GURU KASHI UNIVERSITY

Master of Technology in Civil Engineering (Specialization in Structural Engineering) Annexure-III

Session: 2025-26

Faculty of Engineering & Technology

Graduate Attributes of the Programme: -

Type of learning outcomes	**The Learning Outcomes Descriptors**
Graduates should be able to demonstrate the acquisition of:	
Learning outcomes that are specific to disciplinary/interdisciplinary areas of learning	Technical & analytical skills and research promotion in the field of Structural Engineering to identify, formulate, analyze, and solve complex engineering problems in order to develop sustainable Structural solutions in broader economic, societal, and environmental contexts.
	Practical, professional, and procedural knowledge required for carrying out Structural design related tasks, which will lead the students to obtain the entrepreneurship skills also.
	skills of innovation, creative and critical thinking that enable student to follow systematic ways for analyzing and finding innovative solutions in the field of transportation, geotechnical, structural, construction management, materials, planning, water resources, and field survey.
	comprehensive knowledge and understanding of the fundamentals and theories of science, engineering, and mathematics and advanced specialized knowledge in Civil Engineering.
Generic learning outcomes	The graduates should be able to demonstrate the ability of creativity, critical thinking, and innovation in solving the complex problems that do not have simple solutions
	The graduates should be able to demonstrate the skills of excellent communication, writing, and understanding the technical documents in more than one recognized language.
	Coordinating/collaborating with others: working effectively either individually or in groups, with the ability to lead work teams flexibly and effectively and having the skills of listening and communicating effectively.
	Commitment to professional ethics that are compatible with societal and cultural values, participation in finding valuable solutions to some societal issues, and a commitment to responsible citizenship.
	Having the attribute of lifelong learning to keep up with the latest developments in the field of structural Engineering, as well as to use modern digital technologies and applications to analyze and and design the structural elements of a building.
	The graduates should be able to demonstrate the ability to identify and to address their own educational

	needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge. The graduates should be able to evaluate critically and apply knowledge, methods and skills through self-identified sources and self-directed learning for locating, accessing, and utilizing relevant information sources as related to structural engineering.
	The graduates should be able to conduct independent research and develop innovative solutions for structural challenges.
	The graduates should be Aware of environmental and societal impacts of structural decisions.

Programme Learning outcomes: An Master of Vocational in Civil Engineering (Specialization in Structural Engineering) is awarded to students who have demonstrated the achievement of the outcomes located at level 6.5:

Element of the Descriptor	**Programme learning outcomes relating to M.Voc**
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	knowledge of facts, concepts, principles, theories, and processes in basic sciences, multidisciplinary learning contexts within engineering
	understanding of the linkages between the fundamentals of engineering and its application
	procedural knowledge required for performing skilled or paraprofessional tasks associated with the electrical, mechanical, and computing fields.
General, technical and professional skills required to perform and accomplish tasks	a range of cognitive and technical skills related to manufacturing practices, computing, economics, sciences, communication skills for accomplishing assigned tasks in Structural engineering
Application of knowledge and skills	The graduates should be able to demonstrate the ability to apply the acquired operational or technical and theoretical knowledge, and a range of cognitive and practical skills to select and use basic methods, tools, materials, and information to generate solutions to specific problems
Generic learning outcomes	The graduates should be able to demonstrate the ability of effective communication, critical thinking, self-directed and self-managed learning, gather and interpret relevant quantitative and qualitative data, critically evaluate principles and theories associated with the basic sciences and engineering, make judgment and take decisions, based on analysis of data and evidence, for formulating responses to issues/problems.
Constitutional, humanistic, ethical, and moral values	The graduates should be able to demonstrate the willingness to practice constitutional, humanistic, ethical, and moral values in one's life, and practice these values in real-life situations
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	ability to exercise responsibility for the completion of assigned tasks and for the outputs of own work, and to take some responsibility for group work and output as a member of the group.

Credit requirements	The successful completion of the first year (two semesters) of the M.Tech of 44 credit hours followed by an exit 4-credit 8-weeks internship/industrial training.
Entry requirements	Passed B.Tech. or equivalent degree in relevant discipline with at least 50% in the aggregate.

Program Structure

SEMESTER: 1st									
Course Code	**Course Title**	**Type of Courses**	**L**	**T**	**P**	**No. of Credits**	**Int.**	**Ext.**	**Total Marks**
MSE1450	Advanced Structural Analysis	Core Course	3	1	0	4	30	70	100
MSE1451	Advanced Solid Mechanics	Core Course	3	1	0	4	30	70	100
MSE1500	Composite Materials	Core Course	3	1	0	4	30	70	100
MSE1501	Design of Advanced Concrete Structures	Practicum Course	3	0	0	3	25	50	75
MSE1502	Quality Control Lab	Practicum Course	0	0	2	1	10	15	25
MSE1503	Seminar	Skill	0	0	4	2	15	35	50
Discipline Specific Elective (DSE) Course 1 (Any one of the following)									
MSE1504	Theory of Thin Plates & Shells	Discipline Specific Elective Course	3	1	0	4	30	70	100
MSE1505	Theory & Applications of Cement Composites								
Total			**15**	**4**	**6**	**22**	**170**	**380**	**550**

