I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY

Scheme and Syllabus
of
Master of Technology

(Structural Design)
(Full Time)

SEMESTER I

Course code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
MTSD 101	Material Technology	3	1	0	50	100	150	4
MTSD 102	Advanced Structural Analysis	3	1	0	50	100	150	4
MTSD 103	Pre-Stressed Concrete Design	3	1	0	50	100	150	4
MTSD 104	Design of High Rise structures	3	1	0	50	100	150	4
MTSD 105	Design of Bridges	3	1	0	50	100	150	4
	Total	**15**	**5**	**0**	**250**	**500**	**750**	**20**

SEMESTER II

Course code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
MTSD 201	Structural Dynamic & Earthquake Engineering	3	1	0	50	100	150	4
MTSD 202	Stability of Structures	3	1	0	50	100	150	4
MTSD 203	Advance Steel Design	3	1	0	50	100	150	4
MTSD	Elective I	3	1	0	50	100	150	4
MTSD	Elective II	3	1	0	50	100	150	4
	Total	**15**	**5**	**0**	**250**	**500**	**750**	**20**

SEMESTER III

Course code	Course Title	L	T	P	Marks Distribution		Total Marks	Credits
					Internal	External		
MSTD 301	Elective III	3	1	0	50	100	150	4
MSTD 302	Elective IV	3	1	0	50	100	150	4
MSTD 304	Seminar	0	0	2	100	-	100	4
MSTD 305	Project	0	0	8	50	50	100	8
	Total	**6**	**2**	**10**	**250**	**250**	**500**	**20**

SEMESTER 4

Course code	Course Title	Satisfactory/ Not Satisfactory	Credits
MSTD 401	Dissertation		20
	Total		**20**

Elective	**Structural Design**	
Elective I	MSTD 106	Composite Structures
	MSTD 107	Design of plates and shells
	MSTD 108	Material Science
Elective II	MSTD 204	Professional Practices
	MSTD 205	Earth Retaining Structures
	MSTD 206	Construction Failures
Elective III	MSTD 301	Repairs and Rehabilitation of Structures
	MSTD 302	Design of Hydraulic system
	MSTD 303	Advanced Reinforced Concrete Design
Elective IV	MSTD 306	Industrial Structure
	MSTD 307	Advance Foundation Design and Geotechnics
	MTSD -308	Dynamics of Structures

MTSD -101 Material Technology

L	T/P
3	1

Cement and Concrete: Portland cement: chemical composition, hydration of cement, structure of hydrated cement, mechanical strength of cement gel, water held in hydrated cement paste and heat of hydration. Cements of different types. Factors affecting the strength of concrete.

Elasticity, shrinkage and creep of concrete. Durability of concrete: Permeability of concrete.

Chemical attack of concrete, air-entrained concrete and thermal properties of concrete. The mechanical test of hardened concrete. Light weight and high density concrete. Mix design.

Statistical quality control; Bi axial strength of concrete, Fiber reinforced concrete .Metals: Behavior of common constructional metals in tension and compression. True stress-strain curve for mild steel in simple tension. Theories of failure and yield surfaces.

Fatigue properties: Nature of fatigue failure, fatigue strength for completely reversed stresses, fatigue strength with super imposed static stress and factors influencing fatigue strength.

Temperature and Creep properties: Low temperature properties, high temperature properties, creep-stress-time-temperature relations for simple tension, mechanics of creep in tension.

Structure of materials and their imperfections. Deformation of crystals and theory of dislocations.

References Books:

1. A.M. Neville, J.J. Brooks, *Concrete Technology*, Low Priced Edition, Pearson Education, 2004.
2. A J Martin, *Mechanical behavior of engineering materials.*
3. S P Timoshenko, *Strength of materials- Part II*
4. M. S. Shetty, *Concrete technology- Theory & Practice*, S. Chand & Company New Delhi, 2005

MTSD -102 Advanced Structural Analysis

L	T/P
3	1

Matrix Methods: Types of skeletal structures, internal forces and deformations.

Introduction and applications of flexibility method and stiffness method to analyze beams, trusses and plane frames. Domes: Uses of domes, types of domes, nature of stresses in conical and spherical domes, analysis of conical and spherical domes subjected to uniformly distributed load, concentrated load at crown, analysis of domes with opening.

