

MTSD 301(A) Advanced Foundation Engineering

UNIT 1

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 2

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 3

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 4

Coffer Dams: Introduction, types of Coffer Dams, Design data for cellular cofferdam, Stability analysis of cofferdam, Interlock stresses. Foundations in black cotton soils basic foundation problems associated with black cotton soils. Lime column techniques principles and execution. Under reamed piles-principle of functioning of under reamed pile-Analysis and structural design of under reamed pile. Use of Cohesive Non Swelling (CNS) layer below shallow foundations.

UNIT 5

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 vibrations for 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
3. Foundation Design and Construction-Tomlinson • Foundation Design-Teng.
4. Geotechnical Engg – C.Venkatramaiah
5. Foundation Engineering by Brije.M.Das, Printice Hall Publishers.

MTSD-301 (B) Design of Earth quake Resistant Structures

UNIT 1

Seismic Strengthening of Existing Buildings: Cases histories-Learning from earthquakes, seismic strengthening procedures. Selection of materials and types of construction form of superstructure – framing systems and seismic units – devices for reducing. Earthquake loads,

UNIT 2

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 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.Characteristics of Wind and Earthquake forces and its method of analysis.

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.
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.

MTSD -301 (C) Design & Analysis of steel Structures

UNIT 1

Matrix Method Analysis: Flexibility and stiffness matrices-Force displacement relationships for axial force, couple, torsional moments – stiffness method of analysis and flexibility method of analysis. Equation Solvers: Solution of system of linear algebraic equations-direct inversion method-gauss elimination method-Cholesky method-banded equation solvers frontal solution technique

UNIT 2

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 3

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.

UNIT 4

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 5

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
4. John L.Meek., Matrix Structural Analysis, McGraw Hill Book company.
5. Structural Analysis by Pundit & Gupta
6. Structural Analysis by C.S.Reddy.
7. Structural Analysis – R.C.Hibbeler

MTSD-301 (D) Building Structure & Construction Management

UNIT-1

Types constructions-public and private contract managements – scrutinizing tenders and acceptance of tenders, contracted, changes and terminating of contract – subcontracts construction organizations – organizational chart-Decentralization payrolls and records – organization chart of a construction company.

UNIT-2

Construction Practices and Resource Management– Time Management – bar chart, CPM, PERT – Progress report, Basic concepts equipment management, material management inventory control.

UNIT-3

Accounts Management – Basic concepts, Accounting system and book keeping, depreciation, Balance sheet, profit and loss account, internal auditing. Quality control by statistical methods, sampling plan and control charts, safety requirements.

UNIT-4

Cost and Financial Management – Cost volume relationship, cost control system, budget concept of valuation, cost of equity capital management cash. Labor and industrial; laws – payment of wages act. Contract labor, workmen" s compensation, insurance, industrial disputes act.

UNIT-5

Behavior of tall structures under static and dynamic loads, model analysis. Shear walls, Frame Structures, Coupled shear walls, Tabular Structures, Ductility and reinforcement details at joint. Design Criteria and Modeling of tall structures, case studies.

Reference Books:

1. Coull, Smith, Design of tall buildings
2. Taranath, Design of tall buildings
3. Construction Management and planning by B.Sengupata and H.Gula(Tata McGraw Hill)
4. Construction Management by Atkinson(Elsevier)
5. in principle land practice by EEC beech(Longman)
6. Robert Schultheis, Mary Summer “management information systems-The Management View.”TATA Mc Graw Hill Edition, New Delhi.
7. Kwakye, A.A , Construction Project Administration Addison Wesley Longman, London.
8. Keith Davis, Human Behavior at Work, Mc Graw Hill, USA.
9. Sehroeder, R.G., Operations Management, Mc Graw Hill, USA.
10. James C.Van Horne, Financial Management and Policy, Prentice Hall of India Pvt.Ltd., 4th Ed., NewDelhi.

MTSD-302 (A) Design of Offshore Structures

UNIT-1

Loads and structural forms of different types of offshore structures; Elements of single 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

Behavior 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 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, Texas
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

MTSD – 302(B) Fracture Mechanism

UNIT 1

Summary of Basic Problems and Concepts: Introduction - A crack in a structure - The stress at a crack tip - The Griffith criterion The crack opening displacement criterion - Crack Propagation – Closure.

The Elastic Crack-Tip Stress Field : The Airy stress function - Complex stress functions - Solution to crack problems - The effect of finite size - Special cases - Elliptical cracks - Some useful expressions

UNIT 2

The Crack Tip Plastic Zone: The Irwin plastic zone correction - The Dugdale approach - The shape of the plastic zone - Plane stress versus plane strain - Plastic constraint factor - The thickness effect.

