LNCT UNIVERSITY, BHOPAL

School of Computer Science & Technology

PROGRAMME: **M. Tech.** Scheme of Examination

BRANCH : **STRUCTURAL ENGINEERING** SEMESTER: **I**

S.No.	Paper Code	Paper Name	Maximum Marks Allotted						Credits Allotted Subject Wise			Total Credits	Remark
			Theory Slot		Practical Slot								
			EST	CAT MST	ESP	Continuous Assessment: Lab Performance, Lab Record &	Continuous Assessment: Attendance	Total Marks	L	T	P		
1	MVSE101	Advance Mathematics and Numerical Analysis	80	20	-	-	-	100	3	1	-	**04**	One credit refers to one hour teaching in theory and 2 hour teaching for tutorial andpractical:24 hour workload per week corresponding to LTP
2	MVSE 102	Strength of material and theory of elasticity	80	20	-	-	-	100	3	1	-	**04**	
3	MVSE 103	Advance Structural Analysis	80	20				100	3	1	-	**04**	
4	MVSE 104	Design of Concrete Structures	80	20				100	3	1	-	**04**	
5	MVSE 105	Computer Aided Design	80	20				100	3	1	-	**04**	
6	MVSE 106	Lab-I Concrete			90	30	30	150	-	-	6	**06**	
7	MVSE 107	Lab-II Cad			90	30	30	150	-	-	6	**06**	
Total			**400**	**100**	**180**	**60**	**60**	**800**	**15**	**05**	**12**	**32**	

***PASSING CRITERIA FOR THE SEMESTER ONLY IF THEORY SCORE >=50% AND PRACTICAL SCORE >= 50%.**

MST: Mid Semester Test L: Lecture T: Tutorial P: Practical EST: EndSemester Test ESP: End Semester Practical

LNCT UNIVERSITY, BHOPAL

School of Computer Science & Technology

Scheme of Examination

PROGRAMME: **M. Tech.**

BRANCH : **STRUCTURAL ENGINEERING** SEMESTER: **II**

S.No.	Paper Code	Paper Name	Maximum Marks Allotted						Credits Allotted Subject Wise			Total Credits	Remark
			Theory Slot		Practical Slot								
			EST	CAT MST	ESP	Continuous Assessment: Lab Performance, Lab Record &	Continuous Assessment: Attendance	Total Marks	L	T	P		
1	MVSE 201	Structural Dynamics	**80**	20	-	-	-	**100**	**3**	**1**	-	**04**	One credit refers to one hour teaching in theory and 2 hour teaching for tutorial and practical:24 hour workload per week corresponding to LTP
2	MVSE 202	FEM in Structural Engineering	**80**	20	-	-	-	**100**	**3**	**1**	-	**04**	
3	MVSE 203	Advance Concrete Technology	**80**	20				**100**	**3**	**1**	-	**04**	
4	MVSE 204	Experimental Stress Analysis	**80**	20				**100**	**3**	**1**	-	**04**	
5	MVSE 205	Theory of Plates and Shells	**80**	20				**100**	**3**	**1**	-	**04**	
6	MVSE 206	Lab-III Instrumentation			**90**	**30**	**30**	**150**	-	-	**6**	**06**	
7	MVSE 207	Lab-IV Structural Software Engg.			**90**	**30**	**30**	**150**	-	-	**6**	**06**	
Total			**400**	**100**	**180**	**60**	**60**	**800**	**15**	**05**	**12**	**32**	

***PASSING CRITERIA FOR THE SEMESTER ONLY IF THEORY SCORE >=50% AND PRACTICAL SCORE >= 50%.**

MST: Mid Semester Test L: Lecture T: Tutorial P: Practical EST: End Semester Test ESP: End Semester Practical

LNCT UNIVERSITY, BHOPAL

School of Computer Science & Technology

Scheme of Examination

PROGRAMME: **M. Tech.**

BRANCH : **STRUCTURAL ENGINEERING** SEMESTER: **III**

S. No.	Paper Code	Paper Name	Maximum Marks Allotted						Credits Allotted Subject Wise			Total Credits	Remark
			Theory Slot		Practical Slot								
			EST	CAT: MST	ESP	Continuous Assessment: Lab Performance, Lab Record & Viva	Continuous Assessment: Attendance	Total Marks	L	T	P		
1	MVSE-301	Elective I	80	20	-	-	-	100	3	1		**04**	One credit refers to one hour teaching in theory and 2 hour teaching fortutorial and
2	MVSE-302	Elective II	80	20	-	-	-	100	3	1		**04**	
3	MVSE-303	Seminar	-		-	50	50	100		-	4	**04**	
4	MVSE-304	Pre Dissertation	-		120	40	40	200		-	8	**08**	
Total			**160**	**40**	**120**	**90**	**90**	**500**	**6**	**02**	**12**	**20**	

