

SEMESTER V

SUBJECT CODE	COURSE TITLE	L	P	M
THEORY				
	Structural Analysis I	3	0	100
	Structural Design I	3	0	100
	Basics of Remote Sensing and GIS	3	0	100
	Transportation Engineering I	3	0	100
	Soil Mechanics	3	0	100
	Engineering Geology	3	0	100
PRACTICALS				
	Computer Aided Building Drawing	0	3	100
	Soil Engineering Lab	0	3	100

SEMESTER V
STRUCTURAL ANALYSIS I

UNIT -1 MOVING LOADS AND INFLUENCE LINES

9

(DETERMINATE & INDETERMINATE STRUCTURES)

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads. Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames – Indirect model analysis for influence lines of indeterminate structures.

UNIT -2 ARCHES

9

Arches structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects

UNIT -3 SUSPENSION BRIDGES AND SPACE TRUSSES

9

Analysis of suspension bridges – Unstiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

UNIT -4 SPACE STRUCTURES

9

Introduction to analysis of space trusses using method of tension coefficients – Beams curved in plan.

UNIT -5 PLASTIC ANALYSIS OF STRUCTURES

9

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

Total Hours: 45

Text Books

1. Thadani B. N. and Desai J.P., Structural Mechanics, Weinall Book Corporation, Bombay, 1998
2. Jain A.K. and Arya A.S., Structural Analysis, Vol.II, Nemchand Publishers, Roorkee, 1996

References:

1. Manicka Selvam V.K., Elementary Matrix Analysis of Structures, Khanna Publishers, Delhi, 1994
2. Coates R.C., Coutie M.G. and Kong F.K., Structural Analysis, ELBS and Nelson, 1990

SEMESTER V STRUCTURAL DESIGN I

UNIT -1 INTRODUCTION

9

Type of steel structures- properties of rolled steel sections- allowable stresses in steel. Requirements of structural design –steps involved in design-load analysis-types of load-Applicable codes for load estimation- load combination-general design requirements of a steel structure-increase in allowable stresses- light gauge steel as a structural material-uses-and application-applicable IS codes for light gauge steel

UNIT -2 JOINTS

9

Riveted and bolted connections-failure of joints-simple and multiple riveted lap and butt joints under axial loading –strength of fillet weld and butt welded joints- design of brackets, design of riveted and welded joints for systems subjected to moment in the plane of joints and moment acting at right angles to the plane of joints- -design of joints between beam connected to flange of column-secondary beam connected to web of main beam-beam column connection using seat connections-moment resisting connections

UNIT -3 TENSION AND COMPRESSION

9

Design of simple and built up members subjected to tension-tension splices-effective area of angles connected to gusset- maximum slenderness ratio of compression members-IS code provisions of compression members-design of simple and built up compression members with lacing and battens- design of column bases-design of tension splice –web splice, shear splice, moment splice

UNIT -4 BEAMS

9

Design of simple beams based on strength and stiffness as per IS code- design of built up beams and curtailment of flange plates-connection of flange plate and beams-design of plate girder-design of beam column as per IS code

UNIT -5 TIMBER

9

Study of property of natural timber-allowable stresses in compression tension and flexure-types of joints with nails and bolts-design of simple compression members-design of beams for strength and stiffness as per IS code

Total Hours = 45

Text Books

1. Ramachandra, Design of steel structures Vol. 1, Standard Book House, New Delhi 1992
2. V.N Vazirani and M.M Ratwani, Steel Structures and Timber Structures, Khanna publishers, New Delhi 1995.

References:

1. L S Negi, Design of Steel structures, Tata McGraw Hill, 1995
2. Arya & Ajmani, Design of Steel Structures, Nem Chand & Brors, 1997
3. P Dayaratnam, Design of Steel Structures, A H Wheeler & Co., 1999

SEMESTER V

BASICS OF REMOTE SENSING AND GIS

UNIT -1 REMOTE SENSING

9

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR , Thermal IR and Microwave – Black Body Radiation - Planck's law – Stefan-Boltzman law.

