildings + Earthquake Analysis & Design)	Dr. V .L. Shah & Dr. S. R. Karve	Structures Publications; 2010
02	Earthquake Resistant Design of Structures	Pankaj Aggarwal & Manish Shrikhande	Prentice Hall India Learning Private Limited; 2006
03	Staad.Pro V8i for Beginners	T.S. Sarma	Notion Press; 1 edition (22 August 2014)
04	Learning Bentley Staad.Pro V8I for Structural Analysis	Sham Tickoo	Dreamtech Press (10 June 2015)

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0CVSE553, Seminar - I

Course Details:	
Class	M. Tech, Sem.- I
Course Code and Course Title	0CVSE553, **Seminar I**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	50/00

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Course Objectives:
Students are expected to develop research aptitude by exploring a selected specific area, summarize for current status and present the same in form of a seminar. In depth study in a specialized area by carrying out a literature survey, understanding different aspects related to that area, preparing a status report is expected.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE553_1	Identify research problem. (2nd Cognitive level)
0CVSE553_2	Prepare and present statement of purpose. (3rd Cognitive level)
0CVSE553_3	Perform analysis work. (4th Cognitive level)
0CVSE553_4	Demonstrate with outside agencies. (3rd Cognitive level)
0CVSE553_5	Generate report and Present the work carried out. (6th Cognitive level)

Course Contents:
Student shall be delivered on one of the advanced topics chosen in consultation with the Guide after compiling the information from the latest literature. The concepts must be clearly understood and presented by the student. All modern methods of presentation should be used by the student. Minimum 02 presentations are to be delivered by each student. A hard draft copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing one side printed, as per format) should be submitted to the Department before delivering the final seminar. The final copy of the report in hard and soft form by incorporating corrections from Department, must be submitted to the Guide along with other details.

Text Books:
Relevant textbooks for selected knowledge area/areas.

Reference Books:
Relevant reference books, Journal publications, conference publications, open web sources etc. for selected knowledge area/areas.

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0CVSE510, Theory of Plates and Shells

Course Details:	
Class	M. Tech., Sem.-II
Course Code and Course Title	0CVSE510, Theory of Plates and Shells
Prerequisite/s	0CVSE501, Theory of Elasticity and Plasticity
Teaching Scheme: Lecture/Tutorial	3/1

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Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To study the fundamentals of continuum mechanics.
02	To study the various theories used for the static analysis of plates.
03	To do static and dynamic analysis of plates with different boundary conditions.
04	To analyze the shell element using various theories related to them.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE510_1	Understand the fundamentals of continuum mechanics. (2^{nd} cognitive level)
0CVSE510_2	Understand the classical plate theory and First order shear deformation theory for the static analysis of plates. (2^{nd} cognitive level)
0CVSE510_3	Analyze the plates for various boundary and loading conditions using Navier's and Levi's solution. (4^{th} cognitive level)
0CVSE510_4	Analyze the plates for the dynamic loading and under the vibrations with different boundary conditions. (4^{th} cognitive level)
0CVSE510_5	Analyze all the type of shells with and without edge beams. (4^{th} cognitive level)
0CVSE510_6	Analyze the shell element using bending and membrane theories. (4^{th} cognitive level)

Course Contents:		
Unit 1	**Fundamentals of continuum mechanics** Elasticity approach to solution, Stress, Strain, Dimension reduction- Plane Stress and Strain, Constitutive relationships, Equilibrium Equations, Thermal Stress Analysis.	**07 Hrs.**
Unit 2	**Classical plate theory** Assumptions, Displacement Model, Stress Resultants, Equilibrium Equations, Introduction to First Order Shear Deformation Theories.	**05 Hrs.**
Unit 3	**Navier's and Levi's Solution** Simply supported plates and various boundary and loading conditions. Equations of equilibrium under sinusoidal loading.	**08 Hrs.**
Unit 4	**Vibration and Buckling of Plates** Vibration and buckling analysis of plates. Different loading conditions, numerical problems.	**07 Hrs.**
Unit 5	**Shells** Introduction, cylindrical, elliptical, parabolic Shells membrane theory, bending theory and beam theory for above shells, analysis of shells, shells with and without edge beams.	**06 Hrs.**

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Unit 6	Analysis of Shells Bending and membrane theories - Various analysis problems.UDL and point loads.	07 Hrs.

Tutorials:

One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, and surprise test, declared test, seminar, final orals and any others. The teacher may add any of other academic activity to evaluate student for his/her in semester performance.

Text & Reference Books:

Sr. No	Title	Author	Publisher
01	Theory of plates and shells	Timoshenko S.	McGraw Hills Book Comp.
02	Theory of Plates	Chandrashekhar K.	Universities Press (India) Limited
03	Theory and analysis of elastic plates and shells.	Reddy J. N.	Taylor & Francis
04	Analysis of Thin Concrete Shells	Chandrashekhar K.	New Age International (P) Ltd.
05	Design of concrete shell roofs	Ramaswamy	CBS publishers and distributors New Delhi.
06	Mechanics of Laminated Composite Plates and Shells	Reddy J. N.	CRC Press

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0CVSE511, Finite Element Method

Course Details:	
Class	M. Tech, Sem.-II
Course Code and Course Title	0CVSE511, **Finite Element Method**
Prerequisite/s	0CVSE501 Theory of Elasticity and Plasticity
Teaching Scheme: Lecture/Tutorial	3/0
Credits	03
Evaluation Scheme: ISE/ MSE / ESE	20/30/50
Course Objectives:	
01	To explain the fundamentals of the finite element method for the analysis of engineering problems arising in solids and structures.
02	To illustrate to judge the quality of the numerical solution and improve accuracy in an efficient manner by optimal selection of solution variables.
03	To enable the students to formulate the design problems into FEA.