Plastic Method: concept, assumptions, shape factor for different cross section, collapse load, load factor, plastic modulus of section, plastic moment of resistance, computation of collapse load for fixed beam, continuous beam and plane frame subjected to various load cases.

References Books:

1. William Weaver, Jr & James M. Gere, Matrix Analysis of Framed Structures, CBS Publishers & Distributors, Delhi.
2. Wang C.K., Matrix methods of Structural Analysis Mc Graw Hill book Company, New Delhi. 3. Elements of Matrix and Stability Analysis of Structures by Manicka Selvam
4. Junnarkar S. B. & Shah H.J, Mechanics of Structures Vol-II, Charotar publishing house, Anand.
5. Meghre & Deshmukh; Matrix Analysis of Structures, Charotar Publication
6. Reddy C.S., Basic Structural Analysis, Tata Mc Graw Hill Publishing Company Ltd, New Delhi. 7. Neal B G, Plastic Analyisis, Mc Graw hill Publication.

MTSD -103 Pre-Stressed Concrete Design

L	T/P
3	1

Introduction of pre-stressed concrete definition, comparison with reinforced concrete, advantages and disadvantages review (analysis) basic principles, determination of concrete flexural stresses, basic concept method, C- line method, load balancing method, classification of members, materials for pre-stressed concrete, high strength concrete short-term & long-term properties.

Pre-stressing Steel, steel relaxation and other effects, auxiliary materials, prestress losses, stresses in steel due to loads, Kem points, cracking moment, deflection under service conditions of loading and pre-stressing, determination of strength in bending, shear and bond.

Design preliminary considering no tension in concrete, elastic design allowing and considering tension, shapes of concrete sections, dimensioning and proportioning of section profile, shear design, bond, bearing and end block design, introduction of limit state method.

References Books:

1. T. Y. Lin and H. Burns Ned, Design of Pre-stressed concrete structures, John Willey & Sons, New York-1982.
2. Y. Guyen, Prestressed concrete Vol-I & Vol.-II, John Willey & Sons, New York-1960.
3. E. W. Bennet, Prestressed concrete theory & design, Chapman & Hall, London-1962.
4. Design of Prestressed Concrete by Gilbert & Mickleborough
5. N. Krishnaraju, Prestressed concrete, Tata McGraw-Hill, New Delhi-2004
6. S. K. Mallik and A. P. Gupta, Prestressed concrete, Oxford & IBH, New Delhi-1982.

MTSD -104 Design of High Rise Structures

L	T/P
3	1

1. Analysis of tall building frames, Lateral load analysis, multi bay frames, gravity loads settlement of foundation.

2. Analysis of shear walls - plane shear walls, in filled frames, coupled frames, frames with shear walls. Principle of three dimensional analysis of tall buildings.

3. Perforated cores, pure torsion in thin tubes, bending of perforated cores.

4. Analysis of floor system in tall buildings, Vierendal girders, diagrid floors.

5. Elastic and inelastic stability of frames and shear walls. Analysis of thermal stresses.

References Books:

1. B S Smith & A Coull, *Tall Building Structures:* - John Wiley & Sons.
2. W. Schueller, *High Rise Building Structures*: John Wiley & Sons.

MTSD -105 Design of Bridges

L	T/P
3	1

Introduction: Classification, investigations and planning, choice of type, I.R.C. specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.

Short Span Bridges: Load distribution theories, analysis and design of slab culverts, tee beam and slab bridges.

Long Span Girder Bridges: Design principles of continuous bridges, box girder bridges, and balanced cantilever bridges.

Design Of Pre-stressed Bridges: Flexural and torsional parameters– Courbon's theory– Distribution co-efficient by exact analysis – Design of girder section – maximum and minimum prestressing forces–Eccentricity – Live load and dead load shear forces– Cable Zone in girder – check for stresses at various sections – check for diagonal tension– Diaphragms – End block –short term and long term deflections.

Design of Plate Girder Bridges, Bearings and Substructures: Design of riveted and welded plate girder bridges for highway and railway loading – wind effects – main section, splicing, curtailment, stiffeners – Different types of bearings –Design of bearings – Design of masonry and concrete piers and abutments – Types of bridge foundations – Design of foundations.