SEMESTER: 2nd									
Course Code	**Course Title**	**Type of Courses**	**L**	**T**	**P**	**No. of Credits**	**Int.**	**Ext.**	**Total Marks**
MSE2550	FEM in Structural Engineering	Core Course	3	1	0	4	30	70	100
MSE2551	Structural Dynamics	Core Course	3	1	0	4	30	70	100
MSE2552	Advanced Steel Design	Core Course	3	1	0	4	30	70	100
MSE2553	Design of Formwork	Practicum Course	4	0	0	4	30	70	100
MSE2554	Computer Aided Design Lab	Skill	0	0	4	2	15	35	50
Discipline Specific Elective (DSE) Course 2 (Any one of the following)									
MSE2555	Design of High-Rise Structures	Discipline Specific Elective Course	3	1	0	4	30	70	100
MSE2556	Retrofitting and Rehabilitation of Structures								
Total			**16**	**4**	**4**	**22**	**165**	**385**	**550**

Programme learning outcomes: A Master of Technology in Civil Engineering (Specialization in Transportation Engineering) is awarded to students who have demonstrated the achievement of the outcomes located at level 7:

Element of the Descriptor	**Programme learning outcomes relating to M.Tech**
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	Advanced knowledge about management of multistory Structures
	Advanced knowledge and understanding of the research principles, methods, and techniques related to analysis and design of Masonary Structures & multistory Buildings.
	procedural knowledge required for performing and accomplishing complex and specialized and professional tasks relating to Structural Engineering
	Advanced cognitive and technical skills required for performing and accomplishing complex tasks related to the advanced Structural engineering aspects
Skills required to perform and accomplish tasks	Advanced cognitive and technical skills required for performing and accomplishing complex tasks related to the advanced Structural Engineering projects.
	Advanced cognitive and technical skills required for evaluating research findings and designing and conducting relevant research that contributes to the generation of new knowledge.
Application of knowledge and skills	Apply fundamental and advanced principles of structural engineering to analyze, design, and optimize various structural systems.
Generic learning outcomes	Present in a concise manner view on the relevance and applications of the findings of recent research and evaluation studies in the context of emerging developments and issues with the modern infrastructure.
Constitutional, humanistic, ethical, and moral values	Follow ethical principles and practices in all aspects of research and development, including inducements for enrolling participants, avoiding unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism.
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	The graduates should be able to demonstrate the acquisition of knowledge and skills set required for adapting to the future of work and responding to the demands of the fast pace of technological developments and innovations in the field of structural engineering
Credit requirements	The 2-year/4-semester M.Tech. builds on a 4-year/8-semester B.E./B.Tech. and requires a total of 88 credits

	from the first and second years of the programme, with minimum of 44 credits in the first year and minimum of 44 credits in the second year of the programme at level 6 on the NHEQF.
Entry requirements	M.Voc. in relevant field for admission to Second year of M.Tech

SEMESTER: 3rd									
Course Code	**Course Title**	**Type of Courses**	**L**	**T**	**P**	**No. of Credits**	**Int.**	**Ext.**	**Total Marks**
MSE3600	Dissertation Phase-I	Research Based	0	0	0	12	200	100	300
MSE3601	Design of Prestressed Concrete Structures	Core Course	3	1	0	4	30	70	100
MSE3602	Design of Masonary Structures	Core Course	3	1	0	4	30	70	100
MSE3603	Project	Skill Based	0	0	4	2	15	35	50
Total			**6**	**2**	**4**	**22**	**275**	**275**	**550**

SEMESTER: 4th									
Course Code	**Course Title**	**Type of Courses**	**L**	**T**	**P**	**No. of Credits**	**Int.**	**Ext.**	**Total Marks**
MSE4650	Dissertation Phase-II	Research Based	0	0	0	12	200	100	300
MSE4651	Advanced Concrete Technology	Core Course	3	1	0	4	30	70	100
MSE4652	Business Ownership	Employability & Entrepreneurship Skill Course (EEC)	2	0	0	2	15	35	50
Discipline Specific Elective (DSE) Course 3 (Any one of the following)									
MSE4653	Theory of Structural Stability	Discipline Specific Elective Course 3	3	1	0	4	30	70	100
MSE4654	Soil Structure Interaction								
Total			**8**	**2**	**0**	**22**	**275**	**275**	**550**

Total Credits and Marks

Semester	L	T	P	Total Credits	Total Marks	Qualification
I	15	4	6	22	550	**M.Voc**
II	16	4	4	22	550	
III	6	2	4	22	550	**M.Tech**
IV	8	2	0	22	550	
Total				**88**	**2200**	

Semester: I

COURSE TITLE: Advanced Structural Analysis	L	T	P	Cr.
COURSE CODE: MSE1450	3	1	0	4

Total Hours: 60

Course Outcomes: At the end of the course, students will be able to:
1. analyze large frame structures by applying the stiffness method using both member (local) and structure (global) approaches.
2. apply the stiffness matrix method to analyze determinate and indeterminate structures.
3. implement the Modified Galerkin Method and its matrix formulation for solving one-dimensional boundary value problems.
4. Understand and apply shape functions for linear finite elements.

Course Content

UNIT-I **15 hours**

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

Stiffness Method applied to Large Frames: Local Coordinates and Global Coordinates.

UNIT-II **15 hours**

Stiffness Matrix Assembly of Structures: Stiffness Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations, Calculation of Reactions and Member Forces.

Applications to Simple Problems: Beams, Plane Trusses, Plane Rigid Jointed Frames and Grids by Structure Approach and Member Approach.

