SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC YEAR 2018-19

MAPPING OF COURSE OUTCOMES AND PROGRAM OUTCOMES

M.TECH STRUCTURAL ENGINEERING

PROGRAM OUTCOMES (POS):

After completion of the program graduates will be able to

1. Apply the knowledge of science, mathematics, and engineering principles for developing problem solving attitude.
2. Identify, formulate and solve engineering problems in the domain of structural engineering field.
3. Use different software tools for Analysis and Design structural engineering domain. Design and conduct experiments, analyse and interpret data, for development of simulation experiments.
4. Function as a member of a multidisciplinary team with sense of ethics, integrity and social responsibility.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. To prepare programme graduates with foundation knowledge to perform analysis and design various structures and participate in quality control systems.
2. T o provide programme graduates with entrepreneur skills to take up individual projects or work in teams in the field of structural engineering and in multidisciplinary environments.

To inculcate in programme graduates an interest towards research work in the relevant domain or appropriate domains for providing sustainable solutions to the Civil Engineering Problems.

M. Tech (STRUCTRAL ENGINEERING) – I Semester

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
		Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
Program Core									
SEPC01	Advanced Structural Analysis	3	-	-	3	3	40	60	100
SEPC02	Advanced Solid Mechanics	3	-	-	3	3	40	60	100
Program Elective- I Any One from the Following		3	-	-	3	3	40	60	100
SEPE11	Theory of Thin Plates and Shells								
SEPE12	Theory and Applications of Cement Composites								
SEPE13	Theory of Structural Stability								
Program Elective- II Any One from the following		3	-	-	3	3	40	60	100
SEPE21	Analytical and Numerical Methods for Structural Engineering								
SEPE22	Structural Health Monitoring								
SEPE23	Structural Optimization								
Program Practicals									
SECP01	Structural Design Lab	-	-	4	4	2	40	60	100
SECP02	Advanced Solid Mechanics Lab	-	-	4	4	2	40	60	100
Audit Course-I		2	-	-	2	-	100	-	100
PGPA11	English for Research Paper Writing								
PGPA12	Disaster Management								
PGPA13	Sanskrit for Technical Knowledge								
PGPA14	Value Education								
Mandatory Course									
PGPC41	Research Methodology and IPR	2	-	-	2	2	40	60	100
	Total	16	-	8	24	18	380	420	800

ACADEMIC YEAR – 2018-19
M.Tech. Structural Engineering I Semester
(Subjects, Electives, Labs offered)

SEPC01 ADVANCED STRUCTURAL ANALYSIS

L / week	: 3Hrs	Sessional Marks : 40
University Exam	: 3 Hrs	End Exam Marks : 60

Course Objectives: This Course Will Enable Students:

- To understand the static and kinematic indeterminacy of the structures
- To understand the concepts of matrix methods of analysis of structures
- To understand the analysis of continuous beams.
- To understand the analysis of rigid and pin jointed frames

UNIT-I

INFLUENCE COEFFICIENTS: Physical Significance, Effects of Settlements, Temperature Change and Lack of Fit, Member Approach and Structure Approach.

UNIT-II

STIFFNESS METHOD APPLIED TO LARGE FRAMES: Local Coordinates and Global Coordinates.

STIFFNESS MATRIX ASSEMBLY OF STRUCTURES: Stiffness Matrix in Global Co ordinates, Boundary Conditions, Solution of Stiffness Matrix Equations, Calculation of Reactions and Member Forces.

UNIT-III

APPLICATIONS TO SIMPLE PROBLEMS: Beams, Plane Trusses, Plane Rigid Jointed Frames and Grids by Structure Approach and Member Approach.

UNIT-IV

BOUNDARY VALUE PROBLEMS (BVP): Approximate Solution of Boundary Value Problems, Modified GalerkinMethod for One-Dimensional BVP, Matrix Formulation ofthe Modified GalerkinMethod.

UNIT-V

LINEAR ELEMENT: Shape Functions, Solution for Poisson's Equation, General OneDimensional Equilibrium Problem.