***PASSING CRITERIA FOR THE SEMESTER ONLY IF THEORY SCORE >=50% AND PRACTICAL SCORE >= 50%.**

MST: Mid Semester Test L: Lecture T: Tutorial P: Practical EST: End Semester Test ESP: End Semester Practical

Elective –I (MVSE -301)
(A) Advance Foundation Engineering
(B) Design of Steel Structures
(C) Design of Earth Quake Resistant Structures

Elective-II (MVSE- 302)
(A) Stability Theory in Structural Engg.
(B) Design of Tall Structures
(C) Design of Offshore Structures

LNCT UNIVERSITY, BHOPAL

School of Computer Science & Technology

Scheme of Examination

PROGRAMME: **M. Tech.**

BRANCH : **STRUCTURAL ENGINEERING** SEMESTER: **IV**

S. No.	Paper Code	Paper Name	Maximum Marks Allotted							Credits Allotted Subject Wise			Total Credits	Remark
			Theory Slot				Practical Slot							
			EST MST	Continuous Assessment: Quiz/Assignment	Continuous Assessment: Attendance		ESP	Continuous Assessment: PRE SUBMISSION REPORT	Total Marks	L	T	P		
1	MVSE-401	Dissertation Evaluation And Defense					300	200	500			20	20	One credit refers to one hour teaching in theory and 2 hour teaching for tutorial and practical:24hour workload per week corresponding to LTP
Total							**300**	**200**	**500**			**20**	**20**	

***PASSING CRITERIA FOR THE SEMESTER ONLY IF THEORY SCORE >=50% AND PRACTICAL SCORE >= 50%.**

L: Lecture T: Tutorial P: Practical

LNCT UNIVERSITY, BHOPAL (M.P.)

FIRST SEMESTER (M.TECH STRUCTURAL ENGINEERING)

School of Engineering & Technology

MVSE– 101

ADVANCE MATHEMATICS AND NUMERICAL ANALYSIS

Expected Course Outcomes:
At the end of the course students are able to

CO-1 Analyze and find solution of partial differential equation by finite difference method
CO-2 Analyze and apply transforms to boundary value problem in engineering
CO-3 Analyze and find solution of integral equation.
CO-4 Use Euler's equation for solving engineering problem
CO-5 Apply finite element method for one dimensional problems .

COURSE CONTENTS:

UNIT I

Numerical solution of Partial Differential Equation (PDE): Numerical solution of PDE of hyperbolic, parabolic and elliptic types by finite difference method.

UNIT II

Integral transforms: general definition, introduction to Mellin, Hankel and Fourier transforms and fast Fourier transforms, application of transforms to boundary value problems in engineering.

UNIT III

Integral equations: Conversion of Linear Differential equation (LDE) to an integral equation (IE), conversion of boundary value problems to integral equations using Green's function, solution of Integral equation, IE of convolution type, Abel's IE, Integral differential equations, IE with separable variable, solution of Fredholm Equation with separable kernels, solution of Fredholm and Volterra equations by method of successive approximations.

UNIT IV

Calculus of Variation: Functionals and their Variational, Euler's equation for function of one and two independent variables, application to engineering problems.

Unit-V

FEM: Variational functionals, Euler Lagrange's equation, Variational forms, Ritz methods, Galerkin's method, descretization, finite elements method for one dimensional problems.

Reference Books:

1. CF Froberg, Introduction to numerical analysis.

2. SS Sastry, Introductory methods of numerical analysis

3. Krasnove, Kiselevanded Makarenho, Integral equations

4. Buchanan, Finite element Analysis (schaum Outline S), TMH

5. Krishnamurthy, Finite element analysis, TMH

6. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.

7. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.

8. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH

9. Numerical Methods in engineering, Salvadori and Baron

10. Theory and problems of Numeric analysis (Schaum Outline S), Schied, TMH

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE – 102

STRENGTH OF MATERIAL AND THEORY OF ELASTICITY

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	***DESCRIPTION***
CO1	Comprehending the basics of elastic theory, learner will be able solve differential equation of equilibrium for different boundary conditions.
CO2	learner will be able perform elastic calculation of stress and strain, In two dimensional Cartesian coordinate system,
CO3	learner will be able to perform elastic calculation of stress and strain, In two dimensional Polar coordinate system,
CO4	Be able to analyze stress and strain in three dimensions.
CO5	Learner will be able to analyze torsional problem of different sections.