UNIT-III **15 hours**

Boundary Value Problems (BVP): Approximate Solution of Boundary Value Problems, Modified Galerkin Method for One-Dimensional BVP, Matrix Formulation of the Modified Galerkin Method.

UNIT-IV **15 hours**

Linear Element: Shape Functions, Solution for Poisson's Equation, General One-Dimensional Equilibrium Problem.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

References Books:

- *Matrix Analysis of Framed Structures, Weaver and Gere.*
- *The Finite Element Method, Lewis P. E. and Ward J. P., Addison-Wesley Publication Co.*
- *Computer Methods in Structural Analysis, Meek J. L., E and FN, Span Publication.*

COURSE TITLE: Advanced Solid Mechanics	L	T	P	Cr.
COURSE CODE: MSE1451	3	1	0	4

Total Hours: 60

Course outcomes: At the end of the course, students will be able to:
1. Understand and analyze displacement, strain, and stress fields
2. Analyze two-dimensional elasticity problems.
3. Understand and apply classical torsion theories
4. Understand and interpret the behavior of materials under plastic deformation

Course Content

Unit-I **15 hours**

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 **15 hours**

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

Two-Dimensional Problems of Elasticity: Plane Stress and Plane Strain Problems, Airy's stress Function, Two-Dimensional Problems in Polar Coordinates.

Unit-III **15 hours**

Torsion of Prismatic Bars: Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, Torsion of Thin Tubes.

Unit-IV **15 hours**

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.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

References Books:

- *Theory of Elasticity, Timoshenko S. and GoodierJ. N., McGraw Hill,1961.*
- *Elasticity, SaddM.H., Elsevier,2005.*
- *Engineering Solid Mechanics, RagabA.R., BayoumiS.E., CRCPress,1999.*
- *Computational Elasticity, AmeenM.,Narosa,2005.*
- *Solid Mechanics, KazimiS. M. A., Tata McGrawHill, 1994*

COURSE TITLE: Composite Materials	L	T	P	Cr.
COURSE CODE: MSE1500	3	1	0	4

Total Hours: 60

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

1. Understand the behavior of constituents in the composite materials.
2. Enlighten the students in different types of reinforcement.
3. Develop the student's skillsin understanding the different Manufacturing methods available for composite material.
4. Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro levels.

Course Content

Unit I **15 Hours**

Fiber Reinforced Concrete: Properties of Constituent Materials, Mix Proportions, Mixing and Casting Procedures, Properties of Freshly mixed FRC, Mechanics and properties of Fiber reinforced concrete, Composite Material approach, Application of fibre reinforced concrete.

Fly Ash Concrete: Classification of Indian Flyashes, Properties of Fly ash, Reaction Mechanism, Proportioning of Fly ash concretes, Properties of Fly ash concrete in fresh and hardened state, Durability of flyash concrete.

Unit II **15 Hours**

Polymer Concrete: Terminology used in polymer concrete, Properties of constituent materials, Polymer impregnated concrete, Polymer modified concrete, Properties and applications of polymer concrete and polymer impregnated concrete.

Ferro Cement: Constituent materials and their properties, Mechanical properties of Ferro cement, Construction techniques and application of Ferro cement.

Unit III **15 Hours**

High Performance Concrete: Materials for high performance concrete, Supplementary cementing materials, Properties and durability of high- performance concrete, Introduction to silica fume concrete, Properties and applications of silica fume concrete.

Unit IV **15 Hours**

Sulphur Concrete and Sulphur Infiltrated Concrete: Process technology, Mechanical properties, Durability and applications of sulphur concrete, Sulphur infiltrated concrete, Infiltration techniques, Mechanical properties, Durability and applications of sulphur infiltrated concrete.

Light weight concrete: Properties of light weight concretes, Pumice concrete, Aerated cement mortars, No fines concrete, Design and applications of light weight concrete.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books:

1. *Concrete, its Properties and Microstructure by P.K. Mehta, and P.J.M. Monterio.*
2. *Ferro cement by B.K. Paul, and R.P. Pama*
3. *Fiber Reinforced Concrete by Bentur and Mindess*
4. *Fly ash in Concrete by Malhotra and Ramezanianpour*

COURSE TITLE: Design of Advanced Concrete Structures	L	T	P	Cr.
COURSE CODE: MSE1501	3	0	0	3

Total Hours: 45

Course Outcomes: At the end of the course, students will be able to
1. Explain and adopt the different methods for designing.
2. Design various concrete structures.
3. Apply proper codes for designing.
4. Make proper use of prestressed concrete.

Course Content

Unit-I **13 Hours**

Design Philosophies: Introduction to various design philosophies, their merits and drawbacks, code provisions and their meaning. Inelastic Analysis of R.C. Beams & Frames, and confinement of RC member, Introduction to Prestressed concrete

Unit-II **10 Hours**

Grid Structures: Types of R.C.C. Grids, behaviour, design by approximate and exact methods

Unit-III **10 Hours**

Flat Slab: Definition, Types, Behaviour, Direct Design Method, Equivalent Frame Method.