References:

1. Matrix Analysis of Framed Structures, Weaver and Gere.
2. The Finite Element Method, Lewis P. E. and WardJ. P., Addison-Wesley Publication Co.
3. Computer Methods in Structural Analysis, MeekJ. L., E and FN, Span Publication.
4. The Finite Element Method, Desai and Able, CBS Publication.

Course outcomes: At the end of the course, students will be able to

1. Analysis the structures due to the effects of settlements and temperature changes.
2. Analyze the skeleton structures using stiffness analysis code.
3. Use direct stiffness method understanding its limitations
4. Study the fundamentals of FEM

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2	2	1	1		3	3	2
CO2	3	3	2	1		3	3	2
CO3	3	3	3	1		3	3	2
CO4	2	2	2	1		3	3	2

SEPC02 ADVANCED SOLID MECHANICS

L / week	: 3Hrs	Sessional Marks : 40
University Exam	: 3 Hrs	End Exam Marks : 60

Course Objectives: This Course Will Enable Students:

- To make students understand the principles of elasticity.
- To familiarize students with basic equations of elasticity
- To expose students to two dimensional problems in Cartesian and polar coordinates.
- To make students understand the principle of torsion of prismatic bars.

UNIT-I

INTRODUCTION TO ELASTICITY: Displacement, Strain and Stress Fields, Constitutive Relations, Cartesian Tensors and Equations of Elasticity.

STRAIN AND STRESS FIELD: Elementary Concept of Strain, Stain at a Point, Principal Strains and Principal Axes, Compatibility Conditions, Stress at a Point, Stress Components on an Arbitrary Plane, Differential Equations of Equilibrium, Hydrostatic and Deviatoric Components.

UNIT-II

EQUATIONS OF ELASTICITY: Equations of Equilibrium, Stress- Strain relations, Strain Displacement and Compatibility Relations, Boundary Value Problems, Co-axiality of the Principal Directions.

UNIT-III

TWO-DIMENSIONAL PROBLEMS OF ELASTICITY: Plane Stress and Plane Strain Problems, Airy's stress Function, Two-Dimensional Problems in Polar Coordinates.

UNIT-IV

TORSION OF PRISMATIC BARS: Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, Torsion of Thin Tubes.

UNIT-V

PLASTIC DEFORMATION: Strain Hardening, Idealized Stress- Strain curve, Yield

Criteria, von Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress-Strain Relations, Principle of Normality and Plastic Potential, Isotropic Hardening.

References:

1. Theory of Elasticity, Timoshenko S. andGoodierJ. N., McGraw Hill, 1961.
2. Elasticity,SaddM.H.,Elsevier,2005.
3. Engineering Solid Mechanics, RagabA.R., BayoumiS.E., CRC Press,1999.
4. Computational Elasticity, AmeenM., Narosa,2005.
5. Solid Mechanics, KazimiS. M. A., Tata McGraw Hill,1994.
6. Advanced Mechanics of Solids, SrinathL.S., Tata McGraw Hill,2000.

Course outcomes: At the end of the course, students will be able to

1. Solve simple problems of elasticity and plasticity understanding the basic concepts.
2. Apply numerical methods to solve continuum problems.
3. Study the two-dimensional problems of Elasticity.
4. Solving the tensional problem of prismatic beam.
5. Solve the problems of plasticity understanding the basic concepts.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2	2	1	1		3	2	2
CO2	3	3	3	2		3	2	2
CO3	2	2	2	1		2	2	2
CO4	2	2	2	1		2	1	1
CO5	2	2	2	1		2	2	2

SEPE11 THEORY OF THIN PLATES AND SHELLS

L / week	: 3Hrs	Sessional Marks : 40
University Exam	: 3 Hrs	End Exam Marks : 60

Course Objectives: This Course Will Enable Students:

- Introduce with concept of plate theory,the behaviour and analysis Knowledge about classification of shell surfaces
- To analyse the plate with different boundary conditions
- To understand the classical theory oh shells based on the kirchoff-love assumptions

Syllabus Contents:

UNIT-I

INTRODUCTION: Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions

UNIT-II

STATIC ANALYSIS OF PLATES: Governing Equation for a Rectangular Plate, Navier Solution for Simply- Supported Rectangular Plate under Various Loadings, Levy solution for Rectangular Plate with other Boundary Conditions.

