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Total Contact Hours = 26 Total Marks = 600 Total Credits = 23

SEMESTER 1st		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCIE8-101	Theory and Analysis of Plates	3	1	-	40	60	100	4
MCIE8-102	Bridge Engineering	3	1	-	40	60	100	4
MCIE8-103	Plastic Analysis and Design of Steel Structures	3	1	-	40	60	100	4
MCIE8-104	Non Destructive Testing Lab	-	-	6	60	40	100	3
Departmental Elective – I (Select any one)		3	1	0	40	60	100	4
MCIE8-156	Advanced Solid Mechanics							
MCIE8-157	Advanced Foundation Engineering							
Departmental Elective – II (Select any one)		3	1	0	40	60	100	4
MCIE8-158	Pre Stressed Concrete Structures							
MCIE8-159	Advanced Structure Design and Detailing							
Total	**Theory = 5 Lab = 1**	**15**	**5**	**6**	**260**	**340**	**600**	**23**

Total Contact Hours = 26 Total Marks = 600 Total Credits = 23

SEMESTER 2nd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCIE8-205	Matrix Methods in Civil Engineering	3	1	-	40	60	100	4
MCIE8-206	Structural Dynamics	3	1	-	40	60	100	4
MCIE8-207	CAD Lab	-	-	6	60	40	100	3
Departmental Elective – III (Select any one)		3	1	0	40	60	100	4
MCIE8-260	Industrial Structures							
MCIE8-261	Computer Aided Design Methods							
Departmental Elective – IV (Select any one)		3	1	0	40	60	100	4
MCIE8-262	Finite Element Analysis							
MCIE8-263	Composite Materials							
Open Elective – I (Select any one)		3	1	0	40	60	100	4
Total	**Theory = 4 Lab = 1**	**15**	**5**	**6**	**260**	**340**	**600**	**23**

Overall

Semester	Marks	Credits
1st	600	23
2nd	600	23
Total	**1200**	**46**

THEORY AND ANALYSIS OF PLATES

Subject Code: MCIE8-101 **L T P C** **Duration: 28 Hrs.**
3 1 0 4

UNIT-I (12 Hrs)

INTRODUCTION TO THEORY OF ELASTICITY: Introduction to the elasticity theory, Stress at a point: stress tensor, Strains and displacements, Constitutive equations (without derivation), Equilibrium equations (without derivation), Compatibility equations (without derivation)
RECTANGULAR PLATES: Introduction, the governing equation for deflection of plates, bending of a long, uniformly loaded rectangular plate (simply supported and clamped edges), Rectangular plates subjected to a concentrated load, bending of plates with small initial curvature, Problems (exact analysis using charts/tables and approximate analysis)

UNIT-II (10 Hrs)

PURE BENDING OF PLATES: Slope and curvature, Pure bending in two perpendicular directions, Moment curvature relation, Anticlastic and synclastic surfaces, Thermal stresses in plates, Effect of transverse shear deformation on bending of elastic plates, Triangular plates.

UNIT-III (12 Hrs)

CIRCULAR PLATES: Introduction, Plate differential equation, bending of a circular plate subjected to a lateral pressure per unit area and a centrally placed concentrated load (simply supported and clamped edges), Bending of a circular plate concentrically loaded (simply supported and clamped edges), Deflection of a symmetrically loaded circular plate with a circular hole at the centre, Problems.

UNIT-IV (11 Hrs)

ORTHOTROPIC PLATES:
Introduction, Analysis by Orthotropic plate theory for both longitudinal as well as transverse structural actions using the design charts produced by Morice, Little and Rowe for evaluating bending moment and shear forces, Problems.

Recommended Books

1. Timoshenko, 'Theory of Plates & Shells'.
2. Timoshenko, 'Theory of Elasticity'.
3. Sadhu Singh, 'Theory of Elasticity and Plasticity'.
4. N. Rajagopalan, 'Bridge Superstructure', Narosa Publishers.