Unit-IV **12 Hours**

Folded Plate: Types, Behaviour, Comparison with Shell, Analysis and Design using Whitney Method, Introduction to Simpson's Method.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

References Books:

1. *Limit State method– by A.K.Jain*
2. *Reinforced Cement concrete by Malik & Gupta*
3. *Thin Concrete shells by W.P.Bilington*
4. *Prestressed Concrete by Krishna Raju*
5. *Advanced R.C.C. by Vargheese*
6. *Theory of Plates & Shell by S.P. Timoshenko*

COURSE TITLE: Quality Control Lab	L	T	P	Cr.
COURSE CODE: MSE1502	0	0	2	1

List of Experiments

1. CEMENT

a) Sampling procedures and sample collections

b) Test for cement

2. AGGREGATE

a) Sampling Procedures and Sample Collections

b) Test for Fine Aggregate (Sand)

c) Test for Coarse Aggregate

3. BRICKS

a) Sampling Procedures and Sample Collections

b) Test for Bricks IS: 1077- 1992

4. CONCRETE

a) Sampling Procedures and Sample Collections

b) Test of Cement Concrete

5. STEEL

a) Sampling Procedures and Sample Collection

b) Test of Steel for Reinforcement IS: 1786 – 2008

6. PIPES

a) Sampling Procedures and Sample Collections

7. WATER FOR CONSTRUCTION PURPOSES

a) Sampling of Water

8. BRICK BALLAST IS: 3068-1986 and IS: 3182-1986

9. CHECKS AND TESTS OF FINISHED WORKS

COURSE TITLE: Seminar	L	T	P	Credits
COURSE CODE: MSE1503	0	0	4	2

Every student requires to present a seminar talk on a topic approved by the department except on his/her dissertation & submit the report to the department. The committee constituted by the Head of the department will evaluates the presentation and will award the marks. Student who is awarded with 'F' grade will be required to repeat the seminar on the same topic.

COURSE TITLE: Theory of Thin Plates & Shells	L	T	P	Cr.
COURSE CODE: MSE1504	3	1	0	4

Total Hours: 60

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.

Course Contents

UNIT-I **15 Hours**

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 **15 Hours**

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 **15 Hours**

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 **15 Hours**

Static Analysis of Shells: Membrane Theory of Shells - Cylindrical, Conical and Spherical Shells,

Shells of Revolution: with Bending R**esistance** - Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels. Thermal Stresses in Plate/Shell.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

References Books:

- *Theory of Plates and Shells, Timoshenko S. and KriegerW., McGrawHill.*
- *Stresses in Plates and Shells, UguralAnsel C., McGrawHill.*
- *Thin Elastic Shells, KrausH., John Wiley and Sons.*
- *Theory of Plates, Chandra shekhara K., Universities Press.*

COURSE TITLE: Theory & Applications of Cement Composites	L	T	P	Cr.
COURSE CODE: MSE1505	3	1	0	4

Total Hours: 60

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

1. Formulate constitutive behavior of composite materials – Ferrocement, SIFCON and Fiber Reinforced Concrete - by understanding their strain- stress behavior.
2. Classify the materials as per orthotropic and anisotropic behavior.
3. Estimate strain constants using theories applicable to composite materials.
4. Analyze and design structural elements made of cement composites.

Course Content

UNIT-I **15 Hours**

Introduction: Classification and Characteristics of Composite Materials- Basic Terminology, Advantages. Stress-Strain Relations- Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

UNIT-II **15 Hours**

Mechanical Behavior: Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity, Exact Solutions - Elasticity Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.

UNIT-III **15 Hours**

Cement Composites: Types of Cement Composites, Terminology, Constituent Materials and their Properties, Construction Techniques for Fiber Reinforced Concrete - Ferrocement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

UNIT-IV **15 Hours**

Mechanical Properties of Cement Composites: Behavior of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

Application of Cement Composites: FRC and Ferrocement-Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behavior, Constitutive relationship, Elastic Constants.

Analysis and Design of Cement Composite Structural Elements - Ferrocement, SIFCON and Fiber Reinforced Concrete.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books:

- *Mechanics of Composite Materials, Jones R. M,, 2nd Ed., Taylor and Francis,BSP Books,1998.*
- *Ferrocement – Theory and Applications, Pama R. P., IFIC,1980.*
- *New Concrete Materials, Swamy R.N., 1st Ed., Blackie, Academic and Professional, Chapman & Hall,1983.*

Semester: 2nd

COURSE TITLE: FEM in Structural Engineering	L	T	P	Cr.
COURSE CODE: MSE2550	3	1	0	4

Total Hours: 60

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

1. Understand the fundamentals and historical development of the Finite Element Method (FEM).
2. Understand and apply the Galerkin method within the framework of weighted residual techniques.
3. Identify and apply different finite element types.
4. Apply commercial FEA software tools to model, solve, and interpret engineering problems.

Course Content

Unit-I **15 Hours**

Introduction: History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, Nodal Equilibrium equations, Assembly of Global Stiffness Matrix, Element Strain and Stress. Beam Elements**:** Flexure Element, Element Stiffness Matrix, Element Load Vector.

Unit-II **15 Hours**

Method of Weighted Residuals: Galerkin Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, Polynomial Forms, Applications.

Unit-III **15 Hours**

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

Unit-IV **15 Hours**

Computer Implementation of FEM procedure, Pre-Processing, Solution, Post-Processing, Use of Commercial FEA Software.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books.

- Finite Element Analysis, Seshu P., Prentice-Hall of India, 2005.
- 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.
- 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.
- Finite Element Methods in Engineering, Belegundu A.D., Chandrupatla, T.R., Prentice Hall India, 1991.

COURSE TITLE: Structural Dynamics	L	T	P	Cr.
COURSE CODE: MSE2551	3	1	0	4

Total Hours: 60

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 using fundamental theory and equation of motion.
3. Use the available software for dynamic analysis.