UNIT-III

CIRCULAR PLATES: Analysis under Axi- Symmetric Loading, Governing Differential Equation in Polar Co-ordinates. Approximate Methods of Analysis- Rayleigh-Ritz approach for Simple Cases in Rectangular Plates.

UNIT-IV

STATIC ANALYSIS OF SHELLS: MEMBRANE THEORY OF SHELLS - Cylindrical, Conical and Spherical Shells,

UNIT-V

SHELLS OF REVOLUTION: WITH BENDING R**ESISTANCE** - Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels.

References:

1. Theory of Plates and Shells, Timoshenko S. and KriegerW., McGraw Hill.

2. Stresses in Plates and Shells, UguralAnsel C., McGraw Hill.

3. Thin Elastic Shells, KrausH., John Wiley and Sons.

4. Theory of Plates, Chandra shekhar K., Universities Press.

5. Design and Construction of Concrete Shells, Ramaswamy G.S.

Course Outcomes: At the end of the course, students will be able to

1. Use analytical methods for the solution of thin plates and shells.

2. Use analytical methods for the solution of shells.

3. Apply the numerical techniques and tools for the complex problems in thin plates.

4. Apply the numerical techniques and tools for the complex problems in shells.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	3	3	2	1		2	2	3
CO2	3	3	3	1		2	2	3
CO3	3	2	2	1		2	2	3
CO4	3	2	2	1		2	2	3

SECP01 ADVANCED STRUCTURAL ANALYSIS LAB

P / week : 4Hrs
University Exam : 3 Hrs

Sessional Marks : 40
End Exam Marks : 60

Course Objectives: This Course Will Enable Students:

- To design of reinforced concrete beam
- To design of reinforced concrete slab
- To analyze and design of multi storey building
- To design special multi storey frame structures

Syllabus Content:
Design and detailed drawing of complete G+ 3 structures by individual student using latest relevant IS codes.

Course Outcomes: At the end of the course, students will be able to

1. Design and Detail all the Structural Components of Frame Buildings.
2. Design and Detail complete Multi-Storey Frame Buildings.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2	3	2	1		3	3	2
CO2	2	3	3	1		3	3	2

SEPE22 STRUCTURAL HEALTH MONITORING

L / L / week	: 3Hrs	Sessional Marks : 40
University Exam	: 3 Hrs	End Exam Marks : 60

Syllabus Contents:

UNIT-I

STRUCTURAL HEALTH: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

UNIT-II

STRUCTURAL HEALTH MONITORING: Concepts, Various Measures, Structural Safety in Alteration.

STRUCTURAL AUDIT: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT-III

STATIC FIELD TESTING: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT-IV

DYNAMIC FIELD TESTING: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT-V

INTRODUCTION TO REPAIRS AND REHABILITATIONS OF STRUCTURES: Case Studies (Site Visits), piezo– electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

Reference Books:

1. Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.
2. Health Monitoring of Structural Materials and Components Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.
3. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
4. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007.

Course Outcomes: At the end of the course, students will be able to

1. Diagnosis the distress in the structure understanding the causes and factors.
2. Assess the health of structure using static field methods.
3. Assess the health of structure using dynamic field tests.
4. Suggest repairs and rehabilitation measures of the structure.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2	2	2	1		3	3	2
CO2	2	2	2	1		2	3	2
CO3	2	2	2	1		2	3	2
CO4	2	2	2	1		2	3	2

SECP02 ADVANCED SOLID MECHANICS LAB

P / week	: 4Hrs	Sessional Marks	: 40
University Exam	: 3 Hrs	End Exam Marks	: 60

Course Objectives :

- To investigate the performance of structural elements.
- To evaluate the different testing methods and equipments.

List of Experiments/Assignments:

Study of stress-strain curve of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.

Effect of cyclic loading on steel.

Non-Destructive testing of existing concrete members.

Behaviour of Beams under flexure, Shear and Torsion.

Reference Books:

1. Properties of Concrete, Neville A. M., 5th Edition, Prentice Hall, 2012. Concrete Technology, Shetty M. S., S. Chand and Co., 2006.