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04	To apply commercially available, state-of-the-art finite element analysis software to analyze complex structural systems, including interfacing with CAD models.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE511_1	Explain the fundamentals of the finite element method for the analysis of engineering problems arising in solids and structures. (2^{nd}cognitive level)
0CVSE511_2	Illustrate the quality of the numerical solution and improve accuracy in an efficient manner by optimal selection of solution variables (3^{rd}cognitive level)
0CVSE511_3	Formulate the design problems into FEA (6^{th} cognitive level)
0CVSE511_4	Apply commercially available, state-of-the-art finite element an analysis software to analyze and design complex structural systems, including interfacing with CAD models (6^{th} cognitive level)

Course Contents:		
Unit 1	**1D Problems** Principle of minimum potential energy. Finite element procedure. Discretization, nodes, element incidence, displacement model, shape function, selection of order of polynomials, application to bars with constant and variable cross sections subjected to axial forces.	**07 Hrs.**
Unit 2	**2D Problems** Development of element stiffness matrix and nodal load vector for truss, beam and plane frame elements. Transformation of matrices, relevant structural engineering applications. 2D elements of triangular and quadrilateral shapes for plane stress and plane strain problems. Pascal's triangle, convergence requirements and compatibility conditions, shape functions, boundary conditions, element aspect ratio, applications to a continuum.	**07 Hrs.**
Unit 3	**3D Problems** Development of element stiffness matrix and nodal load vector for Tetrahedron, Hexahedral elements.	**06 Hrs.**
Unit 4	**Isoparametric Elements** Shape function. Natural coordinate systems, classification- isoparametric, subparamelric, superparametric elements, 1D & 2D isoparametric elements, Gauss quadrature integration.	**07 Hrs.**
Unit 5	**Axisymmetric Elements** Development of element stiffness matrix and nodal load vector for axisymmetric element. Plate and Shell Elements: Formation of stiffness matrix for plate bending elements of triangular and quadrilateral shapes,	**07 Hrs.**

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	cylindrical thin shell elements.	
Unit 6	**Plate and Shell Elements** Formation of stiffness matrix for plate bending elements of triangular and quadrilateral shapes, cylindrical thin shell elements.	[illegible]

Text & Reference Books:			
Sr. No	**Title**	**Author**	**Publisher**
01	Introduction to the Finite Element Method	C. S. Desai & J. F. Abel	CBS Pub
02	An introduction to the finite element method	J. N. Reddy	Tata McGraw Hill Publication Co. Ltd.
03	Introduction to the Finite Element in Engineering	T.R.Chandrupatla and Belegundu	Prentice Hall of India, Pvt. Ltd.
04	Programming in finite element method	C.S.Krishnamoorthy	Tata McGraw Hill Publication Co. Ltd.
05	Finite Element Method with application in Engineering	A. H. Shah, Y. M. Desai, T. I. Eldho	Pearson Education (2013)
06	Finite Element Procedures	Bathe K.J.	PHI Learning Pvt. Ltd.
07	The Finite Element Method Vol.I and II	O.C.Zienkiewicz and R.L.Taylor	Tata McGraw
08	Concept and Application of Finite Element Analysis	R. D. Cook	John Wiley & sons

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0CVSE512, Design of Earthquake Resistant Structures

Course Details:	
Class	M Tech. SEM-II
Course Code and Course Title	0CVSE512, **Design of Earthquake Resisting Structures**
Prerequisite/s	CS1104
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE/ MSE / ESE	20/30/50

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Course Objectives:	
01	To understand the behavior of structure under dynamic loading
02	To analyze the structural model mathematically
03	To analyze dynamic analysis of structures.
04	To design of earthquake resistant structures

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
0CVSE512_1	Understand the behavior of structure under dynamic loading. **(2nd cognitive level)**
0CVSE512_2	Model the structure mathematically. **(5th cognitive level)**
0CVSE512_3	Analyze dynamic analysis of structures.**(4th cognitive level)**
0CVSE512_4	Design of earthquake resistant structures. **(6th cognitive level)**

Course Contents:		
Unit 1	Characteristics of Earthquakes: Earthquake terminology, Indian Earthquakes, Measurement of Earthquakes, Magnitude, Intensity, Frequency-magnitude relationship, Liquefaction. prediction of earthquake	**06 Hrs.**
Unit 2	Earthquake response of linear SDOF systems: Response spectrum theory, Strong ground motion, Accelerometers, Peak parameters, Concept of earthquake response spectrum, tripartite spectrum, Construction of design response spectrum.	**07 Hrs.**
Unit 3	Earthquake response of linear MDOF systems: Modal Analysis, Participation factors, Modal contributions, multistoreyed buildings with symmetric and unsymmetric plan, Torsional response.	**07 Hrs.**
Unit 4	Concept of Earthquake resistant design, Objectives, Ductility, Ductility reduction factors, Overstrength, Response reduction factor, Design response spectrum, Lateral stiffness, Conceptual design, Building configuration	**06 Hrs.**
Unit 5	Lateral load analysis, Provisions of IS-1893 for buildings, Base Shear, Application to Multistorey buildings, Load combination.	**08 Hrs.**
Unit 6	Detailing of RCC and Masonry buildings, Provisions of IS-13920, IS – 4326.	**06 Hrs.**

Text & Reference Books:			
Sr. No	**Title**	**Author**	**Publisher**
1	Structural Dynamics	MadhujitMukhopadhyay ,	Ane Books India
2	Structural Dynamics	*Mario Paz*	Springer (sie)
3	Elements of Earthquake engineering	Jaikrishna A.R. Chandrashckharan,	BrijeshChandra.Stands Publishers

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4	Earthquake Resistant Design of Structures	PankajAgarwal, Manish Shrikande	P... Pu...tion
5	Earthquake Resistant Design for Engineers & Architects	D.J. Dowrick,	John Wiley & Sons
6	Dynamic Analysis and Earthquake Resistant Design	Japanasesocity of civil engg.	Japanasesocity of civil engg.
7	Dynamics of Structures	R.W. Clough and J. Penziene	McGraw-Hill Pub
8	Structural Dynamics	Roy Craig, John	Wiley & Sons.
9	Dynamics of Structures- Theory & Application to Earthquake Engineering	A.K.Chopra.	Prentice-H; Pub

