



MTST-101 Advanced Structural Analysis

UNIT-1

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- 2

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

UNIT -3

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 -4

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

Reference Books:

- 1. Basic Structural Analysis ,TMH, Publishers C.S. Reddy.**
- 2. Matrix Analysis of Framed Structures, CBS Pub, W Wearer Jr. & James M. Gere.**
- 3. Computational structural Mechanics, PHI, Rajsekeran, Sankarsubramanian.**
- 4. Structural Analysis: a matrix approach, TMH, Pandit.**



MTST-102 Theory of Elasticity & Plasticity

UNIT-1

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

UNIT-2

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

UNIT-3

Two 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-4

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.

UNIT-5

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. Theory of Elasticity, Timoshenko, S.P.**
- 2. Theory of Elastic Stability, Timoshenko, S.P.**
- 3. Structural Stability of Columns & Plates, Iyenger N.G.R.**



MTST-103 Theory & Design of Concrete Structures

UNIT -1

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

UNIT- 2

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 -3

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 -4

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

Reference Books:

1. Elements of earthquake engineering, Jaikrishna, Chandrasekaran.
2. Text book of reinforced concrete, Shah and Karve.
3. RCC designs, Punamia.
4. IS-456, -875, -1893, -1984
5. Prestressed concrete, Krishna Raju.
6. Varghese, Advanced RC Designs, PHI
7. Theory and problems of RC design (Shaum's Outline S), TMH, Everard.



MTST-104 Computer Aided Design

UNIT -1

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

UNIT- 2

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

UNIT -3

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

UNIT -4

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

Reference Books:

- 1. Object oriented programming in C++, Robert Lafore.**
- 2. Programming in C, E. Balaguruswamy.**
- 3. Computer programming and engineering analysis, Syal and Gupta.**
- 4. AutoCAD, Solid Edge, Cadlab software and Manuals.**



MTST-105(A) Stability of Structure

UNIT -1

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

UNIT -2

Tensional Buckling, Tensional Flexural Buckling.

UNIT - 3

Lateral Instability of Beams, Beam Columns.

UNIT -4

Local Buckling and post buckling behavior of plates.

UNIT - 5

Application of Energy method and matrix method in stability problems.

Reference Books:

Theory of Elastic Stability by Timoshenko TMH Pub.



MTST-105(B) Design of Offshore Structure

UNIT –1

Loads and structural forms of different types of offshore structures, Elements of single degree of freedom (d.o.f.) system subjected to free and forced vibration.

UNIT – 2

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 –3

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 – 4

Behaviour of concrete gravity platform as a rigid body on soil as a continuum, short and long term statistics of wind.

UNIT – 5

Static wind load, Effect of Size, shape and frequency, Aerodynamic admittance function and gust factor, spectral response due to wind for various types 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 Structures 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 Engineering Group, London**
- 4. Graff W.J. Introduction to offshore structures Gulf Publishing Co. Houston Texas**
- 5. Clough R.W. and Penzien J Dynamic of Structures –II Ed. Mc Graw Hill Book Co. Inc**
- 6. Simiu E and Scanlan R.H. Wind Effects on Structures, Wiley, New York**
- 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.**



MTST-105(C) Rock Mechanics and Advance Foundation Engineering

UNIT –1

Exploration and classification of rocks, rock masses structural features of rock masses.

UNIT –2

Classification of rocks; lithology and engineering of rocks, their lab & field determination, fractured rocks, slope stability , ground water analysis, yield criteria and control.

UNIT – 3

Foundations on rocks; improvement of rock properties.

UNIT – 4

Strength and deformation behavior of rock masses state of stress of rock masses & their Distribution.

Reference Books:

- 1. Billings, Structural Geology, PHI**
- 2. E Hock, J Bray, Rock slope engineering**
- 3. T Schebotarioti, Soil Mechanics, TMH**
- 4. W Dunham, Foundations of structure clearance, TMH**



MTST-105(D) Behavior And Design of Steel Structures

UNIT – 1

Concepts of Stability, Introduction to Buckling Behavior of Columns Stability of Beam-Columns and Frames Lateral Instability of Beams. Local Buckling and Post Buckling Behavior of Plates

Unit – 2

Behavior and Design of Cold Formed Thin Walled Structures Subjected to Flexure and Compression.

UNIT – 3

Plastic Analysis and Design of Steel Structures, LRFD approach. Advanced Topics in Bolted and Welded Connections.

UNIT – 4

Behavior of Steel Concrete Composite Construction and Introduction to Brittle Fracture and Fatigue. Design of Steel Truss Bridges.

Reference Books:

1. S.P. Timoshenko and J.M. Gere, "Theory of Elastic Stability" McGraw-Hill.
- 2 A.S. Arya and J.L. Ajmani, "Design of Steel Structures" Nem Chand & Bros.
3. N. Subramanian, "Design of Steel Structures", Oxford University Press.
4. M.L. Gambhir, "Stability Analysis and Design of Structures", Springer.



MTST-105(E) Design of Earthquake Resistant Structure

UNIT -1

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

UNIT- 2

Torsion & Rigidity: Rigid Diaphragms, Torsion 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- 3

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- 4

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.

UNIT -5

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 Earthquake 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.**



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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.

MTST-106 Concrete Technology Lab

The objective of this course is to provide detailed knowledge about concrete and its composition. Ingredients of concrete: Admixtures: Fresh – concrete: Properties of Hardened Concrete: Concrete Mix Design: Special Concretes: Advance technology to check workability of concrete.

MTST-107 Structural Software Engg. LAB

AUTOCAD Civil 2D and 3D, SAP 2000, MATLAB, Primavera