Course Outcomes: At the end of the course, students will be able to

1. Design high grade concrete and study the parameters affecting its performance.
2. Conduct Non Destructive Tests on existing concrete structures.
3. Apply engineering principles to understand behavior of structural/ elements.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2	2	1	1		3	3	2
CO2	2	2	3	1		3	3	2
CO3	2	2	3	1		3	3	3

PGPA12 DISASTER MANAGEMENT (Audit Course - I)

Instruction Hours/week : 2(L) **Credits : -**

Sessional Marks : 100 **Semester-end Examination : -**

Course Objectives: This course will enable students:

- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
- Developanunderstandingofstandardsofhumanitarianresponseandpracticalrelevanceinspecific types of disasters and conflict situations
- Critically under standthestrengthsandweaknessesofdisastermanagementapproaches,planning and programming in different countries, particularly their home country or the countries they work in

UNIT I

Introduction

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; natural and Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II

Repercussions Of Disasters And Hazards

Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Manmade disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III

Disaster Preparedness And Management Preparedness

Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT IV

Risk Assessment Disaster Risk

Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.Course

UNIT V

Disaster Mitigation Meaning

Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

References:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

Course outcomes: At the end of the course, students will be able to:

1. demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop the standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	1							
CO2			2					

CO3							**1**	
CO4			**2**					
CO5			**1**					
CO6							**2**	

PGMC 41 RESEARCH METHODOLOGY AND IPR

Instruction Hours/week : 2(L) **Credits : 2**

Sessional Marks : 40 **Semester-end Examination : 60**

Course Objectives:

- Identify an appropriate research problem in their interesting domain.
- Understand ethical issues understand the Preparation of a research project thesis report.
- Understand the Preparation of a research project thesis report
- Understand the law of patent and copyrights.
- Understand the Adequate knowledge on IPR

UNIT I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT II

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT V

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition , “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
5. Mayall , “Industrial Design”, McGraw Hill, 1992.
6. Niebel , “Product Design”, McGraw Hill, 1974.
7. Asimov , “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New
9. Technological Age”, 2016.
10. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

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

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understand that when IPR would take such important place in growth of individuals & Nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	1							
CO2			2					
CO3							1	

CO4			**2**					
CO5			**1**					
CO6							**2**	

M. Tech (STRUCTRAL ENGINEERING) – II Semester

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
		Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
Program Core									
SEPC03	FEM in Structural Engineering	3	-	-	3	3	40	60	100
SEPC04	Structural Dynamics	3	-	-	3	3	40	60	100
Program Elective- III Any One from the following		3	-	-	3	3	40	60	100
SEPE31	Advanced Steel Design								
SEPE32	Design of Formwork								
SEPE33	Design of High Rise Structures								
SEPE34	Design of Masonry Structures								
Program Elective- IV Any One from the following		3	-	-	3	3	40	60	100
SEPE41	Design of Advanced Concrete Structures								
SEPE42	Advanced Design of Foundations								
SEPE43	Soil Structure Interaction								
SEPE44	Design of Industrial Structure								
SEPE45	--								
Program Practicals									
SECP03	Core Lab III Model Testing Lab	-	-	4	4	2	40	60	100
SECP04	Core Lab IV Numerical Analysis Lab	-	-	4	4	2	40	60	100
Audit Course-II		2	-	-	2	-	100	-	100
PGPA21	Constitution Of India								
PGPA22	Pedagogy Studies								
PGPA23	Stress Management By Yoga								
PGPA24	Personality Development Through Life Enlightenment Skills								
Mini Project									
SEMP01	Mini Project with Seminar	-	-	4	4	2	100	-	100
	Total	14	-	12	26	18	440	360	800

ACADEMIC YEAR – 2018-19
M.Tech. Structural Engineering II Semester
(Subjects, Electives, Labs offered)

SEPC03 FINITE ELEMENT METHOD IN STRUCTURAL ENGINEERING

L / week : 3Hrs Sessional Marks : 40

University Exam : 3 Hrs End Exam Marks : 60

Syllabus Contents:

Course Objectives: This Course Will Enable Students:

- To provide an overview and basic fundamentals of Finite Element Analysis.
- To introduce basic aspects of finite element theory, including domain discretization, interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
- To explain the underlying concepts behind variational methods and weighted residual methods in FEM.
- Formulate simple structural problems in to finite elements

UNIT-I

INTRODUCTION: History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, Nodal Equilibrium equations.