References Books:

1. Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 2008.
2. Johnson Victor, D. "Essentials of Bridge Engineering", Oxford and IBH Publishing Co. New Delhi, 1990
3. Jagadeesh. T.R. and Jayaram. M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd. 2004.
4. Raina V.K." Concrete Bridge Practice" Tata McGraw Hill Publishing Company, New Delhi, 1991.
5. Bakht, B. and Jaegar, L.G., "Bridge Analysis Simplified", McGraw Hill, 1985.
6. Derrick Beckett, "An introduction to Structural Design of Concrete Bridges", Surrey University Press, Henley Thomes, Oxford Shire, 1973.

MTSD -106 Composite Structures

L	T/P
3	1

1. Introduction: definition, Classification and characteristics of Composite materials, advantages and limitations, Current Status and Future Prospects.

2. Basic concepts and characteristics: homogeneity and heterogeneity, isotropy, orthotropy and anisotropy; characteristics and configurations of lamina, laminate, micromechanics and macro mechanics, constituent materials and properties.

3. Elastic behavior of unidirectional lamina: Anisotropic, separately orthotropic and transversely isotropic materials, stress-strain relations for thin lamina, transformation of stress and strain, transformation of elastic parameters.

4. Strength of unidirectional lamina: Macro mechanical failure theories- Maximum stress theory, maximum strain theory, Deviatoric strain energy theory (Tsai-Hill), Interactive tensor polynomial theory (Tsai-Wu).

5. Elastic Behavior of multidirectional laminates: Basic assumptions, Stress-strain relations, load deformation relations, symmetric and balanced laminates, laminate engineering properties.

6. Bending and vibration of laminated plates: Governing equations, Deflection of simply supported rectangular symmetric angle-ply, especially orthotropic, anti-symmetric cross-ply laminates.

7. Recent advances: Functionally graded materials, Smart materials

References Books:

1. R.M. Jones, Mechanics of Composite materials, Taylor and Francis, 1999.
2. I. M. Daniel and O. Ishai, Engineering mechanics of Composite materials, Oxford University press, 1999
3. P.K. Mallick, Fiber-reinforced Composites, Marcel Dekker Inc., 1988.
4. D. Hull and T. W. Clyne, An introduction to composite materials, Cambridge University press, Second Edition, 1996.
5. J.N. Reddy, Mechanics of laminated composite plates and shells-Theory and Analysis, CRC Press, Boca Raton, Second Edition, 2003.

MTSD -107 Design of Plates & Shells

L	T/P
3	1

Pure Bending of Plates: Slope & curvature of slightly bent plates, Relations between bending moments and curvature in pure bending of plates, Strain energy in pure ending of plates.

Symmetrical bending of circular plates: differential equation for symmetrical bending of laterally loaded circular plates, uniformly loaded circular plates, circular plates with circular hole at center, circular plate concentrically loaded ; small deflections of laterally loaded plates.

Differential equation of the deflection surface, Boundary conditions, simply supported rectangular plates under sinusoidal load, Navier solution for simply supported rectangular plates, Further applications of the Navier solution, Alternate solution for simply supported and uniformly loaded rectangular plates, Concentrated load on simply supported rectangular plates.

Classification of shell structures, importance of membrane theory of shells, shells in the form of a surface of revolution and loaded un-symmetrically with respect to their axes, spherical dome, conical shells, cylindrical shells, elliptic parabolic, hyperbolic parabola and cuboids ; general theory of cylindrical shells : circular cylindrical shell loaded symmetrically with respect to its axis, particular cases of symmetrical deformations of circular cylindrical shells, cylindrical tanks of uniform wall thickness. design of spherical domes with/without lanterns at top.

References Books:

1. S. P. Timoshenko and Woinowsky-Kriegar, Theory of plates and shells, Mc Graw Hill International, New Delhi.
2. G. S. Ramaswamy, Design and construction of concrete shells Roofs, CBS Publishers, Delhi.
3. D. P. Billington, Thin shell concrete structures, Mc Graw Hill international, New York
4. W. T. Marshall, Design of cylindrical shell roofs, E& FN SPON, London

MTSD -108 Material Science

L	T/P
3	1

Material classifications and important properties: Requirements and selection factors.
Structure of solid material: Crystalline, no crystalline, atomic bonding and generalized properties, crystal structure, crystal planes & directions, crystal imperfections, diffusion mechanism of solid and its application.