Tutorial:
A set of Tutorial/ problems based on above syllabus is to be submitted

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0CVSE513, Advanced Design of Steel Structures

Course Details:	
Class	M.Tech. SEM-II
Course Code and Course Title	0CVSE513, **Advanced Design of Steel Structure**
Prerequisite/s	0CVPC306
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To understand the concept in design of steel structures.
02	To understand application of steel structures.
03	To understand analysis and design of steel structures.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE512_1	Understand the concept of design of steel structures.
0CVSE512_2	Analyze the forces in members of steel structures.
0CVSE512_3	Design the various steel structure members.

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Course Contents:		
Unit 1	**Multistory steel buildings:** Introduction, load transfer mechanism, lateral load resisting systems and analysis, Design of moment resistant frames, concentrically braced frames, connections in multistory buildings, interacting moment resisting frames with shear walls for seismic/ wind effects structural systems, framed tube structures, braced tube structures, tube in tube structures.	**07 Hrs.**
Unit 2	**Design of Steel bridges:** Types, Loads, Trussed girder bridge design, bearings and it's types. Deck type and through type bridges.	**06 Hrs.**
Unit 3	**Cold-formed light gauge steel sections:** Code provisions,Design considerations for compression elements, design of compression elements, stiffened compression elements, multi stiffened elements, and design of light gauge beams.	**07 Hrs.**
Unit 4	**Plastic analysis**: Plastic bending of beams, plastic hinge, upper and lower bond theorems, uniqueness theorem, yield criteria, analysis and design of fixed and continuous beams.	**06 Hrs.**
Unit 5	**Design of portal frames & Pre-engineered Buildings**: Plastic Analysis: Collapse mechanisms, analysis and design of gables, multistory-multi bay frames, check for stability of frames, plastic moment distribution method. Introduction to Pre-engineered Buildings.	**07 Hrs.**
Unit 6	**Concrete-Steel composite sections:** I. S. Recommendations,Shear connectors, types and characteristics, Design requirements of Shear connectors, Design of composite beams, Design of encased steel columns.	**07 Hrs.**

Text &Reference Books:

Sr. No	Title	Author	Publisher
01	Design of Steel Structures	Dr. N. Subramanian	Oxford University Press, New Delhi.
02	Design of Steel Structures	A. S. Arya, A Kumar	New Chand and Bro., Roorkee.

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03	Limit State Design of Steel Structures	Dr. M.R. Shiyekar	PHI Learning
04	Design of steel structures-Vol. II	Dr. Ramchandra	Standard Book House,Delhi.
05	Design of steel structures	A.S. Arya. J.L. Ajamani	Nemchand and brothers.
06	Structural analysis and design of tall buildings	B.S. Taranath	McGrawHill.
07	Guide for the structural use of steelwork in buildings	Institute for Steel Development And Growth(INSDAG)	Institute for Steel Development And Growth(INSDAG)

Tutorial

A set of Tutorial/ problems based on above syllabus is to be submitted

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0CVSE514, Advances in Concrete Composites

Course Details:	
Class	M. Tech, Sem.-I
Course Code and Course Title	0CVS514, **Advances in Concrete Composites(Elective)**
Prerequisite/s	Strength of Materials
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To explain the weakness of plain concrete, and discuss the latest development and trend in concrete composites.
02	To illustrate advanced applications of composite materials.
03	To explain manufacturing and properties of concrete composites.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE514_1	Describe the weakness of plain concrete, and illustrate the latest development in trend in concrete composites (2nd cognitive level).
0CVSE514_2	Illustrate the advanced applications of composite materials. (3rd cognitive level).
0CVSE514_3	Explain the manufacturing and properties of concrete composites such as fibre reinforced concrete, ferro-cement, silica fume concrete and polymer concrete (2nd cognitive level).

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Course Contents:		
Unit 1	**Fiber reinforced composites** Introduction to Fiber Reinforced Concrete, types of fibers, properties of fibers. Properties of constituent materials. Mix proportion, mixing, casting methods.	06 Hrs.
Unit 2	**Properties and Mechanics** Properties of freshly mixed concrete (fiber reinforced concrete), workabilitytests, mechanical properties, Mechanics and mechanism of Fiber ReinforcedConcrete.	07 Hrs.
Unit 3	**Testing and Design** Testing of fibre reinforced concrete under compression, flexure, shear and bending. Various toughness indices. Stress-strain behaviour. Design aspects of reinforced concrete structures with fibres.	07 Hrs.
Unit 4	**Ferro Cement** Introduction, materials used, mechanical properties, construction techniques, design in direct tension, applications, and merits as structural materials.	07 Hrs.
Unit 5	**Silica Fume Concrete** Introduction, physical and chemical properties of silica fume, reaction mechanism of silica fume, properties of silica fume concrete in fresh state, mechanical properties and durability of silica fume concrete.	07 Hrs.
Unit 6	**Polymer Concrete** Introduction, Classification, properties of constituent materials, polymer impregnated concrete, polymer concrete, application.	06 Hrs.

Tutorial

A set of Tutorial/ problems based on above syllabus is to be submitted.

Text & Reference Books:

Sr. No	Title	Author	Publisher
01	Concrete Technology & Design	R N. Swamy	Surrey University Press
02	Special Structural Concretes	RafalSiddiquc	Galgotia Publisher. Pvt. Ltd., New Delhi
03	Fiber Reinforced Cement Composites	P. N. Balaguru, S. P. Shah	Mc-Graw Hill, New York, 1992
04	Fracture Mechanics and Structural Concrete	Bhusan L. Karihaloo.	Longman Pub Group, 1955, Britain
05	Fiber Cement and Fiber Concrete	D.J Hannant	John Wiley and Sons., 1978

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0CVSE515, Analysis and Design of Multistoried Bui...