COURSE CONTENTS:

UNIT-1

Plane Stress & Plane Strain: Plane Stress, Plane Strain, Stress and Strain at a points, Differential equations of equilibrium, constitutive relation : ansisotropic materials Linear elasticity; Stress, strain, constitutive relations; Boundary conditions, Compatibility equation, stress function.

UNIT-II

Two Dimensional Problems in Rectangular Co-ordinates: Solutions by Polynomials , Saint-Venants Principle, Determination of displacements, bending of beams, solution of two dimensional problem in Fourier series.

UNIT-III

Dimensional Problems in Polar Coordinates : General equations in Polar coordinates, Pure bending of curved bars, displacements for symmetrical stress distributions, bending of curved bar, stress distribution in plates with circular holes, stresses in a circular disc general solution.

UNIT-IV

Analysis of stress and strain in Three Dimensions : Principal stress and strain, shearing stress and strains, elementary equation of equilibrium , compatibility conditions, problems of elasticity involving pure bending of prismatic bars.

LNCT UNIVERSITY, BHOPAL (M.P.)

UNIT-V

Torsion of Prismatic Bars : Torsion of prismatic bars, membrane analogy, torsion of a bar of narrow rectangular cross section, torsion of rectangular bars, solution of torsional problem, torsion of rolled section, torsion of hollow shafts and thin tubes, torsion buckling torsional flexural buckling.

References Books:

1. Timoshenko, S.P. , Theory of Elasticity

2. Timoshenko, S.P., Theory of Elastic Stability

3. Iyenger N.G.R., Structural Stability of Columns & Plates.

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE – 103

ADVANCE STRUCTURAL ANALYSIS

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To enable learner to evaluate and analyze single member of different types using matrix method
CO2	Learner will be able to formulate displacement matrix and analyses continuous beams, rigid & pin jointed plane frames by displacement method.
CO3	Learner will be able to formulate flexibility matrix and analyze rigid jointed plane frames by force method.
CO4	Learner will be able to analyze rigid & pin jointed space frames & space using displacement method.
CO5	Analyze stiffness of plane & space frames using different methods.

COURSE CONTENTS:

UNIT I

Matrix Method (Flexibility Method) : Force methods, Basic Concepts, evaluation of flexibility, transformation, analysis of a single member of different types, transformation of single member.

UNIT II

Applications to plane and space structures with pin joints and rigid joints, energy approach in flexibility method, effect of support displacement and transformation.

UNIT III

Matrix Method (stiffness Method): Displacement methods, Basic concepts, Evaluation of stiffness coefficients, Direct stiffness method, energy approach in stiffness method. Code No. approach for global stiffness matrix, effect of support displacement and temperature.

UNIT IV

Symmetrical & anti-symmetrical problems, Stiffness of plane & space frames solution of problems, comparison of force and displacement methods of solution.

Reference Books:

1. C.S. Reddy , Basic Structural Analysis ,TMH, Publishers

2. W Wearer Jr. & James M. Gere, Matrix Analysis of Framed Structures, CBSPub.

3. Rajsekeran, Sankarsubramanian, Computational structural Mechanics, PHI

4. Pandit, Structural Analysis: a matrix approach, TMH

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE – 104

DESIGN OF CONCRETE STRUCTURES

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analysis and design of rcc flat slab, load bearing structure and seismic analysis
CO2	Analysis and design of ground and elevated water tanks, bridge decks.
CO3	Analyze and design of pres-stressed concrete structures
CO4	Design and analysis of silos and bunkers.

COURSE CONTENTS:

UNIT I

Earthquake and wind effects on structures, loads on structures, reinforced concrete design of flat slabs, grid floors, deep beams, design of building's load bearing and framed structures, design of foundations, seismic analysis.

UNIT II

Design of ground and elevated water tanks, design of bridge decks.

UNIT III

Pre-stressed concrete: analysis and design of sections under flexure using limit state approach, anchorage zone and end block design, composite construction, introduction to statistically indeterminate pre-stressed concrete structures.

UNIT IV

Silos and bunkers, Janseen's and Airy's theory, rectangular bunkers with slopingbottoms and with high side walls, battery of bunkers.