BRIDGE ENGINEERING

Subject Code: MCIE8-102 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

Introduction-definition and components of bridges. Layout and planning of bridges classification, investigations for bridges, preliminary data collection, choice of type of the bridges, hydraulic design of bridges, traffic design of bridges**.**

UNIT-II (12 Hrs)

Analysis and design of superstructure of straight and curved bridge decks-loadings details, specification-reinforced concrete and steel decks. Decks of various types like slab, hollow and voided slab, beam and slam, box girder etc.

UNIT-III (11 Hrs)

Design of substructure-piers and abutments of different types. Analysis and design of foundations-shallow foundations (open Foundations), deep foundations- well foundations and caisson. Design and constructional aspects of foundations.

UNIT-IV (12 Hrs)

Modern methods of construction of concrete and steel bridges- their impact on the analysis and the design. Introduction to analysis and design of long span bridges like suspension and cable stayed bridges. Special aspects in analysis and design, based on construction methodology. Inspection and maintenance and rehabilitation of bridges**.**

Recommended Books

1. Pama & Gusens, 'Bridge Deck Analysis'.
2. Edward V. Hambly, 'Bridge Deck Behavior'.
3. D. Johnson Vector, 'Essentials of Bridge Engineering'.

PLASTIC ANALYSIS & DESIGN OF STEEL STRUCTURES

Subject Code: MCIE8-103 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

Ductility of metals: Concept of plastic design, over loaded factors, ultimate load as design criteria. Hinge formation in indeterminate structures, Redistribution of moments, Assumption made for structures subjected to bending only.

UNIT-II (12 Hrs)

Minimum weight design: concept, assumptions, Design of frame with prismatic measures, Elements of linear programming and its application to minimum weight design problems.

UNIT-III (12 Hrs)

Deflections: Assumption, calculation of deflection at ultimate loads, permissible rotations. Secondary design considerations: Influence of direct load, shear, local buckling, lateral buckling, repeated loading and brittle fracture on moment capacity design of eccentrically loaded columns.

UNIT-IV (11 Hrs)

Problem of incremental: collapse, shake down analysis. Special consideration for design of structures using light gauge metals.

Recommended Books

1. M.J. & Z.P.B., Inelastic Analysis of Structures, John Wiley & Sons, Ltd.
2. M. Bill Wong, Plastic Analysis and Design of Steel Structures.

NON DESTRUCTIVE TESTING LAB

Subject Code: MCIE8-104 **L T P C**
0 0 6 2

List of Experiments

1. Mix Design of concrete without admixtures as per IS Recommended Guidelines
2. Mix Design of concrete with admixtures as per IS Recommended Guidelines
3. Rebound Hammer Test
4. Ultrasonic Pulse Velocity Test

5. Bar Locator test
6. Split Tensile strength of Concrete.
7. Core Test

Recommended Books

1. M.L. Gambhir, 'Concrete Manual', Dhanpat Rai & Co.
2. P.S. Gahlot, Sanjay Sharma, 'Building Repair and Maintenance Management', CBS Publishers.
3. M.S. Shetty, 'Concrete Technology'.

ADVANCED SOLID MECHANICS

Subject Code: MCIE8-156 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (11 Hrs)

Theory of stress, state of stress in a body, Differential equations of equilibrium. Analysis of state of stress at a given point in a body.

UNIT-II (10 Hrs)

Geometrical theory of strains, displacement components and strain components and relation between them, generalized hooks law, strains expressed in terms of stresses.

UNIT-III (12 Hrs)

Stresses expressed in terms of strains, torsion of prismatic bars and bending, Saint- Venant method.

UNIT-IV (12 Hrs)

Three dimensional stress systems, tensors, unsymmetrical bending.