UNIT-II

BEAM ELEMENTS: Assembly of Global Stiffness Matrix, Element Strain and Stress. Flexure Element, Element Stiffness Matrix, Element Load Vector.

UNIT-III

METHOD OF WEIGHTED RESIDUALS: Galerkin Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, Polynomial Forms, Applications.

UNIT-IV

Types: Triangular Elements, Rectangular Elements, Three-Dimensional Elements, Isoparametric Formulation, Axi-Symmetric Elements, Numerical Integration, Gaussian Quadrature.

UNIT-V

APPLICATION TO SOLID MECHANICS: Plane Stress, CST Element, Plane Strain Rectangular Element, Isoparametric Formulation of the Plane Quadrilateral Element, Axi-Symmetric Stress Analysis, Strain and Stress Computations.

COMPUTER IMPLEMENTATION of FEM procedure, Pre-Processing, Solution, Post-Processing, Use of Commercial FEA Software (Practice Only).

Reference Books:

1. Finite Element Analysis, Seshu P., Prentice-Hall of India,2005.
2. Concepts and Applications of Finite Element Analysis, Cook R. D., Wiley J., New York, 1995. Fundamentals of Finite Element Analysis, Hutton David, Mc-Graw Hill, 2004.
3. Finite Element Analysis, Buchanan G.R., McGraw Hill Publications, New York, 1995. Finite Element Method, Zienkiewicz O.C. & Taylor R.L. Vol. I, II & III, Elsevier, 2000.
4. Finite Element Methods in Engineering, Belegundu A.D., Chandrupatla, T.R., Prentice Hall India, 1991.

Course Outcomes: At the end of the course, students will be able to

1. Use Finite Element Method for structural analysis.
2. Execute the Finite Element Program/ Software.
3. Solve continuum problems using finite element analysis.
4. Develop the FEM software.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	3	3	3	1		3	2	3
CO2	2	3	3	1		3	3	3
CO3	3	3	3	1		3	3	3
CO4	1	1	3	1		3	3	3

SEPC04 STRUCTURAL DYNAMICS

L/week	: 3Hrs	Sessional Marks : 40
University Exam	: 3 Hrs	End Exam Marks: 60

Course Objectives: This Course Will Enable Students to

- Determine vibration characteristics of structures like frequency, amplitude, impedence and time
- period Differentiate the response of single and multi degree of freedom systems
- Determine the response of structures for pulse excitation like blast load
- Differentiate the response of Multi Degree of Freedom systems

UNIT - I

RESPONSE OF SIMPLE – SINGLE DEGREE OF FREEDOM SYSTEM

Definition of DOF – Idealization of structure as SDOF system – Formulation of equations of motion for various SDOF systems – Free vibration of un-damped systems – Determination of natural frequency - Free vibration of viscously damped systems – Determination of Damping in structures.

UNIT - II

RESPONSE OF SINGLE DEGREE OF FREEDOM SYSTEMS- FORCED VIBRATIONS

Forced vibration of systems – Steady state response to harmonic forces – Duhamel's integral-Numerical Evaluation – Response to support motion – Transmissibility – Construction of response Spectrum.

UNIT - III

ANALYSIS OF MULTI-DEGREE OF FREEDOM SYSTEMS

Formal Derivations — Formulation of equation of motion - Evaluation of natural frequencies and modes — Free vibration of undamped systems — Forced vibration of damped systems.

UNIT — IV

APPROXIMATE METHODS OF COMPUTING NATURAL FREQUENCIES

Rayleigh's method – Dunkerley's method – Methods of iteration – Stodola – Vainello Method – Rayleigh – Ritz method.