The Energy Principle: The energy release rate - The criterion for crack growth - The crack resistance (R curve) - Compliance , The J integral (Definitions only)

UNIT 3

Plane Strain Fracture Toughness: The standard test - Size requirements - Non-Linearity - Applicability

Plane Stress and Transitional Behaviour: Introduction - An engineering concept of plane stress - The R curve concept

UNIT 4

The Crack Opening Displacement Criterion: Fracture beyond general yield - The crack tip opening displacement - The possible use of the CTOD criterion

UNIT 5

Determination of Stress Intensity Factors: Introduction - Analytical and numerical methods - Finite element methods, Experimental methods

Reference Books:

1. Elementary engineering fracture mechanics - David Broek, Battelle, columbus laboratories, columbus, Ohio, USA
2. Fracture and Fatigue Control in Structures - john M.Barsom, Senior consultant United states Steel corporation & Stanley T.Rolfe, Ross H.Forney Professor of Engineering University of Kansas.& Stanley T.Rolfe, Ross H.forney Professor of Engineering, University of Kansas .

MTSD-302 (C) Low cost Housing Techniques

UNIT 1

Housing Scenario :Introduction - Status of urban housing - Status of Rural Housing. Introduction to - Existing finance system in India - Government role as facilitator - Status of Rural Housing Finance - Impediments in housing finance and related issues .

Land Use and Physical Planning for Housing: Introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye laws - Residential Densities

UNIT 2

Housing the Urban Poor: Introduction - Living conditions in slums - Approaches and strategies for housing urban poor .

Development and Adoption of Low cost Housing: Introduction - Adoption of innovative cost-effective construction techniques - Adoption of precast elements in partial prefabrication - Adopting of total prefabrication of mass housing in India- General remarks on pre cast roofing/flooring systems - Economical wall system - Single Brick thick load bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall - Flyash gypsum brick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

UNIT 3

Alternative Building Materials for Low cost Housing: Introduction - Substitute for scarce materials – Ferrocement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - Alternative building maintenance

UNIT 4

Low Cost Infrastructure Services: Introduction to - Present status - Technological options - Low cost sanitation - Domestic water supply - Water supply, energy

Rural Housing: Introduction to traditional practice of rural housing-continuous Mud Housing technology Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

UNIT 5

Housing in Disaster Prone Areas: Introduction – Earthquake - Damage to houses - Disaster prone areas - Type of Damages and Repairs of non-engineered buildings - Repair and restoration of earthquake Damaged non-engineered buildings recommendations for future constructions Requirement“ s of structural safety of thin precast roofing units against Earthquake forces Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety.

Reference Books:

1. Building materials for low – income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Properties of concrete – Neville A.M. Pitman Publishing Limited, London.
4. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences.
5. Low cost Housing – G.C. Mathur.
6. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G.Annamalai.

MTSD-302(D) Design Of Bridges

UNIT 1

Introduction : Classification, investigations and planning, choice of type – economic span length – IRC specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.

UNIT 2

Design of Box Culverts : General aspects – Design loads – Design moments, shears and thrusts – Design of critical section.

Design of Slab Bridges–:Effective width of analysis – workings stress design and detailing of slab bridges for IRC loading.

UNIT 3

T-BEAM Bridges: Introduction – wheel load analysis – B.M. in slab – Pigaud" s theory – analysis of longitudinal girders by Courbon" s theory working stress design and detailing of reinforced concrete T-beam bridges for IRC loading.

Prestressed Concrete Bridges: General features – Advantages of Prestressed concrete bridges – pretensioned Prestressed concrete bridges – post tensioned Prestressed concrete Bridge decks. Design of post tensioned Prestressed concrete slab bridge deck.

UNIT 4

Bridge Bearings : General features – Types of bearings – forces on bearings basis for selection of bearings – Design principles of steel rocker and roller bearings and its design – Design of elastometric pad bearing detailing of elastometric pot bearings.

Piers and Abutments: General features – Bed block – Materials for piers and abutments – types of piers – forces acting on piers – Design of pier – stability analysis of piers – general features of abutments – forces acting on abutments – stability analysis of abutments.

UNIT 5

Bridge Foundations: General Aspects – Types of foundations – Pile foundations – well foundations – caisson foundations.

Reference Books:

1. Essentials of bridges engineering – D.Hohnson Victor oxford & IBH publishers co-Private Ltd.
2. Design of concrete bridges MC aswanin VN Vazrani, MM Ratwani, Khanna publishers.
3. Bridge Engineering – S.Ponnuswamy.
4. BRowe, R.E., Concrete Bridge Design, C.R.Books Ltd., London.
5. Taylor F.W., Thomson, S.E., and Smulski E., Reinforced concrete Bridges, John wiley and sons, New york.
6. Derrick Beckett, an Introduction to Structural Design of concrete bridges, surrey University; press, Henlely – thomes, oxford shire.
7. Bakht.B.and Jaegar, L.G. bridge Analysis simplified, Mc Graw Hill.
8. Design of Bridges – N.Krishna Raju – Oxford & IBH
9. Design of Bridge structures – FR Jagadeesh, M.A. jaya Ram – Eastern Economy edition.