Course Content

Unit-I **15 Hours**

Introduction: Objectives, Importance of Vibration Analysis, Nature of Exciting Forces, Mathematical Modeling of Dynamic Systems. Single Degree of Freedom System**:** Free and Forced Vibration with and without Damping, Response to Harmonic Loading, Response to General Dynamic Loading using Duhamel's Integral, Fourier Analysis for Periodic Loading, State Space Solution for Response.

Unit-II **15 Hours**

Numerical Solution to Response using New mark Method and Wilson Method, Numerical Solution for State Space Response using Direct Integration.

Multiple Degree of Freedom System (Lumped parameter): Two Degree of Freedom System, Multiple Degree of Freedom System, Inverse Iteration Method for Determination of Natural Frequencies and Mode Shapes, Dynamic Response by Modal Superposition Method, Direct Integration of Equation of Motion.

Unit-III **15 Hours**

Multiple Degree of Freedom System (Distributed Mass and Load): Single Span Beams, Free and Forced Vibration, Generalized Single Degree of Freedom System.

Unit-IV **15 Hours**

Special Topics in Structural Dynamics (Concepts only): Dynamic Effects of Wind Loading, Moving Loads, Vibrations caused by Traffic, Blasting and Pile Driving, Foundations for Industrial Machinery, Base Isolation.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books:

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

COURSE TITLE: Advanced Steel Design	L	T	P	Cr.
COURSE CODE: MSE2552	3	1	0	4

Total Hours: 60

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

1. Design steel structures/ components by different design processes.
2. Analyze and design beams and columns for stability and strength, and drift.
3. Design welded and bolted connections.

Course Content

Unit-I **15 Hours**

Properties of Steel: Mechanical Properties, Hysteresis, Ductility.
Hot Rolled Sections: compactness and non-compactness, slenderness, residual stresses.

Unit-II **15 Hours**

Design of Steel Structures: Inelastic Bending Curvature, Plastic Moments, Design Criteria Stability, Strength, and Drift.
Stability of Beams: Local Buckling of Compression Flange &Web, Lateral Torsional Buckling.

Unit-III **15 Hours**

Stability of Columns: Slenderness Ratio, Local Buckling of Flanges and Web, Bracing of Column about Weak Axis.
Method of Designs: Allowable Stress Design, Plastic Design, Load and Resistance Factor Design

Unit-IV **15 Hours**

Strength Criteria: Beams - Flexure, Shear, Torsion, Columns - Moment Magnification Factor, Effective Length, PM Interaction, Biaxial Bending, Joint Panel Zones.
Drift Criteria: P Effect, Deformation Based Design;
Connections: Welded, Bolted, Location Beam Column, Column Foundation, Splices.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books:

1. *Design of Steel Structures - Vol. II, Ramchandra. Standard Book House, Delhi.*
2. *Design of Steel Structures - Arya A. S., Ajmani J. L., Nemchand and Bros., Roorkee.*
3. *The Steel Skeleton- Vol. II, Plastic Behaviour and Design - Baker J. F., Horne M. R., Heyman J.,ELBS.*
4. *Plastic Methods of Structural Analysis, Neal B. G., Chapman and Hall London.*
5. *IS 800: 2007 – General Construction in Steel - Code of Practice, BIS,2007.*
6. *SP – 6 - Handbook of Structural Steel Detailing, BIS,1987*

COURSE TITLE: Design of Formwork	L	T	P	Cr.
COURSE CODE: MSE2553	4	0	0	4

Total Hours: 60

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

1. Select proper formwork, accessories and material.
2. Design the form work for Beams, Slabs, columns, Walls and Foundations.
3. Design the form work for Special Structures.
4. Understand the working of flying formwork.
5. Judge the formwork failures through case studies.

Course Content

Unit-I **15 Hours**

Introduction: Requirements and Selection of Formwork.
Formwork Materials- Timber, Plywood, Steel, Aluminium, Plastic, and Accessories. Horizontal and Vertical Formwork Supports.

Unit-II **15 Hours**

Formwork Design: Concepts, Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams.
Formwork Design for Special Structures: Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Bridges.

Unit-III **15 Hours**

Flying Formwork: Table Form, Tunnel Form, Slip Form, and Formwork for Precast Concrete, Formwork Management Issues – Pre-and Post-Award.

Unit-IV **15 Hours**

Formwork Failures: Causes and Case studies in Formwork Failure, Formwork Issues in Multi- Story Building Construction.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books:

1. *Formwork for Concrete Structures, Peurify, Mc Graw Hill India,2015.*
2. *Formwork for Concrete Structures, Kumar NeerajJha,*

Tata McGraw Hill Education,2012.

3. IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.

COURSE TITLE: Computer Aided Design Lab	L	T	P	Cr.
COURSE CODE: MSE2554	0	0	4	2

List of Experiments

1. Structural Analysis of 2D and 3D Trusses
2. Structural Analysis of Continuous Beams using for different types of loadings and support conditions
3. Structural Analysis of 2D and 3D Rigid and Braced Frames for different types of loadings, support conditions, section orientations and stiffness variation between columns and beams, Member offsets, End release, Tension only members, Active and Inactive member specifications, Soil - Structure Interaction Problems using Winkler Springs
4. Excel Spread Sheet for analysis of truss, beams and frames, using Direct Stiffness Method
5. Program Development for Design of RC Structural Elements

COURSE TITLE: DESIGN OF HIGH-RISE STRUCTURES	L	T	P	Cr.
COURSE CODE: MSE2555	3	1	0	4

Total Hours: 60

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

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

Course Content

Unit I **15 Hours**

Design of transmission/ TV tower, Mast and trestles: Configuration, bracing system, analysis and design for vertical transverse and longitudinal loads.