Reference Books:

1. Jaikrishna, Chandrasekaran, Elements of earthquake engineering.

2. Shah and Karve, Text book of reinforced concrete

3. Punamia, RCC designs 4.

IS-456, -875, -1893, -1984

5. Krishna Raju, Prestressed concrete.

6. Varghese, Advanced RC Designs, PHI

7. Everard, Theory and problems of RC design (Shaums Outline S), TMH

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE – 105

COMPUTER AIDED DESIGN

COURSE OUTCOMES (CO):

After the successful course completion, a learner will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learn to make program in C++ after learning basics
CO2	Learn to make object oriented programs for engineering problems
CO3	Learn to make 2-D and 3-D drawings using CAD software
CO4	Learn to make 3 D modeling using software

COURSE CONTENTS:

UNIT I

Cpp programming language: Basics of programming, loops, decisions, structures, functions, objects/ classes, arrays.

UNIT II

Overloading, inheritance, virtual functions and pointers, object oriented programming, Turbo Cpp features and programming, structure engineering problems programming.

UNIT III

Computer Aided drafting, 2-D and 3-D drawings, Introduction to CAD software, drawing of buildings.

UNIT IV

Introduction to computer graphics, 3-D modeling software and analysis software.

RECOMMENDED BOOKS

1. Computer Aided Design: A Basic and Mathematical Approach Paperback by Sunil Kumar Srivastava (Author) I K International Publishing House Pvt. Ltd;
2. Fundamentals of Computer Aided Design Paperback by Khushdeep Goyal (Author) S.K. Kataria & Sons; 2013th edition (1 January 2013)
3. Computer Aided Design Paperback by Arora (Author) Vayu Edu;

LNCT UNIVERSITY, BHOPAL (M.P.)

SECOND SEMESTER (M.TECH STRUCTURAL ENGINEERING)

School of Engineering & Technology

MVSE - 201

STRUCTURAL DYNAMICS

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will be able to identify, formulate and solve free response of single degree freedom system.
CO2	Learner will be able to analyze frequency response function using various methods.
CO3	Learner will be able to undertake vibration analysis for two degree of freedom system.
CO4	Lerner will be able to determine response of lumped multi degree of freedom system using normal mode theory & numerical integration scheme
CO5	Learner will be able to analyze continuous system using different methods

COURSE CONTENTS:

UNIT I

Single Degree of Freedom System: Free and forced vibrations, Linear Viscous Damper, Coulomb Damper: Response to harmonic excitation, rotating unbalance and support excitations, Vibration isolation and transmissibility, single degree of freedom system as vibro-meter and accelerometer, response to periodic and arbitrary excitation.

UNIT-II

Duhamel's integral. Impulse response function, Laplace transform Fourier transform methods. Frequency response function. Phase-Plane Techniques. Critical Speed of rotors. Energy methods, Rayleighs method, Equivalent viscous damping.

UNIT-III

Two Degree of Freedom System. Matrix Formulation, Free Vibration, Beat phenomenon. Principle of damped and un-damped vibration absorbers.

UNIT-IV

Multi Degree of Freedom System: Matrix formulation, stiffness and flexibility influence coefficients, eigenvalue problem, normal modes and their properties. Matrix iteration technique for eigenvalue, and eigen vectors, Free and forced vibration by modal analysis.

UNIT-V

Continuous System: Axial vibration of bar, torsion of shafts, transverse vibration of strings and bending vibration beams. Forced vibration. Normal mode method. Lagrangle's equation. Approximate methods of Rayleigh-Ritz, Galerkin etc.

Reference Books:

1. RW Clough, J Penzien, Dynamics of structures

2. D G Fertia, Dynamics and vibration of Structures

3. J M Biggs, Introduction to structural dynamic

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MVSE - 202

FEM IN STRUCTURAL ENGINEERING

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learn application and use of finite element method with other methods. .
CO2	Solution of structural engineering using finite element methods.
CO3	Application of finite element method and its formulation.
CO4	Analyze iso-parametric formulation using interpolation function
CO5	Analysis of truss, frames, plates and shells using equilibrium equation.

COURSE CONTENTS:

UNIT I

Introduction to Finite Element Method: General Applicability and Description of FiniteElement Method Comparison with other methods.

UNIT II

Solution of Finite Element Method: Solution of Equilibrium Problems, Eigen value problems, propagation problems, computer implementation of Gaussian eliminations, Choleskis decomposition, Jocobis and Ranga Kutta Method.