Structure, properties and control of multiphase solids: Solid solutions, home rathery's rules for alloys, system, phases and structural constituents, phase diagrams and transformation; heat treatment of steel and other alloys, effect of alloying elements on steel, case hardening and surface treatment
Ceramic materials: General structure and properties of ceramics, silicate glass, refractory, abrasives etc.

Organic materials: Polymer and polymerization, structure and properties of plastics, rubber etc.

Composite material: Component and types (dispersion reinforced, laminar reinforced fiber reinforced) and applications like Ferro cement, reinforced glass and polymer concrete.

Cement and concrete: Hydration mechanism, microstructure and related properties, constituents and admixture, high strength concretes. Structure property relationship in concrete.

Performance of material in service: Corrosion and oxidation, fracture and fatigue, performance under high temperature, radiation damages.

References Books:

1. Elementary Material Science-By Lawrence
2. Material Science and Metallurgy-By Khanna
3. Material Science-By R Gupta
4. Material Science-By J Patel
5. Concrete-By P.K. Mehta

MTSD -201 Earthquake Engineering & Design of Structures

L	T/P
3	1

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.

Torsion & Rigidity: Rigid diaphragms, torsional moments, center of mass and center of rigidity, torsional effects.

Lateral Analysis of building system: lateral load distribution with rigid floor diaphragm, moment resisting frames, shear walls, and lateral shifting of shear walls, shear walls combinations

Concepts of earthquake resisting design: objectives of seismic design ,ductility and energy dissipation response modification factor, design spectrum, capacity design ,classification of structural system, IS codal provision for seismic design of structure, multi storied buildings ,design criteria ,PΔ factors, storey drift ,design examples, ductility detailing of RCC structure

Seismic design of special structure: elevated liquid storage tank, hydrodynamic pressure in tank, stack like structure, IS -1893 codal provisions for bridges, super structures, sub structures, submersible structures and dams. Hydrodynamic effects due to reservoir, concrete gravity dams

Seismic strengthening of Existing Buildings: Cased history-learning from earthquakes, seismic strengthening procedures.

Liquefaction: Causes of soil liquefaction, liquefaction potential, and measures to reduce liquefaction potential.

Seismic design of brick masonry construction: shear walls and cross walls opening in bearing walls, brick in fills in framed buildings, strengthening arrangements as per IS-4326, design of bands.

References Books:

1. Chopra A.K.,' Dynamics of Structures'- Theory & Applications to Earthquake Engineering: Prentice Hall, India.
2. Clough & Penzien , 'Dynamics of Structures' McGraw Hill Co.
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., and 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 - 202 Stability of Structures

L	T/P
3	1

Torsion of thin walled open sections, warping displacements under pure torsion,- Warping constants for rolled steel section. Strain energy in bending and torsion of members of thin walled open section including the effects of warping.

Torsional buckling including the effects of Wagner's effect, flexural torsional buckling (with centroid and shear centers coincident); Lateral buckling of beams under pure bending central point load through Centre of gravity of the section.

Cantilever beams with point load at the free end, application of Rayleigh-Ritz method; Beam-columns on rigid supports-concentrated and continuous lateral loads with simply supported and built in-ends. Continuous beam with as axial loads.

Application of trigonometric series in plane buckling of bars; approximate calculation of critical loads for bar structures by energy method- a bar on elastic foundation, a bar with intermediate compressive forces, bar under distributed axial loads, a bar with changes in cross section.

Effects of shearing force on the critical load, buckling of built-up columns. In-elastic in-plane buckling of columns. Tangent and reduced modulus concept, elastic critical loads for rigid frames and triangulated structures, stability functions.

Bending of thin plate, buckling of thin rectangular plates in compression, shear and bending.

References Books:

1. S.P. Timoshenko and J. M. Gere, Theory of Elastic Stability, MC Graw Hill,
2. A. Kumar, Stability of Structures, Allied Publishers Ltd., New Delhi, 1998
3. M.R. Horns and W. Merchang, The stability of frames, Porgamon press, 1965.
4. M. Gregory, Elastic Instability Civil Engineering series, 1967.
5. F. Bleich, Buckling strength of Metal structures, Mc Graw Hill Book co., 1952
6. T.V Galambos, Structural members and frames, Prentice-Hall INC, 1968

MTSD -203 Advanced Steel Design

L	T/P
3	1

1. Design for tension and compression members, connections, design of plate girders, crane girders and trusses.

2. Multi-storied buildings, Silos, bins.

3. Design of steel tanks and staging.

4. Design of bridges, trusses, lateral bracings, sway brackens and stress reversals.

5. Design of continuous beams and frames by plastic theory

References Books:

1. K. Mukhanov, *Design of Metal structures.*
2. B Bresler, T Y Lin and J B Scalzi, *Design of Steel structures*.
3. P Dayaratnam, *Design of Steel Structures*

MTSD -204 Professional Practices

L	T/P
3	1

1. Participants in design professionals, clients, structural design engineer, other consultants, architects, understanding their roles, responsibilities and interrelationship. Meaning of terms like site, project, contracts etc.