UNIT -2 EMR INTERACTION WITH ATMOSPHERE AND EARTH

MATERIALS

9

Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface

UNIT -3 OPTICAL AND MICROWAVE REMOTE SENSING

9

Satellites - Classification – Based on Orbits – Sun Synchronous and Geo Synchronous – Based on Purpose – Earth Resources Satellites, Communication Satellites, Weather Satellites, Spy Satellites – Satellite Sensors - Resolution – Spectral, Spatial, Radiometric and Temporal Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Land sat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics

UNIT -4 GEOGRAPHIC INFORMATION SYSTEM

9

GIS – Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters

UNIT -5 MISCELLANEOUS TOPICS

9

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems

Total Hours = 45

Text Books:

1. Anji Reddy, Remote Sensing and Geographical Information Systems , BS Publications 2001
2. M.G. Srinivas(Edited by), Remote Sensing Applications, Narosa Publishing House, 2001.

References:

1. Lillesand T.M. and Kiefer R.W. Remote Sensing and Image Interpretation, John Wiley and Sons, Inc, New York, 1987.
2. Janza.F.J., Blue, H.M., and Johnston, J.E., "Manual of Remote Sensing Vol.I., American Society of Photogrammetry, Virginia, U.S.A, 1975.
3. Burrough P A, Principle of GIS for land resource assessment, Oxford, 1990

SEMESTER V

TRANSPORTATION ENGINEERING – I

UNIT -1 HIGHWAY PLANNING AND ALIGNMENT

9

Highway Development in India, Macadam's Method of Road Construction, Jayakar Committee Recommendations and Realisations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level, Institutions for Highway Development at National level - Indian Roads Congress, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques) Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards]

UNIT -2 GEOMETRIC DESIGN OF HIGHWAYS

9

Design of Horizontal Alignments – Superelevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves Sight Distances - Factors Affecting Sight Distances, PIEV Theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] Geometric Design of Hill Roads [IRC Standards Only]

UNIT -3 DESIGN OF RIGID AND FLEXIBLE PAVEMENTS

9

Rigid and Flexible Pavements- Components and their Functions Design Principles of Flexible and Rigid Pavements, Factors Affecting the Design of Pavements - ESWL, Climate, Sub-grade Soil and Traffic Design Practice for Flexible Pavements [CBR method, IRC Recommendations- Problems] Design Practice for Rigid Pavements – [IRC Recommendations-Problems]

UNIT -4 HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE

9

Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) Soil – California Bearing Ratio Test, Field Density Test Aggregate - Crushing, Abrasion and Impact Tests Bitumen - Penetration, Ductility, Viscosity, Binder Content and Softening Point Tests. Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]

UNIT -5 HIGHWAY MAINTENANCE

9

Types of Defects in Flexible Pavements – Surface Defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. Types of Pavement Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks, Spalling of Joints and Mud Pumping – and Special Repairs Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation Overlay Design by Benkleman Beam Method [Procedure only]

Total Hours = 45

Text Books:

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000

References:

1. IRC Standards
2. Bureau of Indian Standards (BIS) Publications on Highway Materials
3. MORTH Guidelines for Highway Engineering

SEMESTER V
SOIL MECHANICS

UNIT - 1 INTRODUCTION

9

Nature of soil - Soil description and classification for engineering purposes - IS Classification system - Phase relationships - Soil compaction - Theory, comparison of laboratory and field compaction methods - Ground improvement by compaction.

UNIT - 2 SOIL WATER AND WATER FLOW

9

Soil water - static pressure in water - Permeability measurement in the laboratory and field - Seepage - Introduction to flow nets - Simple problems.

UNIT - 3 STRESS DISTRIBUTION AND SETTLEMENT

9

Effective stress concepts in solids - Stress distribution in soil media - Use of influence charts - Components of settlement - Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory.

UNIT - 4 SHEAR STRENGTH

9

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - saturated soil mass - Measurement of shear strength, direct shear - Triaxial compression, UCC and Vane shear tests - Pore pressure parameters.

UNIT - 5 SLOPE STABILITY

9

Slope failure mechanisms - Types - Infinite slopes - Finite slopes - Total stress analysis for saturated clay - Method of slices - friction circle method - Use of stability number - Slope protection measures.

Text Books:

1. Punmia P.C., " Soil Mechanics and Foundations ", Laximi Publications Pvt. Ltd., New Delhi, 1995.
2. Gopal Ranjan and Rao A.S.R., " Basic and applied soil mechanics ", Wiley Eastern Ltd., New Delhi (India), 1997.
3. Khan I.H., " A text book of Geotechnical Engineering ", Prentice Hall of India, New Delhi, 1999.
4. Arora K.R., " Soil Mechanics and Foundation Engineering ", Standard Publishers and Distributors, New Delhi, 1997.