UNIT III

General Procedure of Finite Element Method: Descretization of the domain, Selection ofShapes, Types and Number of elements, node numbering technique, Interpolation Polynomials, their selection and derivation in terms of global and local coordinates, Convergence requirements. Formulation of Element Characteristic matrices and vectors, Variational approach. Assembly of Element matrices and Vectors and Derivation systemequations, computation of element resultants.

UNIT-IV

Iso-parametric Formulation: Lagrange and Hermite interpolation functions, Isoparametric Elements, Numerical Integration.

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UNIT-V

Static Analysis: Formulation of equilibrium equation, Analysis of truss, Frames, Plane Stress and Plane Strain Problems Plates and Shells.

Reference Books:

1. Weaver, Johnson, Finite element and structural analysis

2. HC Martin, Matrix structural analysis

3. CF Abel, CS Desai, Finite element methods

4. Buchanan, Finite element Analysis (schaum Outline S), TMH

5. Krishnamurthy, Finite element analysis, TMH)

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE - 203

ADVANCE CONCRETE TECHNOLOGY

COURSE OUTCOMES (CO):

After the successful course completion, a learner will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Evaluate and analyze properties of fresh concrete .
CO2	Evaluate and analyze properties of hardened concrete.
CO3	Assessment of permeability and durability of concrete,
CO4	Examine properties of concrete at low and high temperature and evaluate high performance concrete
CO5	Mix design as per codes and examine non-destructive testing of concrete.

COURSE CONTENTS:

UNIT I

Cement & its properties, properties of fresh concrete compaction of concrete, curing of concrete.

UNIT II

Properties of hardened concrete, strength characteristic, shrinkage, creep, durability, fattier.

UNIT III

Permeability & durability of concrete is detail. Special concrete and their properties.

UNIT IV

Concrete at low & high temp. Air entrained concrete, high performance concrete.

UNIT V

Mix Design, Non destructive Testing of Concrete.

Reference Books:

1. A.M. Nobille, Concrete Technology , ELBS, London

2. M.L. Gambir, Concrete Technology, Tata Mc Graw Hill Book Co.

3. Peurifoy R.L., Construction Planning Equipment & Methods, TMH

4. Verma Mahesh, Construction Equipments and its Planning & Application,MetropolitonBook Company N.Delhi.

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE - 204

EXPERIMENTAL STRESS ANALYSIS

COURSE OUTCOMES (CO):

After the successful course completion, a learner will develop following attributes:

COURSE OUTCOME(CO)	DESCRIPTION
CO1	Distinguish different types of strain gauges
CO2	Analysis of stress analysis by photo elasticity optical theory
CO3	Analysis of fracture mechanics including crack growth by different methods
CO4	Analysis of systems of crack for different structures

COURSE CONTENTS:

UNIT I

Introduction to stress analysis by strain measurement, mechanical strain gages, Moire fringe method, Brittle coatings for stress indication, circuitry for resistance strain gages, calibrating strain gages, temperature compensation of circuitry, indication and recording equipments, unbalance of bridge systems, balanced bridge systems, reference bridge systems, constant current strain indicators, multichannel recording systems.

UNIT II

Introduction to stress analysis by photo elasticity, optical theory, stress optical relationship, equipment and models, static stress analysis (2-D, 3-D techniques), stress analysis by photo elastic strain gages

UNIT III

Conditions for crack growth, fracture mechanics and strength of solids, stress and displacement fields in the vicinity of crack tip, the Griffith Orowan-Irwin concept,

stable and unstable crack growth, the integral variation principle in crack theory, some more model representations, cracks in linearly elastic bodies, stress intensity factor, basic numerical methods for calculating the stress intensity factor, calculation of stress intensity factor for double cantilever beam specimen by FEM, the method of section for an approximate calculation of stress intensity factor, some material characteristics used for evaluation of crack propagation resistance.

UNIT IV

Solution of some plane and three dimensional problems, constructional crack arrest, system of cracks, stress intensity factors for some practical important cases, shell with a crack trajectory.

Reference Books:

1. Dove, Adams, Experimental stress analysis and motion
2. Heteny, Experimental stress analysis
3. Dally, Rilay, Experimental stress analysis
4. VZ Panon, M Morozove, Elastic-plastic fracture mechanics

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE - 205

THEORY OF PLATES AND SHELLS

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analysis of theory of plates for different boundary conditions.
CO2	Will be able to analyse plates of various shape
CO3	Distinguish and examine different methods of theory of plates
CO4	Analysis of shells using different methods and its classification.
CO5	Analysis of shells including various theories..