UNIT — V

DYNAMIC ANALYSIS OF CONTNUOUS SYSTEM

Vibration of flexural beams — Equation of motion — Free vibrations of Uniform Beams - Natural frequencies and Mode Shapes of Beams with different Support Conditions - Orthogonality Condition between Normal Modes.

Reference Books:

1. Dynamics of Structures, Clough R. W. and Penzien J., Mc Graw Hill.
2. Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K.
3. Vibration of Structures - Application in Civil Engineering Design, Smith J. W., Chapman and Hall.
4. Dynamics of Structures, Humar J. L., Prentice Hall.
5. Structural Dynamics - Theory and Computation, Paz Mario, CBS Publication.
   Dynamics of Structures, Hart and Wong.

Course Outcomes: At the end of the course, students will be able to

1. Analyze and study dynamics response of single degree freedom system using fundamental theory and equation of motion.
2. Analyze and study dynamics response of Multi degree freedom system with lumped parameter using fundamental theory and equation of motion.
3. Analyze and study dynamics response of Multi degree freedom system with distributed man and load.
4. Study the concepts of dynamic effects due to wind loading, moving loading & vibrations caused by Traffic, Blasting & Pile driving.
5. Use the available software for dynamic analysis.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	3	3	2	1		3	2	2

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

SEPE33 DESIGN OF HIGH RISE STRUCTURES

L / week : 3Hrs Sessional Marks : 40
University Exam : 3 Hrs End Exam Marks : 60

UNIT-I
DESIGN OF TRANSMISSION/ TV TOWER, MAST AND TRESTLES: Configuration, bracing system, analysis and design for vertical transverse and longitudinal loads.

UNIT-II
ANALYSIS AND DESIGN OF RC AND STEEL CHIMNEY, Foundation design for varied soil strata.

UNIT-III
TALL BUILDINGS: Structural Concept, Configurations, various systems, Wind and Seismic loads,

UNIT-IV
Dynamic approach, structural design considerations and IS code provisions. Firefighting design provisions.

UNIT-V
APPLICATION of software in analysis and design.

Reference Books:
1. Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., SouthAsian Publishers, New Delhi, 2002.

2. Structural Analysis and Design of Tall Buildings, Taranath B. S., Mc Graw Hill, 1988.
3. Illustrated Design of Reinforced ConcreteBuildings(GF+3storeyed), Shah V. L. &Karve S. R., Structures Publications, Pune, 2013.
4. Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications, 1976. Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India. 1991. High Rise Building Structures, Wolfgang Schueller, Wiley., 1971.
5. Tall Chimneys, Manohar S. N., Tata Mc Graw Hill Publishing Company, New Delhi

Course Outcomes: At the end of the course, students will be able to

1. Analyse, design and detail Transmission/ TV tower, Mast and Trestles with different loading conditions.
2. Analyse, design and detail the RC and Steel Chimney.
3. Analyse. design and detail the tall buildings subjected to different loading conditions using relevant codes.

4. Analysis and design of dynamic approach OF STRUCTURAL DESIGN USING is Code provisions.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2	2	2	1		2	3	2
CO2	2	3	3	1		2	3	2
CO3	2	3	2	1		2	3	2
CO4	2	3	3	1		2	3	3

SEPE41 DESIGN OF ADVANCED CONCRETE STRUCTURES

L / week : 3Hrs Sessional Marks : 40
University Exam : 3 Hrs End Exam Marks : 60

Course Objectives: This Course Will Enable Students:

- To design of reinforced concrete beam
- To design of reinforced concrete slab
- To analyze and design of multi storey building and Industrial Building
- To design special structures such as Deep beams,Corbels and Grid Floors

Syllabus Contents

UNIT – I

ESTIMATION OF CRACK WIDTH AND REDISTRIBUTION OF MOMENTS IN REINFORCED CONCRETE BEAMS :

Factors affecting crack width in beams - Calculation of crack width - Empirical Method - Estimation of crack width in beams by IS 456 - Shrinkage and thermal cracking - Redistribution of moments in a fixed beam and a two-span continuous beam - Advantage and disadvantages of moment redistribution.