References:

1. Holtz R.D. and Kovacs W.D., " Introduction to Geotechnical Engineering ", Prentice-Hall, 1995.
2. McCarthy D.F., " Essentials of Soil Mechanics and Foundations ", Prentice-Hall, 1997.
3. Suttan B.H.C., " Solving Problems in Soil Mechanics", Longman Group Scientific and Technical, U.K. England, 1994.

**SEMESTER V
ENGINEERING GEOLOGY**

UNIT -1 GENERAL GEOLOGY

9

Geology in Civil Engineering - Branches of geology - Earth Structure and composition - Elementary knowledge on continental drift and plate tectonics. Earth processes - Weathering - Work of rivers, wind and sea and their engineering importance - Earthquake belts in India. Groundwater - Mode of occurrence - prospecting - importance in civil engineering.

UNIT -2 MINERALOGY

9

Elementary knowledge on symmetry elements of important crystallographic systems - physical properties of minerals - study of the following rock forming minerals - Quartz family. Feldspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet - properties, behaviour and engineering significance of clay minerals - Fundamentals of process of formation of ore minerals - Coal and Petroleum - Their origin and occurrence in India.

UNIT -3 PETROLOGY

9

Classification of rocks - Distinction between Igneous, Sedimentary and Metamorphic rocks. Description occurrence, engineering properties and distribution of following rocks. Igneous rocks - Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt. Sedimentary rocks sandstone, Limestone, Shale Conglo, Conglomerate and breccia. Metamorphic rocks, Quartzite, Marble, Slate, Thyllite, Gniess and Schist.

UNIT -4 STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD

9

Attitude of beds - Outcrops - Geological maps - study of structures - Folds, Faults and points - Their bearing on engineering Construction. Seismic and Electrical methods for Civil Engineering investigations. Remote sensing techniques - study of air photos and satellite images - Interpretation for Civil Engineering

UNIT -5 GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING

9

Projects - Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road cuttings, Lad slides - causes and preventions. Sea erosion and coastal Protection.

Total Hours : 45

TEXT BOOKS:

1. Parbin Singh, " Engineering and General Geology ", Katson Publication House, 1987.
2. Krynine and Judd, " Engineering Geology and Geotechniques ", Graw Hill Book Company, 1990.

References:

1. Legeet, " Geology and Engineering ", McGraw Hill Book Company, 1998.
2. Blyth, " Geology for Engineers ", ELBS, 1995.

SEMESTER V

COMPUTER AIDED BUILDING DRAWING

Building drawing in accordance with development and control rules satisfying orientation and functional requirements for the following :

1. Residential buildings with load bearing walls (RCC roof)

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2. RCC framed structures

9

3. Office buildings (RCC roof)
9

4. Industrial buildings – North light roof structures – Trusses – Gantry arrangements
9

5. Perspective view for small buildings
9

Total Hours = 45

Text Books:

1. Civil Engg. Drawing & House planning – B.P.Verma, Khanna publishers, Delhi
2. Building drawing & detailing – Dr. Balagopal & T.S.Prabhu, Spades publishers, Calicut.

References:

1. Building drawing – Shah, Tata McGraw-Hill
2. Building planning & drawing – Dr. N.Kumaraswamy, A.Kameswara Rao, Charotar publishing house.
3. Shah, Kale and Patki, Building drawing, Tata McGraw-Hill

SEMESTER V
SOIL ENGINEERING LABORATORY

1. Grain size distribution - Sieve analysis
2. Grain size distribution - Hydrometer analysis
3. Atterberg limits test
4. Determination of moisture - Density relationship using standard proctor.
5. Permeability determination (constant head and falling head methods)
6. Determination of shear strength parameters.
 - a) Direct shear test on cohesion less soil
 - b) Unconfined compression test in cohesive soil
 - c) Triaxial compression test on cohesion less soil
7. One dimensional consolidation test (Determination of co-efficient of consolidation only)

Total Hours = 45

REFERENCES:

- 1 " Soil Engineering Laboratory Instruction Manual ", Published by the Engineering College Co operative Society, Chennai, 1996.
- 2 Lambe T.W., " Soil Testing for Engineers ", John Wiley and Sons, New York, 1990.
- 3 " I.S.Code of Practice (2720) Relevant Parts ", as amended from time to time.