2. Codes of conducts for professionals: Handing approvals, procedures, office organization & structure.

3. Professional fees and accounting procedures, Tax planning, professional associations, social obligations.

4. History of professional associations, trends in professional practice.

References Books:

1. Estimation and Costing – S.C. Rangawala
2. Estimation and Costing (Civil Engineering) – B.N. Dutta
3. Civil Engineering Contracts and Estimates – B.S. Patil
4. Estimation, Costing and Valuation – N. Chakraborty.

MTSD -205 Earth Retaining Structures

L	T/P
3	1

Earth Pressure: Fundamental relationships between the lateral pressures and the strain with a back fill. Rankine and Coulomb theories, active, passive and pressure at rest; Backfill with broken surface, wall with broken back, concentrated surcharge above the back fill, earth pressure due to uniform surcharge, earth pressure of stratified backfills, saturated and partially saturated backfill. Passive earth pressure in engineering practice.

Assumption and conditions, point of application of passive earth pressures.

Bulkheads: Definition and assumptions, conditions of end supports and distribution of active earth pressure and bulkheads, bulkheads with free and fixed earth supports, equivalent beam method, Improvements suggested by Row, Tschebotarioff's method.

Anchorage of bulkheads and resistance of anchor walls, spacing between bulkheads and anchor walls, resistance of anchor plates, Consideration of effects of ground water, seepage, surcharge loading together with possibility of shallow and deep sliding failures on retaining structure.

Sheet Pile wall: Free earth system, fixed earth system.

Tunnel and Conduit: Stress distribution around tunnels, Types of conduits, Load on projecting conduits.

Arching and Open Cuts: Arching in soils, Braced excavations, Earth pressure against bracings in cuts, Heave of the bottom of cut in soft clays.

Reinforced earth retaining structures- Design of earth embankments and slopes; Recent advances in Earth retaining structures.

References Books:

1. B. M. Das, Principles of Foundation Engineering, Thomson, Indian Edition, 2003.
2. J. Bowel, Foundation Engineering, Analysis and Design. Mc Grw Hill
3. P. Raj, Geotechnical Engineering, Tata McGraw Hill
4. R F Craig, Soil Mechanics, Chapman and Hall (ELBS)

MTSD -206 Construction Failures

L	T/P
3	1

Meaning of construction failure, historical references, main broad causes of failures such as design deficiency, use of improper materials and poor workmanship, removal of formwork at early stage, inadequate supervision and inspection, subsidence of foundations, fire, flood, earthquake, etc.

Factors affecting durability of concrete structures with emphasis on corrosion of reinforcement and codal provisions for design of durable concrete structures.

Cracks in concrete and masonry structures their reasons and measures to reduce or/and to avoid such cracks.

Professional & legal responsibility. Measures to reduce frequency and severity of constructions failures.

References Books:

1. Construction Failures by Jacob Feld.
2. Learning from Failures: Deficiency Design, Construction & Service by R.N. Raiker.
3. Concrete Reinforced Concrete Deterioration & Protection Edited by V. Moskvin.
4. Building Failures. Diagnosis and Avoidance by W.H. Ransom.
5. Building Disasters & Failures by Geoff Scott.
6. Common Defects in Buildings Published by HMSO, London.
7. Design & Construction Failures, Lesson from Forensic Investigation by Dov Kaminetzky - 1991.
8. The Testing of Concrete in Structure, Second Edition by J.H. Bungey.

MTSD -301 Repairs and Rehabilitation of Structures

L	T/P
3	1

Investigation and Evaluation of Distressed Structures. Preliminary investigation, detailed investigation, documentation, field observation and condition survey, sampling and material testing, evaluation, final report.

Materials & Technologies for repair surface repair, material requirements, material selection, and surface preparation, reinforcing steel, cleaning, repair and protection, bonding repair materials to existing concrete, placement methods.