UNIT – II

DESIGN OF RIBBED (VOIDED) SLABS & GRID FLOORS :

Analysis of the ribbed slabs for moment and shears - Design for shear - Deflections - Arrangement of reinforcements.

Analysis of grid floors by Timoshenko's plate theory, stiffness matrix method - Equating joint deflections - Detailing of steel.

UNIT – III

DESIGN OF PLAIN CONCRETE WALLS :

Braced and unbraced walls - Eccentricities of vertical loads - Empirical design method (walls carrying axial load) - Design of wall for In-plane horizontal forces.

DESIGN OF SHEAR WALLS :

Steps of designing deep beams by IS 456 - Detailing of deep beams.

UNIT – IV

EARTH QUAKE FORCES AND STRUCTURAL RESPONSE :

Earthquake magnitude and intensity - Determination of design forces - Torsion in buildings - Ductile detailing of beams - Columns and frame members with axial force and moment.

DESIGN OF SHEAR WALLS :

Classification of shear walls - Loads in shear walls - Design of rectangular and flanged shear walls - Moment of resistance of rectangular shear walls

REFERENCES :

1) P.C.Varghese, "Advanced Reinforced Concrete Design", Prentice-Hall of India, Private Ltd., New Delhi.

2) P.C.Varghese, "Limit State Design of Reinforce Concrete", Prentice-Hall of India, Private Ltd., New Delhi.

3) Krishna Raju, "Advanced Reinforced Concrete Design - SI Units" CBS, New Delhi, 1986.

4) Blume, J.A., Newmark, N.M. and Corning, L.M. "Design of Multi-Storey Reinforced Concrete Buildings for Earth Quake Motion", Portland Cement Association, Chicogo, 1961.

5) Pankaj Agarwal, "Earthquake Resistant Structures", Prentice-Hall of India, Private Ltd., New Delhi.

Course Outcomes: At the end of the course, students will be able to

1. Model the loads and findings the material properties.
2. Design deep beams and corbels
3. Design of shear walls using IS, ACI & Errocode.
4. Analyse the special structures by understanding their behaviour in torsional buckling.
5. Design and prepare detail structural drawings for execution citing relevant IS codes.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2	3	2	1		2	3	2
CO2	2	3	2	1		2	3	2
CO3	2	3	3	1		2	3	2
CO4	2	3	2	1		2	3	2
CO5	2	3	2	1		2	2	2

SECP03 MODEL TESTING LAB

L/week : 4Hrs Sessional Marks : 40
University Exam : 3 Hrs End Exam Marks: 60

Course Objectives: The students will acquire knowledge about

- To investigate the performance of structural elements.
- To evaluate the different testing methods and equipments

Concrete:

Properties and testing of fresh and hardened concrete

Concrete Mix Design

Non-Destructive Testing of Concrete

Reinforced Concrete:

Under- reinforced and over-reinforced beams

Column

Steel:

Testing of steel beams under static loading including measurement of strains (Using electric resistance strain gauges)

Course Outcomes: At the end of the course, student will be able to

1. Plan the test set-up for model testing
2. Understand the behavior of structural components.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2							
CO2							2	

SECP04 NUMERICAL ANALYSIS LAB

P / week	: 4Hrs	Sessional Marks : 40
University Exam	: 3 Hrs	End Exam Marks : 60

Course Objectives: The students will acquire knowledge

- To develop MATLAB codes for solution of simultaneous linear equations
- To construct codes for 1D Finite Element problems.
- To code for numerical integration techniques & statistical methods.

Syllabus Contents:

Find the Roots of Non-Linear Equation Using Bisection Method. Find the Roots of Non-Linear Equation Using Newton's Method. Curve Fitting by Least Square Approximations. Solve the System of Linear Equations Using Gauss - Elimination Method.

Solve the System of Linear Equations Using Gauss - Seidal Iteration Method. Solve the System of Linear Equations Using Gauss - Jorden Method.

Integrate numerically using Trapezoidal Rule. Integrate numerically using Simpson's Rules.

Numerical Solution of Ordinary Differential Equations By Euler's Method.

Numerical Solution of Ordinary Differential Equations ByRunge- Kutta Method.