Unit II **15 Hours**

Analysis and Design of RC and Steel Chimney, Foundation design for varied soil strata.

Unit III **15 Hours**

Tall Buildings: Structural Concept, Configurations, various systems, Wind and Seismic loads, Dynamic approach, structural design considerations and IS code provisions. Firefighting design provisions.

Unit IV **15 Hours**

Application of software in analysis and design.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books:

1. Structural Design of Multi-storeyed Buildings, Varyani U. H., 2nd Ed., South Asian Publishers, New Delhi,2002.

2. Structural Analysis and Design of Tall Buildings, Taranath B. S., Mc Graw Hill,1988.

3. Illustrated Design of Reinforced Concrete Buildings (GF+3storeyed), Shah V. L. & Karve S. R., Structures Publications, Pune, 2013.

4. Design of Multi Storeyed Buildings, Vol. 1 & 2, CPWD Publications, 1976.

5. Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India.1991.

6. High Rise Building Structures, Wolfgang Schueller, Wiley.,1971.

COURSE TITLE: RETROFITTING & REHABILITATION OF STRUCTURES	L	T	P	Cr.
COURSE CODE: MSE2556	3	1	0	4

Total Hours: 60

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

1. Identify type of distress in deteriorated concrete structure.
2. To estimate the extent of damage level in concrete structures using Non Destructive Tests.
3. To implement various rehabilitation and retrofitting techniques using various innovative materials in structures.
4. To understand usefulness of various structural health monitoring methods and its applications in maintenance of structures.

Course Content

Unit I **15 hours**

Introduction: Overview of distress, deterioration in concrete structures, Scenario of distressed structures world over, Need for repairs and upgrading of structures, General introduction to process (Road-map) to a durable concrete repair.

Unit II **15 hours**

Deterioration of Concrete Structure:

Types of deterioration – Signs, causes & symptoms, Mechanism of deterioration, contributing factors like permeability, inadequate durability & micro-structure of concrete, Physical deterioration due to moisture, temperature, shrinkage, freeze-thaw, abrasion, erosion, cavitation, crystallization of salts, Efflorescence, exposure to severe environment like marine exposure.

Unit III **15 hours**

Conditional assessment and evaluation of structure:

Structural assessment: Conditional evaluation / Structural Appraisal of the structure – Importance, objective & stages, Conditional/damage assessment procedure, Preliminary & Detailed investigation – Scope, Objectives, Methodology & Rapid visual inspection of structures.

Damage Assessment allied Tests (Destructive, Semi-destructive, Nondestructive): Field & laboratory testing procedures for evaluating the structure for strength, corrosion activity, performance & integrity, durability. Interpretation of the findings of the tests.

Unit IV **15 hours**

Repairs, rehabilitation & Retrofitting of concrete structures:

Repair materials - Criteria for durable concrete repair, Methodology, performance requirements, repair options, selection of repair materials, Preparatory stage of repairs, Different types of repair materials & their application, types of repair techniques**.**
Retrofitting/Strengthening: Need for retrofitting, Design philosophy of strengthening structures, Techniques available for strengthening including conventional and advanced techniques.
Seismic retrofit of concrete structures: Deficiencies in structure requiring seismic retrofit, Design philosophy, Techniques to enhance the seismic resistance of structures, advanced techniques for making seismic resistant structures.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Reference Books:

1. Concrete microstructure, Properties and materials – P Kumar Mehta and Paulo J.M.Monterio

2. Handbook on Repairs and Rehabilitation of RCC buildings – CPWD, Government of India.

3. Concrete technology – A.R.Shanthakumar, Oxford University Press, India

4. Concrete Technology by M.L.Gambhir, Tata McGraw-Hill Education, Third Edition

5. Appraisal and Repair of Reinforced concrete by R.Holland, Thomas Telford Ltd. London. 6. J.H.Bungey, S.G.Millard & M.G.Grantham ,
6. Testing of Concrete in Structures, 4th Edition, Taylor & Francis, London & New York, 2006.

Semester: 3rd

COURSE TITLE: Dissertation Phase-I*	L	T	P	Credits
COURSE CODE: MSE3600	0	0	0	12

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify structural engineering problems reviewing available literature.
2. Identify appropriate techniques to analyze complex structural systems.
3. Apply engineering and management principles through efficient handling of project

Course Contents

The dissertation will normally contain:

1. Dissertation-I will have mid semester presentation and end semester presentation. Mid semester
2. Presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.
3. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individual's contribution.
4. Continuous assessment of Dissertation – I at Mid Sem and End Sem will be evaluated by the departmental committee.
5. The Dissertation – I will be continued in the 4th semester.

COURSE TITLE: DESIGN OF PRE STRESSED CONCRETE STRUCTURES	L	T	P	Cr.
COURSE CODE: MSE3601	3	1	0	4

Total Hours: 60

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

1. Understand the requirement of PSC members for present scenario.
2. Analyze the stresses encountered in PSC element during transfer and at working.
3. Understand the effectiveness of the design of PSC after studying losses
4. Capable of analyzing the PSC element and finding its efficiency.
5. Design PSC beam for different requirements.