Recommended Books

1. S. Timoshenko, 'Theory of Elasticity'.
2. M. Filonenko, 'Theory of Elasticity'.
3. S.H. Crandall, 'Solid Mechanics'.

ADVANCED FOUNDATION ENGINEERING

Subject Code: MCIE8-157 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

Criteria for foundation choice, bearing capacity, total and differential settlement, tolerance for various types of structures. Interpretation of soil profile for design parameters like modulus of compressibility, modulus of sub grade reaction, Poisson ratio etc.

UNIT-II (12 Hrs)

Raft foundations for buildings and tower structures including effects of soil structure interaction and non-linearity, different types of rafts and methods of analysis, precautions for construction of shallow foundations.

UNIT-III (12 Hrs)

Pile foundations, types, method of installation codal practices for permissible loads under vertical and lateral loads, Diaphragm walls, design and construction, foundations for heavy structures, well and caisson foundations.

UNIT-IV (11 Hrs)

Equipment foundation subjected to dynamic loads. Underground structures, strategies for instrumentation and monitoring of foundation performance.

Recommended Books

1. J.E. Bowles, 'Foundation Analysis and Design'.
2. Pech, Hansen and Thornburn, 'Foundation Engineering'.

PRE STRESSED CONCRETE STRUCTURES

Subject Code: MCIE8-158 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

Limit state design of statically determinate pre-stressed beams- limit state of collapse by flexure, shear, torsion limit state of serviceability. Anchorage zone stresses for posttensioned members**.**

UNIT-II (12 Hrs)

Statically indeterminate structures- analysis and design- continuous beams and frames. Choice of profile, linear transformation, concordancy, omically viable profile. Composite beam with precast pre-stressed beams and cast in situ RC slab analysis and design.

UNIT-III (12 Hrs)

Time dependent effects such as creep, shrinkage etc. on composite construction inclusive of creep relaxation and relaxation creep- partial pre-stressing principles, analysis and design of simple beams, crack and crack width calculations**.**

UNIT-IV (11 Hrs)

Analysis and design of prestressed pipes, tanks and spatial structures slabs, grids, folded plates and shells.

Recommended Books

1**.** Lundy, 'Pre-stressed Concrete Structures'.
2. T.Y. Lin, 'Pre-stressed Concrete'.
3. N. Krishna Raju, 'Pre-stressed Concrete'.

ADVANCED STRUCTURE DESIGN & DETAILING

Subject Code: MCIE8-159 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (12 Hrs)

Introduction to limit state method of design, provisions in the Indian standard codes for loading wind loads and seismic loads, design and detailing of concrete structures, BIS Handbook for design, Examples of design using handbook.

UNIT-II (10 Hrs)

Design of Structures as per I.S. 1893 for Earthquake Resistant Design Construction, Design and Detailing Requirements as per 4326-1993.

UNIT-III (11 Hrs)

Design and Detailing of Earthen Buildings as per 13827-1993, Design and Detailing of Masonry Structures as per I.S. 13828-1993.

UNIT-IV (12 Hrs)

Design and Ductile Detailing of R.C.C. Structures as per I.S. 13920-1993, Repair and Seismic Strengthening of Buildings as per I.S. 13935-1993.

Recommended Books

1. P. Dayaratnam, 'Reinforced Concrete Structure'.
2. A.K. Jain, 'Reinforced Concrete, Limit State Method of Design'.
3. B.C. Punmia, 'Reinforced Concrete Structures', Vol II.
4. Jain and Jaikrishna, 'Plain and Reinforced Concrete', Vol II.
5. P. Dayaratnam, 'Design of Steel Structures'.
6. S.K. Duggal, 'Design of Steel Structures'.
7. B.I.S. Codes 1893, 4326, 13827, 13828, 13920, 13935.

MATRIX METHODS IN CIVIL ENGINEERING

Subject Code: MCIE8-205 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

BASIC CONCEPTS: Introduction, Static and Kinematic Indeterminacies, Axes and Coordinates, Types of structures, Actions and displacements, Action and displacement equations, Generalized system of coordinates**.**

UNIT-II (10 Hrs)

DEVELOPMENT OF MATRICES: Flexibility and Stiffness Influence Coefficients, Flexibility Matrix, Stiffness Matrix, Physical and Element Approach, Relation between Flexibility and Stiffness Matrices, Systems Approach of Flexibility and Stiffness Methods, Comparison of methods.