Course Details:	
Class	M. Tech, Sem.-II
Course Code and Course Title	0CVSE515, **Analysis and Design of Multistoried Buildings**(El...ctive)
Prerequisite/s	Structural Analysis, R.C.C. Design
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To discuss the methods of.static and dynamic wind analysis of multistoried buildings.
02	To identify preliminary sizing for mathematical modeling of RC/steel structures.
03	To apply Indian codes/Standards for RCC and PSC structures.
04	To analyze shear walls.
05	To analyze and design multistoried structures.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE515_1	Discuss the methods of static and dynamic wind analysis of multistoried buildings (2^{nd} cognitive level)
0CVSE515_2	Identify preliminary sizing for mathematical modeling of RC/steel structures. (2^{nd} cognitive level)
0CVSE515_3	Apply Indian codes/Standards for RCC and PSC structures. (3^{rd} cognitive level)
0CVSE515_4	Analyze shear walls. (4^{th} cognitive level)
0CVSE515_5	Analyze and design multistoried structures.(5^{th} cognitive level)

Course Contents:		
Unit 1	**Introduction to IS Code** Brief study of criteria for earthquake resistant design of structure part1general provisions and buildings(Fifth revision),Ductile detailing of reinforced concrete structures subjected to seismic forces-code of practiee(First revision),Seismic Evaluation strengthen of existing reinforced concrete building guidelines, code of practice for earthquake resistant design and construction of buildings(third Revision).	04Hrs.
Unit 2	**Building frames** Building frames, frame-shear wall buildings, Braced Buildings, Mathematical modeling of buildings with different structural systems with and without diaphragms. Introduction about method of analysis of multi-storied building.	07 Hrs.

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Unit 3	**Multi-storied buildings** Special aspects in Multi-storied buildings: Effect of torsion, flexible first story, P-delta effect, soil structure interaction on building response, drift limitation.	**06 Hrs.**
Unit 4	**Analysis and design - I** Analysis and design of multistoried buildings with masonry infill, Sequential analysis for multistoried buildings. Software approach.	**08 Hrs.**
Unit 5	**Analysis and design - II** Analysis and design of multi-storied buildings with masonry infill, Sequential analysis for multistoried buildings. Software approach, problems.	**08 Hrs.**
Unit 6	**Design – Different parameters** Design for Fire Resistant, Creep, Shrinkage and Thermal stresses.	**07 Hrs.**

Tutorials:
One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, and surprise test, declared test, seminar, final orals and any others. The teacher may add any of other academic activity to evaluate student for his/her in semester performance.

Text &References Books:

Sr. No	Title	Author	Publisher
01	Illustrated Reinforced Concrete Design (as per IS : 456 - 2000)	Dr. V.L.Shah& Dr. S.R.Karve	Structures Publications
02	Handbook of Reinforced Concrete Design (as per IS : 456 - 2000)	Dr. V.L.Shah& Dr. S.R.Karve	Structures Publications
03	Illustrated Design of Reinforced Concrete Buildings (Design of G+3 Storeyed Buildings + Earthquake Analysis & Design)	Dr. V.L.Shah& Dr. S.R.Karve	Structures Publications
04	Earthquake Resistant Design of Structures	Aggarwal P	Prentice Hall India Learning Private Limited
05	Tall building structures: Analysis and Design	Smith. B. S. and Coull. A.	John Wiley & Sons.
06	Structural analysis and design of tall buildings	Taranath. S. B	McGraw-Hill BookCompany.
07	Design and Drawing For Multistoried Apartments	Mukesh Kumar Lalji	LAP LAMBERT Academic Publishing
08	Handbook on Seismic Analysis and	FarzadNaeim	Kluwer

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	Design of Structures		Academic Publisher
09	Seismic design of R C & Masonry Buildings	Paulay, T. &Prestiley, M.J.N.	John Willey & Sons.
10	Concrete Structures in Earthquake Regions	Booth, E	Longman Higher Education.
11	Handbook of Concrete Engineering, 2nd Edition	Fintel, M.	CBS Publications Delhi.
12	Non Sway and Sway Methods for Design of Multi-Storey Building	Noor M S Hasan, Habibur R Sobuz, Costas Ioannou	VDM Verlag, February.

First year M. Tech. Civil Structural Engineering Sem. - II

0CVSE516, Design of RCC Bridges

Course Details:	
Class	F. Y. M. Tech, Sem.- II
Course Code and Course Title	0CVSE516, **Design of R.C.C. Bridges(Elective)**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	Understand different types of loads related to construction of roads and bridges.
02	Develop skill of modelling and resolution of force system using mechanics.
03	Understand application of structural mechanics for analysis of bridges.
04	Acquire knowledge of behaviour of bridges subjected to different types of situations.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE516_1	Illustrate different types of loads related to construction of roads and bridges. (3^{rd} cognitive level)
0CVSE516_2	Develop skill of modelling and resolution of force system using mechanics. (6^{th} cognitive level)
0CVSE516_3	Apply structural mechanics for analysis of bridges. (3^{rd} cognitive level)
0CVSE516_4	Design all types of R.R.C. Bridges. (6^{th} cognitive level)
0CVSE516_5	Predict knowledge of behaviour of bridges subjected to different types of situations. (6^{th} cognitive level)