COURSE CONTENTS:

UNIT I

Theory of Plates: Bearing of long rectangular plates to the cylindrical surface with different edge conditions. Pure bending of plates-Differential equations of equilibrium. Theory of small deflections of laterally loads plates. Boundary conditions, momentcurvature relationship.

UNIT II

Analysis of rectangular plates, Navier's and levy solutions, exact theory of plates, symmetrical bending of circular plates, continuous rectangular plates

UNIT III

Special and approximate methods of theory of plates, singularities, use of influence surfaces, use of infinite integrals and transforms, strain energy methods, experimental methods.

UNIT IV

Theory of Shells: Classification of shells, Gaussian curvature, General theory of cylindrical shells, membrane theory and bending theory for cylindrical shells, long and short shells, shells, shells with and without edge beams, Fourier loading.

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UNIT V

Equation of equilibrium for shells of surface of revolution, Reduction to two differential equations of second order. Spherical shells, membrane theory for shells of double curvature-syn-elastic and anti-elastic. Cylindrical shells, Hyperbolic-parabolic shells, funicular shells.

Reference Books:

1. S Timoshenko, S Woinowasky K, Theory of Plates and Shells

LNCT UNIVERSITY, BHOPAL (M.P.)

THIRD SEMESTER (M.TECH STRUCTURAL ENGINEERING)

School of Engineering & Technology

MVSE – 301(A)

ADVANCED FOUNDATION ENGINEERING

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Evaluate different methods for soil investigation as per requirement
CO2	Analyze different types of shallow foundation and interpret plate loading test.
CO3	Analysis and selection of pile foundation for different application, individual as well as group
CO4	Lerner will be able to design of coffer dams as per code provision.
CO5	Lerner will be able to design machine foundation as per code provision.

COURSE CONTENTS:

UNIT I

Deep Open Cuts: Introduction, Types of Coffer Dams, Design data for cellular cofferdam, Stability analysis of cofferdam, interlock stresses. Soil Exploration: Introduction, Methods of exploration, Direct Methods and techniques of exploration, Methods of boring types of samples, Disturbance of soil sample, Soil samplers and sampling techniques, Ground water observations, Boring records, Spacing and depth of bore holes, Indirect methods of soil exploration, Penetration tests, Geophysical methods, Dynamics methods, Sequence of exploration programs

UNIT II

Shallow Foundations: Introduction, General Requirements, Depth of foundation, Bearing capacity, Eccentric Inclined loads, Bearing capacity of stratified soils, Settlement of footings, Settlement of footings from constitutive laws, Settlement and tilt of eccentrically loaded footings, Allowable settlement, Plate bearing test, Standard penetration test Effect of water table, shallow foundation classification, Modulus of sub-grade reaction, Beams on elastic foundation, Raft foundation.

UNIT III

Pile Foundation: Introduction, Uses of piles, Types of piles, pile drivers, Bearing capacity of piles, Static analysis, Pile load test, Dynamic methods, Other methods, 24 Negative skin friction, Pile group, Ultimate bearing capacity of pile groups, Settlement of pile group, Influence of pile cap. Laterally loaded piles, Ultimate resistance, Elastic methods, Pile groups under lateral load, batter pile under lateral load, Batter pile groups under inclined loads, pile under dynamic loads.

UNIT IV

Coffer Dams: Introduction, types of Coffer Dams, Design data for cellular cofferdam, Stability analysis of cofferdam, Interlock stresses.

UNIT V

Machine Foundations : Introduction, Criteria for satisfactory action of a machine foundation, Definitions, Degrees of freedom of a block foundation, Analysis of block foundation, Theory of linear weightless spring, Equivalent soil springs, Vertical vibration, Rocking vibration, Vibration in shear, Simultaneous rocking sliding and vertical vibrationsfor a foundation, Indian standard on design and construction of foundations for reciprocating machines, Foundations for impact type machines, Indian Standard on design and construction of foundations for impact type machines, Analysis of block foundation based on elastic half space theory.

References Books:

1. Bowles, Foundation: Analysis and Design, McGraw Hill Book CO. Inc.

2. Peck , R.B. , W.E. Hanson and T.H. Thornburn, Foundation Engineering, Wiley , New York.

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE – 301(B)

Design of steel Structures

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learner will apply limit state method for design of RCC strctures after assessment of partial safety factors, sections.
CO2	Design of column using different theories utilizing concept of eccentricity, buckling of column
CO3	Analysis and design of various beams under different loading conditions
CO4	Analysis and design of beam column
CO5	Analysis and design of beams subjected to torsion and bending with different methods.

