SYLLABUS FOR THE POST OF
LECTURER (TECHNICAL)

SUBJECT : CIVIL ENGINEERING

1. STRUCTURAL ENGINEERING

1.1 Engineering Mechanics and Strength of Materials

System of forces, free-body diagrams; Internal forces in structures; Simple stress and strain relationships; Mohr's circle of stress and strain; Bending moment and shear force; Theories of failures; Simple bending theory; Flexural and shear stresses; Columns and struts; Uniform torsion.

1.2 Structural Analysis

Determinate and indeterminate structures; Analysis of beams, trusses, arches, cables and frames; Deflection in beams; Moment distribution method; Slope deflection method; Conjugate beam method; Rolling loads and influence lines.

1.3 Construction Materials, Practices and Management

Building materials used in construction- stone, sand, timber, bricks and tiles, cement, structural steel, paints; Concrete technology – cement its properties, classification and specification, provisions in I.S. code, properties of coarse and fine aggregates, production of fresh concrete, concrete mix design; Detailing of walls, floors, roofs, ceilings, doors and windows, stair cases; Construction management; Types of construction projects; Rate analysis and standard specifications; Cost estimation; Project planning and network analysis – PERT and CPM.

1.4 Design of Concrete Structure

Working stress, limit state and ultimate load design concepts; Design of simple and continuous beams, slabs, columns, footings; Design requirements for retaining wall and water tank; Principles of prestressed concrete design, materials, methods of prestressing, losses in prestressing, anchorages.

2. WATER RESOURCES ENGINEERING

2.1 Fluid Mechanics and Hydraulic Engineering

Fluid properties and definitions; Fluid statics- hydrostatic pressure, measurement of pressure, pressure on submerged surfaces, buoyancy; fluid kinematics; Continuity, momentum and energy equations applicable to fluid flow; Viscous flow; Flow in pipes; Pipe networks; Concept of boundary layer and its growth; Dimensional analysis and hydraulic similitude; Open channel

flow – uniform flow, energy-depth relationships, specific energy, critical flow, gradually varied flow, hydraulic jump; Basics of hydraulic machines- pumps and turbines.

2.2 Hydrology and Flood Management

Hydrologic cycle; Precipitation; Evaporation; Evapotranspiration; Infiltration; Watershed; Runoff components; Hydrograph and its components; Unit hydrograph; Stream-flow measurement; Occurrence of ground water; Soil-water relationship; Aquifers; Application of Darcy's law; Yield from wells for confined and unconfined aquifers; Reservoir- storage capacity, reservoir sedimentation; Flood estimation- rational, empirical and unit hydrograph methods, Design flood; Flood routing- definition, reservoir routing and channel routing; Flood damage mitigation and river training works; Dams and embankments- elements of gravity, arch and earth dams.

2.3 Irrigation Engineering

Crop water requirements; Duty; Delta; Estimation of evapo-transpiration; Types of irrigation systems and irrigation methods; Design of lined and unlined canals; Head works; Design of weirs on permeable foundation; Water logging and drainage; Canal regulatory works- cross-drainage structures, outlets and escapes.

3. GEOTECHNICAL ENGINEERING

3.1 Soil Mechanics

Origin of soils; Soil structure and fabric; Three-phase system and phase relationships; Index properties; Identification and classification of soils; Permeability – one dimensional flow, Darcy's law; Seepage through soils – two-dimensional flow, flownet –its construction and uses; Seepage through homogeneous earth dam with and without filters; Compaction in laboratory and field conditions; One-dimensional consolidation, time rate of consolidation; Shear strength of soils; Stress at a point; Mohr's stress circle; Soil stabilization.

3.2 Foundation Engineering

Types of foundation, selection criteria; Earth pressure theories – Rankine and Coulomb; Stress distribution in soils – Boussinesq's and Westergaard's theories; Shallow foundations – Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table, combined footing and raft foundation, contact pressure, settlement of foundation in sand and clay; Deep foundations – types of piles, dynamic and static formulae, load capacity of piles in sands and clays, pile load test, negative skin friction.

4. ENVIRONMENTAL ENGINEERING

4.1 Water Supply Engineering

Water uses; Quantity requirements; Sources of water- surface and subsurface sources and their characteristics; Water quality; Drinking water standards; Treatment of water- sequence of treatments, aeration, sedimentation, coagulation and flocculation, filtration, disinfection, hardness and chemical softening, base exchange process; Principles and methods of design of distribution systems.

4.2 Waste Water Engineering

Domestic and industrial wastes; Sewerage systems and their design principles; Sewer construction materials; Sewer appurtenances; Characteristics of domestic sewage; Waste water treatment- methods and their sequence, preliminary treatment, primary treatment, secondary treatment; waste water disposal.

4.3 Introduction to air pollution, noise pollution and solid waste

5. TRANSPORTATION ENGINEERING

Highway alignment and engineering surveys; Classification; Geometric design of highways – cross-sectional elements, gradients, super-elevation, camber, sight distances, horizontal and vertical curves, transition curves, grade separations; Highway materials – desirable properties and quality control tests; Pavement design- types of pavement, design factors for flexible and rigid pavements, Indian Road Congress method of design, typical construction methods; Traffic engineering- traffic volume studies and characteristics, speed and delay studies, origin-destination studies, parking studies, traffic accident studies, traffic capacity, traffic signs and markings, traffic signals and its classification, traffic channelization-islands and its design, road intersections, traffic rotary and its design.

6. ENGINEERING SURVEYING

Classification of surveys; Principles of surveying; Scales; Errors and their adjustment; Distance and angle measurement; Levelling and trigonometric levelling; Traversing and triangulation survey; Total station.