UNIT-III (12 Hrs)

FLEXIBILITY METHOD: Introduction, Equilibrium and Compatibility, Equations of Equilibrium, Compatibility Conditions, Analysis of Continuous Beams including Support Settlements, Pin-jointed Plane Frames and Rigid-jointed plane Frames using Physical and Element Approach, Support Reactions, Shear Force and Bending Moment Diagrams.

UNIT-IV (13 Hrs)

STIFFNESS METHOD: Introduction, Joint Loads, Member Loads, Combined Loads, Equivalent Joint Loads, Analysis of Continuous Beams including Support Settlements, Pin-jointed Plane Frames and Rigid-jointed Plane frames using Physical and Element Approach, Support Reactions, Shear Force and Bending Moment Diagrams**.**

Recommended Books

1. Weaver & Gere, 'Matrix Analysis of Framed Structures', CBS Publishers.
2. C.S. Reddy, 'Basic Structural Analysis', McGraw Hill Publishers.
3. G.S. Pandit & S.P. Gupta, 'Matrix Methods in Structural Analysis'.
4. A.K. Jain, 'Advanced Structural Analysis'.
5. Menon, 'Advanced Structural Analysis'.

STRUCTURAL DYNAMICS

Subject Code: MCIE8-206 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

Introduction, Systems with single degree of freedom (SDOF) Equation of motion – Analysis of free vibration-response to harmonic, impulsive, periodic and general dynamic loadings.

UNIT-II (10 Hrs)

Forced and free vibration response of MDOF damp and undamped discrete systems-equation of motion- evaluation of natural frequencies and modes – approximate methods.

UNIT-III (12 Hrs)

Overview of dynamics of continuous elastic systems-flexural beams-shear beams-columns, base excited system-formulation of equations for SDOF & MDOF systems-concepts of spectral quantities and response spectrum-fundamental of earthquake engineering**.**

UNIT-IV (13 Hrs)

Computational and numerical methods-solution of Eigen value problems mode superposition method and modal truncation errors-modal acceleration method, direct integration method-explicit and implicit methods.

Recommended Books

1. Clough and Penzien, 'Dynamics of Structures'.
2. G.K. Grover, 'Mechanical Vibrations'.
3. Walter C. Hurty & Moshe F. Rubinsten, 'Dynamics of Structures'.

CAD LAB

Subject Code: MCIE8-207 **L T P C**
0 0 6 3

List of Experiments

1. Computer Aided Analysis & Design of Reinforced Concrete Elements such as Beams, Slabs.
2. Computer Aided Analysis & Design of Steel Elements such as Connections, Tension Members, Compression Members, Beams, Column Base, and Roof Trusses.
3. To develop a complete self-reliance in solving analysis and design problems of engineering with the use of computers. The effort must culminate with a CAD program and a project report.
4. To develop a complete self-reliance of software used for the structural analysis & design.

INDUSTRIAL STRUCTURES

Subject Code: MCIE8-260 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

Planning of industrial structures: Design of single and multibay industrial structures in steel.

UNIT-II (10 Hrs)

Bunkers & Silos in steel

UNIT-III (12 Hrs)

Liquid retaining structures in steel, Pressure vessels & chimneys in concrete

UNIT-IV (13 Hrs)

Cooling tower in concrete, Structural aspects /design of machine, foundation in concrete

Recommended Books

1. C.W. Dunham, Planning of Industrial Structures'.
2. Structural Engineers Handbook.
3. S.K. Duggal, 'Design of Steel Structures'.