UNIT I

Introduction to Limit States: Introduction, Standardization, allowable stress design, limit state design, partial safety factors, concept of section, classification; Plastic, compact semicompact & slender.

UNIT II

Columns: Basic concepts, strength curve for an ideal strut, strength of column members in practice effect of eccentricity of applied loading. Effect of residual stresses, concept of effective lengths, no sway columns, torsional and torsion flexural buckling of columns, Robertson's design curve, modification to Robertson approach, design of columns using Robertson approach.

UNIT III

Laterally Restrained Beams: Flexural & shear behavior, web buckling & web crippling, effect of local buckling in laterally restrained plastic' or 'compact' beams, combined bending & shear, unsymmetrical bending. Unrestrained Beams: Similarity of column buckling of beams, lateral torsional buckling of symmetric section, factors affecting lateral stability, buckling of real beams , design of cantilever beams, continuous beams.

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UNIT IV

Beams Columns: Short & long beam columns, effects of slenderness ratio and axial force on modes of failure, beam column under biaxial bending, strength of beam columns, local section failure & overall member failure.

UNIT V

Beams Subjected to Torsion and Bending: Introduction, pure torsion and warping, combined bending torsion, capacity check, buckling check, design methods for lateral torsional buckling.

Reference Books:

1. Morsis L.J. Plum, D.R., Structural Steel Work Design
2. Sinha D.A. , Design of Steel Structures
3. Yu, W.W. , Cold Formed Steel Structures Design

LNCT UNIVERSITY, BHOPAL (M.P.)

MVSE – 301(C)

Design of Earth quake Resistant Structures

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME(CO)	DESCRIPTION
CO1	Learner will be able to apply different methods for strengthening of existing building and learning lessons from past damages to structures from earthquake and seismic activities
CO2	Analysis of torsion & rigidity for moment resisting frame and shear walls
CO3	Analysis and design of earthquake resistant structures including IS code provisions for seismic design of multi-storey buildings.
CO4	Analysis and design of special structures such as elevated liquid storage tank, bridges, dam, including IS code provisions.
CO5	Analyze dynamic response of structure after application of seismic coefficients.

UNIT I

Seismic Strengthening of Existing Buildings: Cases histories-Learning from earthquakes, seismic strengthening procedures.

UNIT II

Torsion & Rigidity: Rigid Diaphragms, Torsional moment, Center of mass and center of rigidity torsion effects. Lateral Analysis of Building Systems: Lateral load distribution with rigid floor diaphragms, moment resisting frames, shear walls, lateral stiffness of shear walls, shear wall-frame combination, examples.

UNIT III

Concept of Earthquake Resistant Design: Objectives of seismic design , Ductility, Hysteric response & energy dissipation, response modifications factor, design spectrum, capacity design, classification of structural system, IS code provisions for seismic design of structures, multi-storied buildings, design criteria, P-A effects, storey drift, design examples ductile detailing of RCC structures.

UNIT IV

Seismic Design of Special Structures: Elevated liquid storage tanks, Hydrodynamic pressure in tanks, stack like structures, IS-1893 code provisions for bridges; Superstructures, substructures, submersible bridges, dams; Hydrodynamic effect due to reservoir, concrete gravity dams.

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UNIT V

Engineering Seismology: Basic terms, seismic waves, earthquake magnitude and intensity,ground motion, dynamic response of structures, normalized response spectra, seismic coefficients and seismic zone coefficients.

Reference Books:

1. Chopra A.K., Dynamics of Structures', Theory & Applications to Eqrthquake Engineering , Prentice Hall India, New Delhi-1995

2. Clough & Penzien, Dynamics of Structures , McGraw Hill Book CO. Inc.

3. Paz M, Structural Dynamics, , Van Nostrand Reinhold, New York

4. Paz, M, International Handbook of Earthquake Engineering, Chapman & Hall, New York.

5. IS-1893-1984, Indian Standard Criteria for Earthquake Resistant Design of Structures, B.I.S., New Delhi.

6. IS-4326-1993, Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings, B.I.S., New Delhi

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MVSE 302 (A)

Stability Theory in Structural Engineering

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analysis of stability and buckling for design of column
CO2	Analyze Torsional Buckling, Torsional Flexural Buckling
CO3	Analysis of Lateral Instability of Beams, Beam Columns.
CO4	Analysis of local buckling and post buckling behaviour of plates
CO5	Application of energy method and matrix method in stability problems.