Strengthening and stabilization techniques /design considerations, beam shear capacity strengthening, shear transfer strengthening between members, stress reduction techniques, column strengthening, flexural strengthening, connections stabilization and strengthening, crack stabilization.

References Books:

1. Concrete Repairs & Maintenance by Peter H. Emmons & Gajanan M. Subnis.
2. Repair and Rehabilitation of Concrete Structures, ACI Compilation 10.
3. Bridge Repairs & Rehabilitation, ACI Compilation 29.
4. Guide to Investigation of Structural Failures by Jack R. Jonney & ASCE Research Council on Performance of Structures.
5. Strength Evaluation of Existing Concrete Buildings by ACI 437R-91

MTSD -302 Design of Hydraulic Systems

L	T/P
3	1

Objectives of hydraulic structures in Water resources systems, preliminary investigation and preparation of the reports, design of water storage structures ; (1)High dams-gravity dams(zonal method design), over flow and non over flow section.(2) Low dams- weirs, earthen dams, vented dams (Barrage), instrumentation and maintenance of dam structures.

Collection and conveyance of water design of intakes, conveyance system of Irrigation, drinking and hydro power. Design of canal network.

Hydraulic design of pressure pipes, hydrostatic tests on pipes, design of distribution systems pressure in distribution systems, Nomo graphs, Hardy cross and numerical methods, computer aided design (CAD).

References Books:

1. Creager, Justin & Hinds, *Engineering for Dams*, Vols - I, II, III.
2. Varshney, *Hydraulic and Irrigation Structures*.
3. Varshney, *Hydraulic and Irrigation Structures*.

MTSD -303 Advanced Reinforced Concrete Design

L	T/P
3	1

1. Estimation of crack width and deflection of reinforced concrete beams.

2. Analysis and design of building frames subjected to wind load.

3. Earthquake forces and structural response.

4. Ductile detailing of RCC frames, design of beam-column joints.

5. Design of deep beam.

6. Design of shear walls.

References Books:

1. R. Park and T. Pauley, Reinforced concrete structures, John Wiley and sons
2. A. K. Jain, Reinforced Concrete: Limit State design, Nem Chand and Bros. 1999.
3. J. Krishna and OP Jain, Plain and Reinforced Concrete, Vol. II, Roorkee, Nem Chand and Bros.
4. H. Nilson, D. Darwin and C. W. Dolar, Design of Concrete structures, Tata McGraw Hill
5. T. Paulay and M.J.N. Priestley , Seismic Design of Reinforced Concrete and Masonry Buildings, John Wiley & Sons Inc.

MTSD -304 Seminar

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.

MTSD -305 Minor Project

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. The committee constituted will screen both the presentations to award the sessional grades out of A^+, A, B, C, D E and F. Student scoring 'F' grade shall have to improve this grade before continuing his/her Dissertation in the 4th semester failing which he/she shall have to repeat the project next time in the regular 3rd semester.

MTSD -306 Industrial Structures

L	T/P
3	1

Role of Design dengineer, properties of structural steel, merits and demerits of structural steel over reinforced concrete structures.

Steel Structure Design: Design of tension members, compression members, and flexure members and beam-columns junctions, adopting codal provisions of IS: 800 components & its terminology, load estimation, choice of sections, analysis and design for gantry girders.

Industrial structures with steel trusses and portal frames. Typical configuration with various elements, load assessment (deal load, live load, wind load and earthquake load).

Different roofing and cladding alternatives and their design, types of purlins and their design, analysis and design of a trusses and portal frames, design of base plate, pedestal and footing considering both hinged and fixed support conditions, design of bracing and preparation of construction drawings.

Welded Connections: Advantages of welding, fundamentals and methods of welding, types of joints, welding symbols, inspection of welding, codal provisions, and design of typical welded connections. Bolted connections, Types of bolts, codal provisions, design of typical bolted connections.

References Books:

1. Design of Steel Structures - by Bresler & Lin.
2. Theory of Modern Steel Structures - by Linton Grinter.
3. Design of Steel Structures - by P. Dayaratnam.
4. Reinforced Concrete Structural Elements (behavior, analysis & design) by P. Purushothoman.
5. Practical Design of Reinforced Concrete by Russell S. Fling.
6. Design of Reinforced Concrete Structures by Ashok Kumar Gupta.