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Course Contents:		
Unit 1	General Basic bridge forms –beam, arch, suspension, various types of bridges, selection of type of Bridge and economic span length, super structure -philosophy, geometric alignment, drainage, road kurb, wall foundation, pile foundation, open well foundation.	**07Hrs.**
Unit 2	Design loads for bridges –dead load, vertical live load, IRC loading, wind load, longitudinal forces, centrifugal forces, buoyancy, water current forces, thermal forces, deformation and horizontal forces.	**07 Hrs.**
Unit 3	Design of R. C. deck slab, beam and slab, T beam, Pigeaud's theory, Courbon's theory, balanced cantilever bridge, box culvert.	**06 Hrs.**
Unit 4	Construction techniques -construction of sub structure footing, piles, cassions, construction of reinforced earth retaining wall and reinforced earth abutments, super structure erection method bridge deck construction,by cantilever method, Inspection maintenance and repair of bridges	**07 Hrs.**
Unit 5	Design of sub structure abutments, Piers, approach slab.	**06Hrs.**
Unit 6	Bearing and expansion joints forces on bearings Types of bearings, design of unreinforced elastometric bearings, expansion joints	**07 Hrs.**

Text& Reference Books:

Sr. No	Title	Author	Publisher
1.	Reinforced Concrete Structures Vol II	Dr. B. C. Punmia, Ashok Kumar Jain, Anil Kumar Jain	Laxmi Publications
2	Design of Bridge structures	Jagadeesh T. R.	Prentice Hall of India Pvt. Ltd
3.	Concrete bridge design	R. E. Rowe.	John Willey & sons
4.	Advanced Reinforced Concrete Design	N Krishna Raju	CBS Publication & distributors
5.	Essential of bridge Engg.	D Johnson Victor	Oxford & IBH Publishing Co. Pvt. Ltd.
6.	Concrete Bridge Practice	Dr. V.K. Raina	Tata McGraw Hill Pub. Co

Tutorial

A set of Tutorial/ problems based on above syllabus is to be submitted.

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First year M. Tech. Civil Structural Engineering Se... II

0CVSE517, Design of Masonry Structures

Course Details:	
Class	M.Tech. SEM-II
Course Code and Course Title	0CVSE517, **Design of Masonry structures (Elective)**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial	3/1
Credits	04
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To understand the concept of masonry and its types.
02	To understand application of masonry structures.
03	To understand analysis and design of masonry structures.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE517_1	Understand the concept of masonry and its types.
0CVSE517_2	Analyze the strength of masonry in compression, flexure and shear.
0CVSE517_3	Design the masonry structures.
0CVSE517_4	Understand behavior of masonry structures in earthquake and in ancient structures.

Course Contents:		
Unit 1	**Masonry structures, Materials, Types:** Masonry units, Materials and Types, History, Characteristics of Brick, Stone, Clay Block, Concrete Block, Stabilized Mud Block , Masonry units – Strength, Modulus of Elasticity and Water Absorption. Masonry materials, Classification and Properties of Mortars, Selection of Mortar.	06 Hrs.
Unit 2	**Strength of Masonry in Compression:** Behavior under Compression, Strength and Elastic Properties, Influence of Masonry unit and Mortar Characteristics, Effect of Masonry unit Height on Compressive Strength, Influence of Masonry Bonding Patterns on Strength, Prediction of Strength of Masonry in Indian Context, Failure Theories of Masonry under Compression. Effects of Slenderness and Eccentricity, Effect of Rate of Absorption, Effect of Curing, Effect of Ageing, Effect of Workmanship on Compressive Strength.	08 Hrs.

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Unit 3	**Flexural, Shear and Bond Strength** Flexural Strength and Shear Strength of Masonry, Bond between Masonry unit and Mortar, Tests for determining Flexural, Shear and Bond strengths, Factors affecting Bond Strength, Effect of Bond Strength on Compressive Strength, Orthotropic Strength Properties of Masonry in Flexure, Shear Strength of Masonry.	**06 Hrs.**
Unit 4	**Design of Load Bearing Masonry Buildings** Permissible Compressive Stress, Stress Reduction and Shape Reduction Factors, Increase in Permissible Stresses for Eccentric Vertical and Lateral Loads, Permissible Tensile and Shear Stresses, Effective Height of Walls and Columns, Opening in Walls, Effective Length, Effective Thickness, Slenderness Ratio, Eccentricity, Load Dispersion, Arching action, Lintels, Wall Carrying Axial Load, Eccentric Load with Different Eccentricity Ratios, Wall with Openings, Free standing Wall, Design of Load Bearing Masonry for Buildings up to 3 to 8 Storey's using codal Provisions.	**08 Hrs.**
Unit 5	**Earthquake Resistant Masonry Buildings** Behavior of masonry during earthquakes, concepts and design procedure for earthquake resistant masonry, codal provisions. Masonry arches, domes and vaults: Components and classification of masonry arches, domes and vaults, historical buildings, construction procedure.	**06 Hrs.**
Unit 6	**Structural Aspects of Monuments & Ancient Structures** Evolution of Construction Practices, Materials of Construction, Choice of Structural Framing, Form Design, Geometric Proportions, Choice of Foundations, Footprint Ratio, Study of any Four Historical Monuments from Structural point of view.	**06 Hrs.**

Text &Reference Books:

Sr. No	Title	Author	Publisher
01	Structural Masonry.	Jagadish K S	IK International Publishing House Pvt. Ltd.
02	Design of Masonry Structures.	Hendry A.W., Sinha B.P & Davis S.R.	CRC Press
03	Brick and Reinforced Brick Structures.	Dayaratnam P	Oxford & IBH
04	Design of Reinforced and Prestressed Masonry.	Curtin	Thomas Telford

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05	Structural Masonry	Sven Sahlin	Prentice Hall
06	Alternative Building Materials and Technologies	Jagadish K S, Venkatarama Reddy B V and Nanjunda Rao K S	New Age International, New Delhi & Bangalore
07	IS 1905: 1987 Indian Standard Code of Practice for Structural Use of Unreinforced Masonry	Bureau of Indian Standards, New Delhi.	Bureau of Indian Standards, New Delhi.
08	SP20 (S&T): 1991, Handbook on Masonry Design and Construction	Bureau of Indian Standards, New Delhi.	Bureau of Indian Standards, New Delhi.