COMPUTER AIDED DESIGN METHODS

Subject Code: MCIE8-261 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

Introduction to CAD and its scope simple description of computer hardware. - Micro, mini etc. - memory, processor - Peripheral devices-disks, printer. Video terminals. Graphic floater, graphic screen digitizer**.**

UNIT-II (11 Hrs)

Computer Graphics: introduction, point plotting techniques, line drawing displays, two/three dimensional transformation, clipping and windowing, segmentation geometric modeling. Three dimensional graphics, curves and surfaces, hidden surface elimination, shading. Graphic input devices. Graphic input technique, input functions.

UNIT-III (10 Hrs)

Raster graphic fundamentals, interactive raster graphics, raster graphic systems. Computer aided linkage displays and synthesis, interactive acceleration analysis. Appreciation of graphic packages.

UNIT-IV (14 Hrs)

Matrix methods of structural analysis and associated computer programme assembly of matrices. Solution of equilibrium equations. Flow charts. Typical listing as illustrations. Introduction to interactive computer programme for the design detailing of simple structural elements: RCC slab, beams, columns, isolated footings etc. Steel typical members and connections. Data base management, storing and retrieving of data**.**

Recommended Books

1. William M. Newman & Robert F. Sproul, 'Principles of Interactive Computer Graphics'.
2. Hunton and Owan, 'Programming in Finite Element'.
3. Joe Rooney & Philips Steadman, 'Principles of Computer Aided Design'.

FINITE ELEMENT ANALYSIS

Subject Code: MCIE8-262 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

UNIT-I (10 Hrs)

Basic equations of solid mechanics-review of equilibrium conditions, strain – displacement relations, stress – strain relations, principles of virtual work and stationary potential energy and various formulations.

UNIT-II (10 Hrs)

Approximate methods Rayleigh, Ritz weighted residual (Galerkin) and finite difference methods. Finite element method: displacement model-shape functions Lagrange and Serendipity elements.

Element properties-isoperimetric elements-numerical integration technique assemblage of elements and solution technique for static analysis.

UNIT-III (12 Hrs)

Analysis of framed structures-2D & 3D truss and beam element and applications. Analysis of plan stress/strain and ax symmetric solids-triangular, quadrilateral and isoperimetric elements, incompatible modes. Three dimensional stress analysis isoperimetric 8 and 20 nodded elements.

UNIT-IV (13 Hrs)

Analysis of plate bending-basic equations of thin plate theory Reissinner-Mindlin theory- plate elements and applications. Analysis of shells-degenerated shell elements. Finite element programming and FEA software**.**

Recommended Books

1. C.S. Krishanmurthy, 'Finite Element Analysis – Theory and Programming'.
2. K.J. Bathe & E.L. Wilson, 'Numerical Method in Finite Element Analysis'.
3. R.D. Cook, 'Concepts and Applications of Finite Element Analysis', Wiley India Pvt. Ltd.

COMPOSITE MATERIALS

Subject Code: MCIE8-263 **L T P C** **Duration: 45 Hrs.**
3 1 0 4

MRSPTU

UNIT-I (10 Hrs)

FIBRE REINFORCED CONCRETE: Properties of Constituent Materials, Mix Proportions, Mixing and Casting Procedures, Properties of Freshly mixed FRC, Mechanics and properties of Fibre reinforced concrete, Composite Material approach, Application of fibre reinforced concrete.

UNIT-II (12 Hrs)

FLY ASH CONCRETE: Classification of Indian Flashes, Properties of fly ash, Reaction Mechanism, Proportioning of Fly ash concretes, Properties of fly ash concrete in fresh and hardened state, Durability of fly ash concrete.

FERRO CEMENT: Constituent materials and their properties, Mechanical properties of ferro cement, Construction techniques and application of ferro cement.

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

UNIT-III (10 Hrs)

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.

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 (13 Hrs)

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.

Recommended Books

1. A.M. Nevillie, 'Concrete Technology'.

2. M.L. Gambhir, 'Concrete Technology'.
3. M.S. Shetty, 'Concrete Technology'.

MRSPTU