Course Content

UNIT-I **15 hours**

Introduction: Analysis of Members: Concept of Pre stressing - Types of Pre stressing - Advantages - Limitations –Pre stressing systems - Anchoring devices - Materials - Mechanical Properties of high strength concrete - high strength steel - Stress-Strain curve for High strength concrete. Analysis of members at transfer - Stress concept - Comparison of behavior of reinforced concrete – pre stressed concrete - Force concept - Load balancing concept - Kern point -Pressure line.

UNIT-II **15 hours**

Losses in Pre stress:

Loss of Pre stress due to Elastic shortening, Friction, Anchorage slip, Creep of concrete, Shrinkage of concrete and Relaxation of steel - Total Loss. Deflection and Crack Width Calculations of Deflection due to gravity loads - Deflection due to prestressing force -Total deflection - Limits of deflection - Limits of span-to-effective depth ratio -Calculation of Crack Width - Limits of crack width.

UNIT-III **15 hours**

Design of Sections for Flexure:

Analysis of members at ultimate strength - Preliminary Design - Final Design for Type 1members.

UNIT IV **15 hours**

Design for Shear:

Analysis for shear - Components of shear resistance - Modes of Failure - Limit State of collapse for shear - Design of transverse reinforcement. Different anchorage system and design of end block by latest IS codes.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books:

1. Krishna Raju, N. “Pre stressed Concrete”, Tata McGraw Hill Publishing Company, New Delhi 2006
2. Krishna Raju. N., “Pre-stressed Concrete - Problems and Solutions”, CBS Publishers and Distributors, Pvt. Ltd., New Delhi.
3. Rajagopalan N, “Pre - stressed Concrete”, Narosa Publishing House, New Delhi

COURSE TITLE: DESIGN OF MASONARY STRUCTURES	L	T	P	Cr.
COURSE CODE: MSE3602	3	1	0	4

Total Hours: 60

Course Outcomes: At the end of the course, students will be able to.
1. Understand Structural design of walls, columns and beams.
2. Explain the static behaviour of masonry structures.
3. Selection of measures for moisture protection, heat insulation, sound insulation and fire insulation of masonry structures
4. Design of movement joints

Course Content

Unit I **15 hours**

Masonry Units, Materials, types and masonry construction: Bricks, Stone and Block masonry units-strength, modulus of elasticity and water absorption of masonry materials-classification and properties of mortars. Defects and Errors in masonry construction-cracks in masonry, types, reason for cracking, methods of avoiding cracks. Strength and Stability: Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.

Unit II **15 Hours**

Permissible stresses: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses. Design Considerations: Effective height of wall sand columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars.

Unit II **15 Hours**

Design of walls subjected to concentrated axial loads: Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings. Design of walls subjected to eccentric loads: Design criteria-stress distribution under eccentric loads -Problems on eccentrically loaded solid walls, cavity walls, walls with piers.

Unit IV **15 Hours**

Design of Laterally and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of shear wall-design of compound walls. Introduction to reinforced brick masonry, lintels and slabs. In-filled frames: Types-modes of failures-design criteria of masonry retaining walls.

Transactional Mode: Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learnings.

Reference Books:

1. DESIGN OF MASONRY STRUCTURES Third edition of Load Bearing Brickwork Design A.W. Hendry, and S.R. Davies.

Course Title: Project	L	T	P	Credits
Course Code: MSE3603	0	0	4	2

Every student will carry out project under the supervision of a supervisor(s). The topic shall be approved by a Committee constituted by the Head of the concerned department. Every student will be required to present two seminar talks, first at the beginning of the project to present the scope of the work to finalize the topic, and second at the end of the semester, presenting the work carried out by him/her in the semester.

Semester: 4th

COURSE TITLE: ADVANCED CONCRETE TECHNOLOGY	L	T	P	Cr.
COURSE CODE: MSE4651	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Discuss the concrete ingredients and its influence at gaining strength.
2. Summarize the concepts of conventional concrete and its differences with other concretes like no fines, light weight etc.
3. Describe the application and use of fiber reinforced concrete.
4. Design and develop the self-compacting and high-performance concrete.

Course Content

Unit I: **15 Hours**

Properties of cement, fine aggregate and coarse aggregates, Additives and Admixtures in Concrete, Rheology of Concrete.

Unit II: **15 Hours**

Manufacturing and methods of concreting, Properties of fresh and hardened concrete, mix design by I.S. method, Design and manufacture of normal concrete, Light weight concrete – Cellular concrete – No fines concrete – Aerated & foamed concrete

Unit III: **15 Hours**

Design and manufacture of fiber reinforced concrete – Polymer concrete – Fly ash concrete

Unit IV: **15 Hours**

Design and manufacture of Self compacting concrete – High performance concrete – Very high strength concrete – High density concrete

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. Neville, A.M., “Properties of Concrete”, 3rd Edition, Longman Scientific and General, 1992.
2. Shanta Kumar A.R., “Concrete Technology”, 2 nd Edition, Oxford University Press, New Delhi, 2000.
3. Krishna Raju. N, “Design of Concrete Mixes”, 2nd Edition, CBS Publishers and Distributors, 2009.
4. Shetty, M.S., “Concrete Technology”, 3 rd Edition, S.Chand Publications, 2008.

COURSE TITLE: BUSINESS OWNERSHIP	L	T	P	Cr.
COURSE CODE: MSE4652	2	0	0	2

Total Hours: 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Assess the commercial viability of new technologies, business opportunities and existing companies.
2. Plan, organize, and execute a project or new venture with the goal of bringing new products and service to the market.
3. Carry out scientific research in the field of entrepreneurship.
4. Improved your interpersonal and collaborative skills.