Course Outcomes: At the end of the course, students will be able to

1 Find Roots of non-linear equations by Bisection method and Newton's method.

2 Do curve fitting by least square approximations by using matlab

3 Solve the system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/ Gauss - Jorden Method

4 To Integrate Numerically Using Trapezoidal and Simpson's Rules

5 To Find Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge- Kutta Method

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	1							
CO2			2					
CO3							1	
CO4			2					
CO5			1					

M. Tech (STRUCTRAL ENGINEERING) – III Semester

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
		Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
Program Elective- IV Any One from the following		3	-	-	3	3	40	60	100
SEPE51	Design of Pre-stressed Concrete Structures								
SEPE52	Analysis of Laminated Composite Plates								
SEPE53	Fracture Mechanics of Concrete Structures								
SEPE54	Design of Plates and Shells								
SEPE55	--								
Open Elective Any One from the Following		3	-	-	3	3	40	60	100
SEOE11	Business Analytics								
SEOE12	Industrial Safety								
SEOE13	Operations Research								
SEOE14	Cost Management of Engineering Projects								
SEOE15	Composite Materials								
SEOE16	Energy Generation from Waste								
Dissertation									
SEPD01	Dissertation- Phase-I	-	-	20	20	10	100		100
	Total	6	-	20	26	16	180	120	300

ACADEMIC YEAR – 2018-19
M.Tech. Structural Engineering III Semester
(Subjects, Electives, Labs offered)

SEPE51 DESIGN OF PRESTRESSED CONCRETE STRUCTURES

L / week	: 3Hrs	Sessional Marks : 40
University Exam	: 3 Hrs	End Exam Marks : 60

Course Objectives: This Course Will Enable Students:

- Familiarize students with concrept of prestressing and analysis of prestress
- Design and analysis of pretension and post tensioned concrete members
- Determination of deflections of prestressed members
- To calculate the losses of prestress,creep and shrinkage.

Syllabus Contents

UNIT-I

INTRODUCTION TO PRESTRESSED CONCRETE: types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provision.

UNIT-II

STATICALLY DETERMINATE PSC BEAMS: design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions.

TRANSMISSION OF PRESTRESS in pretensioned members; Anchorage zone stresses for post tensioned members.

UNIT-III

STATICALLY INDETERMINATE STRUCTURES - Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy.

UNIT-IV

COMPOSITE CONSTRUCTION with precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects. Partial prestressing - principles, analysis and design

concepts, crack-width calculations. Analysis and design of pre stressed concrete pipes

References:

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House, 1955.
2. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981.
3. Limited State Design of Prestressed Concrete, GuyanY., Applied Science Publishers, 1972.
4. IS: 1343- Code of Practice for Prestressed Concrete
5. IRC: 112

Course outcomes: At the end of the course, students will be able to

1. Find out losses in the pre-stressed concrete. Understand the basic aspects of pre-stressed concrete fundamentals, including pre and post-tensioning processes.
2. Analyse pre-stressed concrete deck slab and beam/ girders.
3. Design pre-stressed concrete deck slab and beam/ girders.
4. Design of end blocks for pre-stressed members.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	2							
CO2			1					
CO3								2
CO4			2					

SEOE 12 INDUSTRIAL SAFETY

Instruction Hours/week : 3(L) **Credits : 3**

Sessional Marks : 40 **Semester-end Examination: 60**

Course Objectives:

- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models
- To understand about fire and explosion, preventive methods, relief and its sizing methods
- To analyze industrial hazards and its risk assessment.

UNIT I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in achine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

References:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

Course outcomes:

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

1. To list out important legislations related to health, Safety and Environment.
2. To list out requirements mentioned in factories act for the prevention of accidents.
3. To understand the health and welfare provisions given in factories act.

CO-PO MAPPING

CLO	PO1	PO2	PO3	PO4		PSO1	PSO2	PSO3
CO1	1							
CO2			2					
CO3							2	
CO4			1					

M. Tech (STRUCTRAL ENGINEERING) – IV Semester

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
		Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
Dissertation									
SEPD02	Dissertation- Phase-II	-	-	32	32	16	40	60	100
Total		-	-	32	32	16	40	60	100