UNIT I

Concepts of Stability, Euler Buckling Load, Critical Load of Laced, Battened and Tapped columns, Inelastic Buckling of column.

UNIT II

Torsional Buckling, Torsional Flexural Buckling.

UNIT III

Lateral Instability of Beams, Beam Columns.

UNIT IV

Local Buckling and post buckling behaviour of plates.

UNIT V

Application of Energy method and matrix method in stability problems.

Reference Books:

1. Theory of Elastic Stability by Timoshenko, TMH Pub.

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MVSE -302 (B)

DESIGN OF TALL STRUCTURES

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analyze behavior of tall structures under static and dynamic loads and model analysis
CO2	Analysis and design of structures for wind and earthquake forces by different methods.
CO3	Apply concept of shear wall for tall structures/frame structures
CO4	Design of chimneys, TV towers and other tall structures
CO5	Modeling of tall structures and critical evaluation using case studies.

COURSE CONTENTS:

UNIT I

Behavior of tall structures under static and dynamic loads, model analysis.

UNIT II

Characteristics of Wind and Earthquake Forces. Gust Factor and Karman Vortices. Approximate and Regorlons Methods of analysis for wind and Earthquake Forces.

UNIT III

Shear walls, Frame Structures, Coupled shear walls, Tabular Structures, Ductility and reinforcement details at joint.

UNIT IV

Criteria for design of Chimneys, T.V. Towers and other Tall Structure.

UNIT V

Modeling of tall structures, case studies.

Reference Books:

1. Coull, Smith, Design of tall buildings

2. Taranath, Design of tall buildings

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MVSE 302 (C)

Design of Off shore Structures

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Analysis and design of different types of offshore structures under free and forced vibration
CO2	Analysis of transient and steady state force using different methods
CO3	Analysis of structure for single degree freedom system.
CO4	Analysis of behavior of concrete gravity platform under different conditions.
CO5	Analysis of wind load and wave loads on structures with different methods.

UNIT-I

Loads and structural forms of different types of offshore structures; Elements of single degree of freedom. system subjected to free and forced vibration.

UNIT-II

Analysis for transient and steady state force; Equivalent damping for nonlinear systems; Dynamics of multi d.o.f. systems; Eigen values and vectors; Iterative and transformation methods.

UNIT-III

Mode superposition. Fourier series and spectral method for response of single d.o.f. systems; Vibrations of bars, beams and cones with reference to soil as half space.

UNIT-IV

Behavior of concrete gravity platform as a rigid body on soil as a continuum; short and long term statistics of wind;

UNIT-V

Static wind load; Effect of size, shape and frequency; Aerodynamic admittance function and gust factor, spectral response due to wind for various typres of structures; Wave loads by Morison's equation; Static and dynamic analysis of fixed structures; Use of approximate methods.

Reference Books:

1. Brebbia C.A. Walker, Dynamic Analysis of Offshore Str., Newnes Butterworth

2. Sarpakaya T and Isaacson M., Mechanics of wave forces on offshore structures, Van Nostrand Reinhold New York,

3. Hallam M.G. Heaf N.J. and Wootton, L.R., Dynamics of Marine Structures, CIRIA Publications Underwater Engg., Group , London

4. Graff W.J., Introduction to offshore Structures, Gulf Publishing Co., Houston, Taxas

5. Clough R.W. and Penzine J., Dynamic of Structures - II Ed., McGraw Hill Book CO.

6. Simiu E. and Scanlan R.H., Wind Effects on Structures, Wiley, New York 1978

7. Codes of Practice (latest versions) , Such as API RP-2A ,Bureau Veritas etc.

8. Proceedings of Offshore Technology Conference (OTC) Behavior of Offshore Structures (BOSS) and other Conferences on offshore Engineering.

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FOURTH SEMESTER (M.TECH STRUCTURAL ENGINEERING)

School of Computer Science & Technology

M. TECH DISSERTATION

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Capability to work independently on a research-based problem.
CO2	Skill to perform review of available literature effectively to present research gap.
CO3	Aptitude to plan methodology for the attainment of various research objectives.
CO4	Competency to apply various engineering and technological tools to carry research.
CO5	Ability to conclude work using critical thinking.
CO6	Proficiency in preparing presentation and report, verbal as well as written