Course Content

UNIT I **10 Hours**

Introduction to Generic Skills: Importance of Generic Skill Development (GSD), Global and Local Scenario of GSD, Life Long Learning (LLL) and associated importance of GSD. Managing Self: Knowing Self for Self-Development- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc., Managing Self – Physical- Personal grooming, Health, Hygiene, Time Management, Managing Self – Intellectual development -Information Search: Sources of information, Reading: Purpose of reading, different styles of reading, techniques of systematic reading, Note Taking: Importance of note taking, techniques of note taking, Writing: Writing a rough draft, review and final draft. Managing Self – Psychological, Stress, Emotions, Anxiety-concepts and significance, Techniques to manage the above.

UNIT II **5 Hours**

Managing in Team: Team - definition, hierarchy, team dynamics, Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background, Communication in group - conversation and listening skills.

UNIT III **5 Hours**

Task Management: Task Initiation, Task Planning, Task execution, Task close out, Exercises/case studies on task planning towards development of skills for task management Problem Solving: Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving, Different approaches for problem solving. Steps followed in problem solving. Exercises/case studies on problem solving.

UNIT IV **10 Hours**

Entrepreneurship: Introduction, Concept/Meaning and its need, Competencies/qualities of an entrepreneur, Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture

and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level. Market Survey and Opportunity Identification (Business Planning)- How to start a small-scale industry, Procedures for registration of small-scale industry, List of items reserved for exclusive manufacture in small-scale industry, Assessment of demand and supply in potential areas of growth, understanding business opportunity, Considerations in product selection, Data collection for setting up small ventures. Project Report Preparation- Preliminary Project Report, Techno-Economic Feasibility Report, Exercises regarding "Project Report Writing" for small projects.

Transaction Modes:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. Khanka, S. S. (2006). Entrepreneurial development. S. Chand Publishing.
2. Desai, V. (2009). Dynamics of entrepreneurial development and management (pp. 119-134). Himalaya Publishing House.
3. Kennedy, A. (2015). Business development for dummies. John Wiley & Sons.

COURSE TITLE: Theory Of Structural Stability	L	T	P	Cr.
COURSE CODE: MSE4653	3	1	0	4

Total Hours: 60

Course Outcomes: At the end of the course, students will be able to:
1. Determine stability of columns and frames.
2. Determine stability of beams and plates.
3. Use stability criteria and concepts for analysing discrete and continuous systems.

Course Content

UNIT-I **15 Hours**

Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behaviour.

UNIT-II **15 Hours**

Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

UNIT-III **15 Hours**

Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

UNIT-IV **15 Hours**

Stability of Beams: lateral torsion buckling. Stability of Plates: axial flexural buckling, shear flexural buckling, buckling under combined loads. Introduction to Inelastic Buckling and Dynamic Stability.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Reference Books:

1. Theory of elastic stability, Timoshenko and Gere, Tata Mc GrawHill,1981
2. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
3. Structural Stability of columns and plates, Iyengar, N. G. R., Eastern west press Pvt. Ltd. New York.

COURSE TITLE: Soil Structure Interaction	L	T	P	Cr.
COURSE CODE: MSE4654	3	1	0	4

Total Hours: 60

Course Outcomes: At the end of the course, students will be able to:
1. Understand soil structure interaction concept and complexities involved.
2. Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics.
3. Prepare comprehensive design-oriented computer programs for interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc.
4. Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics.
5. Evaluate action of group of piles considering stress-strain characteristics of real soils.

Course Content

Unit I **15 Hours**

Critical Study of Conventional Methods of Foundation Design, Nature and Complexities of Soil Structure Interaction. Application of Advanced Techniques of Analysis such as FEM and Finite Difference Method.

Unit II **15 Hours**

Relaxation and Interaction for the Evaluation of Soil Structure Interaction for Different Types of Structure under various Conditions of Loading and Subsoil Characteristics. Preparation of Comprehensive Design Oriented Computer Programs for Specific Problems, Interaction Problems based on Theory of Sub Grade Reaction Such as Beams, Footings, Rafts Etc.

Unit III: **15 Hours**

Analysis of Different Types of Frame Structures Founded on Stratified Natural Deposits with Linear and Non-Linear Stress-Strain Characteristics.

Unit IV **15 Hours**

Determination of Pile Capacities and Negative Skin Friction, Action of Group of Piles Considering Stress-Strain Characteristics of Real Soils, Anchor Piles and Determination of Pull-out Resistance.

Transactional Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

References:

1. Analytical and Computer Methods in Foundation, Bowels J.E., McGraw Hill Book Co., New York, 1974. 26 M. Tech Structural Engineering
2. Numerical Methods in Geotechnical Engineering, Desai C.S. and Christian J.T., McGraw Hill Book Co., New York.

3. Soil Structure Interaction - The real behaviour of structures, Institution of Structural Engineers.

4. Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg. Vol-17,Elsevier Scientific Publishing Company.

5. Elastic Analysis of Soil-Foundation Interaction, Selvadurai A.P.S., Elsevier Scientific

6. Analysis & Design of substructures, Swami Saran, Oxford & IBH Publishing Co. Pvt. Ltd.

7. Design of Foundation System- Principles & Practices, Kurian N. P., Narosa Publishing