Tutorial

A set of Tutorial/ problems based on above syllabus is to be submitted

First year M. Tech. Civil Structural Engineering Sem. – II

0CVSE518, Structural Audit

Course Details:	
Class	M. Tech, Sem.-II
Course Code and Course Title	0CVSE518, **Structural Audit**
Prerequisite/s	Nil
Teaching Scheme: Lecture/Tutorial	02/00
Credits	02
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Course Objectives:	
01	To provide knowledge of basic concepts of Structural Audit.
02	To prepare report of Structural Audit.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE518_1	Know the basic concepts of Structural Audit.(1st cognitive level)
0CVSE518_2	Define Structural Audit and parameters for visual inspection. (1st cognitive level)
0CVSE518_3	Describe NDT and SDT techniques. (2nd cognitive level)
0CVSE518_4	Explain the methods of interpretation the testing reports. (2nd cognitive level)

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Course Contents:		
Unit 1	**Introduction** Definition, necessity of structural audit, structural failures: buildings, bridges, public transport systems, and industries etc., design life, insurance schemes.	**05 Hrs.**
Unit 2	**Legal Aspects and Awareness** Government acts and circulars, awareness about safety, precautions, guidelines for public and private participation, identifying and sharing risks, structural auditor registration procedures	**04 Hrs.**
Unit 3	**Defect Mapping and Accessibility to Records** Structural condition: visual inspection, reason of distress, safety & quality, availability of drawings, maintenance records, inspection records	**03 Hrs.**
Unit 4	**Testing** Non destructive testing: Rebound hammer test, semi-destructive testing: UPSV test, Carbonation test, Half-cell potentiometer test, Cover meter test, Interpretation of tests.	**05 Hrs.**
Unit 5	**Repairs and Rehabilitation schemes** Technicality of repairs, structural repairs and paintings, waterproofing work, treatment for vegetation, rehabilitation scheme, estimation of remedial measures	**04 Hrs.**
Unit 6	**Audit Report** Drawings, Specifications, Tenders for repairs, Structural audit reports	**03 Hrs.**

Text & Reference Books:

Sr. No	Title	Author	Publisher
1.	Repair and Rehabilitation of Concrete Structures	Poonam I. Modi and Chirag N. Patel	PHI Learning Pvt. Ltd.
2.	Structural Health Monitoring of long span suspension bridges	You-Lin Xu and Yong Xia	CRC Press
3.	Maintenance, repairs and rehabilitation works of buildings	P. C. Verghese	PHI Learning Pvt. Ltd.
4.	Nondestructive testing of materials and structures	Buyukozturk, O. and Tasdemir, M. A.	Springer Pvt. Ltd. New Delhi.
5.	Nondestructive Testing of deep foundation	Hertlein Bernard	John Wiley and Sons, UK.
6.	Handbook on repair and rehabilitation of R. C. C. Buildings	Director General Works	CPWD, New Delhi, India.

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First Year M. Tech. Civil Structural Engineering Sem.-II

0CVSE554, Structural Lab

Course Details:	
Class	M. Tech, Sem.-II
Course Code and Course Title	0CVSE554,**Structural Lab**
Prerequisite/s	Design of Steel Structures, Design of Concrete Structures
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE/ESE	**100/50**

Course Objectives:	
01	To perform compression test on cubes / cylinders.
02	To perform tensile test on steel / composite bars.
03	To analyze deflection and stresses of steel / concrete beam using actual test.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE554_1	Practice the compression test on concrete cubes / cylinders. (3^{rd}cognitive level)
0CVSE554_2	Practice the tensile test Steel / Composite bars. (3^{rd}cognitive level)
0CVSE554_3	Perform the compression test on fibre reinforced / carbon reinforced cube. (4^{th}cognitive level)
0CVSE554_4	Compare the analysis of deflection and stresses of steel / concrete beam with practical test with manual analysis of the same. (5^{th} cognitive level)
0CVSE554_5	Perform axial compression test on FRP Column. (4^{th}cognitive level)

Course Contents:	
The lab work shall consist of following parts:**(Any Three)**	
Part I	Mix Design and Compression test on concrete cubes / cylinders.
Part II	Tensile Test on Steel / Composite bars.
Part III	Compression test on fibre reinforced / carbon reinforced cube.
Part IV	Measurement of Deflection and stresses of steel / concrete beam using loading frame.
Part V	Axial Compression test on column enclosed with Fibre reinforced plastics (FRP).
Note: • A Report based on above parts shall be submitted by each student.	

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First Year M. Tech. Civil Structural Engineering Sem. – II

0CVSE555, Seminar II

Course Details:	
Class	M. Tech, Sem.- II
Course Code and Course Title	0CVSE555,**Seminar II**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial/Practical	00/00/02
Credits	01
Evaluation Scheme: ISE / ESE	100/00

Course Objectives:

Students are expected to develop research aptitude by exploring a selected specific area, summarize for current status and present the same in form of a seminar. In depth study in a specialized area by carrying out a literature survey, understanding different aspects related to that area, preparing a status report is expected. Students should able to do validation of the problems in literature survey by the results of the same with any FEM software.

Course Outcomes (COs):

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

0CVSE555_1	Identify research problem. (2^{nd} Cognitive level)
0CVSE555_2	Prepare and present statement of purpose. (3^{rd} Cognitive level)
0CVSE555_3	Perform analysis work. (4^{th} Cognitive level)
0CVSE555_4	Demonstrate with outside agencies. (3^{rd} Cognitive level)
0CVSE555_5	Generate report and Present the work carried out. (6^{th} Cognitive level)
0CVSE555_6	Validate the problem in literature using any FEM software.

Course Contents:

Student shall be delivered on one of the advanced topics chosen in consultation with the Guide after compiling the information from the latest literature. The concepts must be clearly understood and presented by the student. Students should able to do validation of the problems in literature survey by the results of the same with any FEM software. All modern methods of presentation should be used by the student. Presentations is to be delivered by each student.