MTSD -307 Advanced Foundation Design and Geotechnics

L	T/P
3	1

Geotechnics: Review of index properties and soil classification, site investigations, foundation settlement, bearing capacity of foundations, excavations & earth retaining structures, earth structures, design of shallow and deep foundations, ground modification - improvement & land, reclamation geo environmental engineering.

Shallow Foundation: Terzaghi's bearing capacity equation, general bearing capacity equation , Balla's & Meyerhoff's theory, effect of water table, special footing problems, I.S. Code, Footing pressure for settlement on sand, soil pressure at a depth, Boussinesq's & Westergaard methods, computation of settlements (immediate & consolidation) permissible settlements, proportioning of footing, inclined & eccentric loads.

Pile Foundation: Timber, concrete, steel piles, estimating pile capacity by dynamic formula, by wave equation & by static methods, point bearing piles, pile loads tests, negative skin friction, modulus of subgrade reaction for laterally loaded piles, lateral resistance.

Single pile v/s pile groups, pile group consideration, efficiency, stresses on underlying strata, settlement of pile group, pile caps, batter piles, approximate and exact analysis of pile groups, I.S code.

Well foundation: Types (open end & closed or box, pneumatic, drilled) shapes, bearing capacity and settlements, determination of grip length by dimensional analysis, design of well foundation construction, tilts & shifts.

Machine Foundations: Types, analysis and design by Barkens methods, determination of coefficient of uniform elastic compression, Pauw's analogy and design of a block type M/C foundation, I.S.I method of design, Co- vibrating soil mass.

Sheet Pile Structure: Types, Cantilever, Anchored sheet pilling , Design by Fixed earth Method and modifications by Anderson & Techabotarioff, Anchor Braced sheeting cofferdam , Single well cofferdams, cellular cofferdam, stability of cellular cofferdam, instability due to heave of bottom.

References Books:

1. Foundation Engineering by Pack, Hansen and Thornburn
2. Foundation Design Manual by Winterkorn and Feng
3. Foundation Analysis and Design
4. Geotechnical Engineering by Venkatramaiyah
5. Soil Mechanics and Foundation Engineering by Alamsingh

MTSD -308 DYNAMICS OF STRUCTURES

L	T/P
3	1

Introduction, Systems with single degree of freedom (SDOF) Equation of motion – Analysis of free vibration-response to harmonic, impulsive, periodic and general dynamic loadings, forced and free vibration response of MDOF damped and un-damped discrete systems-equation of motion- evaluation of natural frequencies and modes – approximate methods, 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., 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.

References:

1. Dynamics of Structures by Clough and Penzien

2. Mechanical Vibrations by G.K. Grover

3. Dynamics of Structures by Walter C. Hurty & Moshe F. Rubinstein

MTSD - 401 Dissertation

The Dissertation Phase-1 will be continued as dissertation in 4th Semester. The award of sessional grades out of A+, A, B, C, D and E will be done by an internal committee constituted by the Head of the Dept. This assessment shall be based on presentation (s), report, etc. before this committee. In case a student scores 'F' –grade in the sessional, failing which he/ she will not be allowed to submit the dissertation. At the end of the semester, every student will be required to submit three bound copies of his/her Master's dissertation at the office of the concerned department. Out of these, one copy will be kept for department record & one copy shall be for the supervisor. A copy of the dissertation will be sent to the external examiner by mail by the concerned Department, after his/her appointment and intimation from the university. Dissertation will be evaluated by a committee of examiners consisting of the Head of the Department, dissertation Supervisor and one external examiner. There shall be no requirement of a separate evaluation Report on the Master Dissertation from the external examiner. The external examiner shall be appointed by the University from a panel of examiners submitted by the respective Head of Dept., to the Chairman, Board of Studies. In case the external examiner so appointed by the University does not turn up, the Director/ Principal of the concerned college, on the recommendation of the concerned Head of the Dept. shall be authorized, on behalf of the University to appoint an external examiner from some other institution. The student will defend his/her dissertation through presentation before this committee and the committee will award one of the grades out of A+, A, B, C, D E and F. Student scoring 'F' grade in the exam shall have to resubmit his /her Dissertation after making all correction / improvements and this Dissertation shall be evaluated as above.

Note: The Scheme of awarding the Grades to the student in the course will be supplied by the University to the examiner(s).