

SYLLABUS OF CIVIL ENGINEERING

Building Materials and Constructions

Engineering Materials: Physical properties of construction materials: stones, bricks, timber, sand, tiles, lime, surkhi, mortar, concrete, varnishes, plastics, rubber, damp-proofing materials, termite treatment materials, materials for low cost buildings, seasoning and preservation of timber.

Building Construction: Building components and their functions : walls, floors, roofs, ceilings, staircase, doors and windows, ventilation, air-conditioning, lighting & acoustics etc. Finishing of buildings: plastering, pointing, painting, use of building codes.

Design of Structures

Design of RC Structures : Concept of mix design; Limit State and Working Stress method of design; Recommendations of I.S Codes of one way and two-way slabs, staircase, simple and continuous beams of rectangular T and L sections, compression members under direct load with or without eccentricity, isolated and combined footings, elevated and underground water tanks; Methods and systems of prestressing, anchorages, losses in prestress; design of prestress girder; Design of Cantilever and Counterfort type retaining walls.

Engineering Mechanics

Static : Coplaner and multiplaner system; Varignon's theorem, free body diagrams, conditions of equilibrium; second moment of plane figure; force and funicular polygon; principle of virtual work; suspension systems of catenary.

Dynamic: Units and dimensions; Gravitational and absolute systems; MKS & S.I. Units; Vectors, concept of force, concept of particle and rigid body.

Kinematics: Rectilinear and Curvilinear motion; relative motion; instantaneous centre.

Kinetics: Mass moment of inertia; simple harmonic motion, momentum and impulse; equation of motion of rigid body rotating about a fixed axis.

Strength of Materials

Simple Stress and strain; Elastic constants; tension and compression in one direction; riveted and welded joints.

Shear force and bending moment; Theory of simple bending; shear stress distribution in cross section of beams; beams of uniform strength; Strain energy in direct stress, bending and shear.

Fluid Mechanics

Dynamics of fluid flow: Equation of continuity; energy and momentum Bernoulli's theorem; cavitation, velocity potential and stream function; rotational and irrotational flow, free and forced vortices; flow net. Dimensional analysis and its application to practical problems

Viscous flow: Flow between static and moving parallel plates, flow through circular tubes; film lubrication; velocity distribution in laminar and turbulent flow; boundary layer.

Water Resources Engineering:

Hydrology: Hydrological cycle, precipitation evaporation; transpiration; depression storage; infiltration; overland flow; hydrograph; flood frequency analysis; flood estimation; flood routing through a reservoir; channel flow routing- Muskingam method.

Ground water flow: Specific yield; storage coefficient; coefficient of permeability; confined and unconfined aquifers; radial flow into well under confined and unconfined conditions; tube wells; pumping land recuperation tests; ground water potential.

Sanitation and Water Supply (Environmental Engineering):

Sanitation: Site and orientation of buildings; ventilation and damp proof course; house drainage;
conservancy and water-borne systems of waste disposal; sanitary appliances; latrines and urinals.

Disposal of sanitary sewage: Industrial waste; domestic waste; storm sewage-separate and combined systems; flow through sewers; design of sewers; sewer appurtenances-manholes, inlet junctions, siphon, ejections etc.

Sewer treatment: Working principles; units, chambers; sedimentation tanks; trickling filters;
oxidation ponds; activated sludge; recycling of waste water; septic tanks; soak pit; disposal of sludge.

Irrigation Engineering

Water requirement for crops: Quality of irrigation water; consumptive use of water ; water depth and frequency in irrigation; duty of water; irrigation methods and their efficiencies.

Distribution system for canal irrigation: Determination of require canal capacity; canal losses;
alignment of main and distributory canals

Design of canals : Unlined canals in alluvium; the critical tractive stress; principles of sediment transport; regime theories, lined canals; hydraulic design and cost analysis; drainage behind lining.

Canal structures: Design of regulation works; cross drainage and communication works-cross regulators, head regulators, canal aqueducts, metering flumes etc; canal outlets.

Water logging; Its causes and control; design of drainage system; soil salinity

Diversion headworks: Principle and design of weirs of permeable and impermeable foundations; Khola's theory; energy dissipation; stilling basin; sediment excluders

Storage works: Types of dams including earth dam and their characteristics; principles of design; criteria for stability; foundation treatment; joint and galleries; control of seepage.

Spillways: Different types and their suitability; energy dissipation; spillway crest gates.

River training: Objectives of river training; methods of river training

Soil Mechanics

Soil Mechanics : Properties and Classification of soils; Atterburg limits; void ratio; moisture content; permeability-laboratory and field tests (Darcy's Law); seepage and flow nets; flow under hydraulic structures; uplift and quick sand condition; unconfined and direct shear test; triaxial test; earth pressure theories (Rankine's theory and Coulomb's wedge theory); stability of slopes; theories of soil consolidation (Terzaghi's theory); compaction of soil; rate of settlement; total and effective stress analysis; pressure distribution of soils; Boussinesque and Waterguard theories; soil stabilization.

Surveying, Estimation & Costing

Surveying : General principles; surveying instruments and their adjustments; recording of survey observations; plotting of maps and sections; errors and their adjustments. Measurement of distances, direction and heights; correction to measured lengths and bearings; correction for local attraction; measurement of horizontal and vertical angles; leveling operations; refraction and curvature correction. Chain and compass survey; theodolite and techeometric traversing; traverse computation; plan table survey; solution of two and three points problems; contour surveying. Setting out directions and grades; types of curves; setting out of curves and excavation lines for building foundations. Field astronomy; concept of global positioning

system; remote sensing concepts; map substitute.

Estimating and costing : Estimating quantities of various items of civil works like roads, bridges, building, water supply structures, dams, irrigation canals, hydro-power structures, airports, railways etc. estimating the costs of various items of works on the basis of prevalent market rates, analysis of rates of civil works items.

Transportation Engineering

Roads : Classification of roads; planning of highway systems; alignment and geometric design; horizontal and vertical curves; grade separation. Road construction materials; types of pavements, design of pavements and pavement structures; construction methods; evaluation of pavement failure and strengthening. Maintenance of roads. Drainage system-surface and sub-surface drainages. Traffic engineering : Forecasting techniques, traffic survey- origin and destination survey; highway capacity; channelised and unchannelised intersections; traffic signs and road safety measures. Principles of highway financing.

Tunnelling : Alignment; methods of construction; disposal of muck; drainage; lighting & ventilation; traffic control; emergency management.