A hard draft copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing one side printed, as per format) should be submitted to the Department before delivering the final seminar. The final copy of the report in hard and soft form by incorporating corrections from Department, must be submitted to the Guide along with other details.

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S. Y. M. Tech.

Civil Structural Engineering

Teaching and Evaluation Scheme

M. Tech. Structural Engineering: III Semester

Course code	Course	Teaching Scheme				Evaluation Scheme		
						Scheme	Practical (Marks)	
		L	T	P	Credits		Max	Min for Passing
0CVSE651	Industrial Training Assessment	-	-	-	2	ISE	100	40
0CVSE652	Dissertation Phase I	-	-	5**	5	ISE	50	20
0CVSE653	Dissertation Phase II	-	-		7	ISE	50	20
						ESE	100	40
Total		--	--	--	14		300	--
Total Contact Hours/Week: 5hrs								

Note: **Average contact hours/week/student.

M. Tech. Structural Engineering: IV Semester

Course code	Course	Teaching Scheme				Evaluation Scheme		
						Scheme	Practical (Marks)	
		L	T	P	Credits		Max	Min for Passing
0CVSE654	Dissertation Phase III	--	--	5**	10	ISE	100	40
0CVSE655	Dissertation Phase IV	--	--		10	ISE	100	40
						ESE	100	40
Total		--	--	--	20		300	--
Total Contact Hours/Week: 5hrs								

Note:

1. **Faculty contact hours per student per week.
2. Student working hours: 34 Hrs/week

Total number of Credits: 80

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Annasaheb Dange College of Engineering and Technology, Ashta
Department of Civil Engineering

Second Year M. Tech. Civil Structural Engineering Sem. – III

0CVSE651, Industrial Training Assessment

Course Details:	
Class	M. Tech, Sem.- III
Course Code and Course Title	0CVSE651, **Industrial Training Assessment**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial	-
Credits	02
Evaluation Scheme: ISE / ESE	100/00

Course Objectives:
Students are expected to do actual practice on construction site / consultancy. The students should experience design procedure in consultancy work. Students should get hands on training and site experience. Students are expected to do comparison of the manual design and design prepared by the consultant. Student has to go for Internship as an industrial training for 1 month in the vacation before actual start of this semester.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE651_1	Perform practical / field work on site. (4^{th} Cognitive level)
0CVSE651_2	Design and analysis of any structure has to be done in consultancy company. (6^{th} Cognitive level)
0CVSE651_3	Compare the manual design and design prepared by consultant. (5^{th} Cognitive level)

Course Contents:
Student shall be delivered presentation on the knowledge gained at the actual site / consultancy at the time of industrial training time. The concepts must be clearly understood and presented by the student. Students should able to do comparison between the manual design and design prepared by consultant. All modern methods of presentation should be used by the student. Presentations isto be delivered by each student at the beginning of the semester. A hard draft copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing one side printed, as per format) should be submitted to the Department before delivering the final seminar. The final copy of the report in hard and soft form by incorporating corrections from Department, must be submitted to the Guide along with other details.

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Second Year M. Tech. Civil Structural Engineering Sem. – III

0CVSE652, Dissertation Phase – I

Course Details:	
Class	M. Tech, Sem.- III
Course Code and Course Title	0CVSE652, **Dissertation Phase – I**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial	05**/00
Credits	05
Evaluation Scheme: ISE / ESE	50/00

Course Objectives:

Students are expected to develop research aptitude by exploring a selected specific area, summarize for current status and present the same in form of a seminar. In depth study in a specialized area by carrying out a literature survey, understanding different aspects related to that area, preparing a status report is expected.

Course Outcomes (COs):

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

0CVSE652_1	Identify research problem from literature survey. (2nd Cognitive level)
0CVSE652_2	Prepare research design for above problem. (3rd Cognitive level)
0CVSE652_3	Generate synopsis report. (6th Cognitive level)
0CVSE652_4	Present the work carried out. (3rd Cognitive level)

Course Contents:

Candidates in consultation with guide shall carry out rigorous literature survey/visit to industry to finalize the topic of dissertation. Student need to carry out exhaustive literature survey with consultation of his/her guide for not less than 25 reputed national international journal and conference papers. They have to define research problem and prepare synopsis. Each candidate should

1. Submit synopsis of his/her dissertation work consisting of literature survey, problem definition and methodology to be used for his/her work.
2. Give 20 minutes of Power Point presentation followed by 10 minutes of discussion.

The Dissertation Phase-I evaluation will be conducted by project review committee consisting of Head of the Department, Guide and one/two internal experts. At the time of presentation, student shall also prepare Synopsis of the work and submit to department for approval. Student shall submit synopsis of dissertation as per the prescribed format in 02 copies to department.

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Second Year M. Tech. Civil Structural Engineering Sem. – III

0CVSE653, Dissertation Phase – II

Course Details:	
Class	M. Tech, Sem.- III
Course Code and Course Title	0CVSE653, **Dissertation Phase – II**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial	05**/00
Credits	07
Evaluation Scheme: ISE / ESE	50/100

Course Objectives:
Students are expected to develop research aptitude by exploring a selected specific area, summarize for current status and present the same in form of a seminar. In depth study in a specialized area by carrying out a literature survey, understanding different aspects related to that area, preparing a status report is expected.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE653_1	Prepare the set up for experimentation/software. (4^{th} Cognitive level)
0CVSE653_2	Perform experimental/software analysis for validation of research work. (4^{th} Cognitive level)
0CVSE653_3	Prepare research design for above problem. (3^{rd} Cognitive level)
0CVSE653_4	Generate synopsis report. (6^{th} Cognitive level)
0CVSE653_5	Present the work carried out. (3^{rd} Cognitive level)

Course Contents:
Dissertation Phase-II is an integral part of the project work. In this, the candidate has to complete the partial work of the project in addition to problem statement, literature review, project overview, methodology, Layout and Design of the Set-up. As a part of the progress of Dissertation, the candidate shall deliver a presentation on the advancements pertaining to the dissertation. This work shall be supported with paper publication work progress (conference/peer reviewed journal). The project work should be carried out within department or corresponding industry under the guidance of the guide. The project-report should be duly approved by the concerned guide and should embody results of research / development work carried out by the candidate. The project work will be assessed by panel of examiners on the basis of a viva-voce examination and report submitted by the candidate at the end of third semester. ISE will be evaluated by Department and ESE will be evaluated by Department with one external expert. Student will submit a report (soft bound before 1 week of date of presentation) as per prescribed format and present to department for ISE and ESE. If student is not showing satisfactory performance in then he/she will be given grace period of two weeks. After two weeks student

will again evaluated with grade penalty.

Second Year M. Tech. Civil Structural Engineering Sem. – IV

0CVSE654, Dissertation Phase – III

Course Details:	
Class	M. Tech, Sem.- IV
Course Code and Course Title	0CVSE654, **Dissertation Phase – III**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial	05**/00
Credits	10
Evaluation Scheme: ISE / ESE	100/00

Course Objectives:
Students are expected to develop research aptitude by exploring a selected specific area, summarize for current status and present the same in form of a seminar. In depth study in a specialized area by carrying out a literature survey, understanding different aspects related to that area, preparing a status report is expected.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0CVSE654_1	Perform experimental/software analysis for developing research work. (4th Cognitive level)
0CVSE654_2	Prepare research design for above problem. (3rd Cognitive level)
0CVSE654_3	Generate synopsis report. (6th Cognitive level)
0CVSE654_4	Publish a research paper in journals/conference. (6th Cognitive level)
0CVSE654_5	Write total work as dissertation report. (2nd Cognitive level)
0CVSE654_6	Present the work carried out. (3rd Cognitive level)

Course Contents:
Candidate has to submit a report on work done by him / her according to a schedule announced by the department. The project-report should be duly approved by the guide and should embody results of research / development work carried out. A project work may be carried out within department or in any other academic / research / industrial / commercial organization under the guidance of the guide. 1. Project Review Committee (P.R.C) consisting of HOD, Supervisor and two internal faculties shall monitor the progress of the project work. 2. The duration of the project is of two semesters. Head of the institution holds the authority for getting extension to complete dissertation work.

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3. The candidate must submit status report at least in three different phases during the project work period. Report must be approved by the P.R.C. before final submission of the Project.
4. A candidate shall be allowed to submit the final dissertation only after passing in all the prescribed subjects (both theory and practical) and then allowed for viva voce examination.

Second Year M. Tech. Civil Structural Engineering Sem. – IV

0CVSE655, Dissertation Phase – IV

Course Details:	
Class	M. Tech, Sem.- IV
Course Code and Course Title	0CVSE655, **Dissertation Phase – IV**
Prerequisite/s	-
Teaching Scheme: Lecture/Tutorial	05**/00
Credits	10
Evaluation Scheme: ISE / ESE	100/100

Course Objectives:

Students are expected to develop research aptitude by exploring a selected specific area, summarize for current status and present the same in form of a seminar. In depth study in a specialized area by carrying out a literature survey, understanding different aspects related to that area, preparing a status report is expected.

Course Outcomes (COs):

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

0CVSE655_1	Perform experimental/software analysis for developing research work. (4^{th} Cognitive level)
0CVSE655_2	Prepare research design for above problem. (3^{rd} Cognitive level)
0CVSE655_3	Generate synopsis report. (6^{th} Cognitive level)
0CVSE655_4	Publish a research paper in journals/conference. (6^{th} Cognitive level)
0CVSE655_5	Write total work as dissertation report. (2^{nd} Cognitive level)
0CVSE655_6	Present the work carried out. (3^{rd} Cognitive level)

Course Contents:

Candidate has to submit a report on work done by him / her according to a schedule announced by the department. The project-report should be duly approved by the supervisor and should embody results of research / development work carried out. A project work may be carried out within department or in any other academic / research / industrial / commercial organization under the guidance of the supervisor.

1. Project Review Committee (P.R.C) consisting of HOD, Supervisor and two internal faculties shall monitor the progress of the project work.

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2. The duration of the project is of two semesters. The candidate can submit Project thesis with the approval of P.R.C. after 36 weeks from the date of registration at the earliest and one calendar year from the date of registration for the project work. Head of the institution holds the authority for getting extension to complete dissertation work.
3. The candidate must submit status report at least in three different phases during the project work period. Report must be approved by the P.R.C. before final submission of the Project.
4. A candidate shall be allowed to submit the final dissertation only after passing in all the prescribed subjects (both theory and practical) and then allowed for viva voce examination.
5. Three copies of the Dissertation report certified by the supervisor, HoD and head of institution in the prescribed format should be submitted to the Department. The Institute shall submit a panel of three experts for a maximum of 5 students at a time for viva voce examination. However, the thesis / dissertation will be adjudicated by one examiner.
6. If the report of the examiner is satisfactory, viva-voce examination shall be conducted by a panel of examiners otherwise student should reappear for the examination.
7. If candidate fails in second attempt of viva-voce examination, he/she will not be eligible for the award of the degree unless permitted to revise and resubmit the thesis.

MODE OF CONDUCT-EXAM

Class	M.Tech, Sem.-I
Course Code and Course Title	**All Theory Courses.**
Prerequisite/s	---
Evaluation Scheme: ISE / MSE / ESE	20/30/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Written Exam /Assignments /quiz /Presentations	On entire syllabus	It is of 20 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ESE	Written Exam	On entire syllabus of all theory courses.	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE. Design papers will be of 4 hrs. max. duration instead of 3 hrs. for theory papers.

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