

CIVIL ENGINEERING SYLLABUS(BELOW DEGREE STANDARD)

1. MATERIALS OF CONSTRUCTION

Stones: classification, characteristics, properties and uses, quarrying, deterioration, retardation, preservation and decay of stones, artificial stones and tests on stones.

Timber: classification and sources, defects, decay and its prevention, seasoning and conservation of timber.

Bricks: manufacturing, uses, classification, requirement of good bricks, types of bricks and their uses, test of bricks and their objectives, substitute for bricks.

Clay products: characteristics, types and uses of clay tiles, terracotta, application of clay bricks in engineering field, ceramic tiles, commercial sizes of ceramic tiles, popular brand names.

Ferrous metals: types, properties and uses of ferrous metals. Market forms of cast iron, wrought iron and mild steel, deformed bars - their types, properties and uses, high tensile steel - its types, properties and uses.

Non ferrous metals: properties, uses and advantages of non-ferrous metals - copper, aluminum, zinc and tin, their market forms and application in engineering field.

Alloys: types, properties and uses - aluminum alloys, copper alloys and steel alloys.

Cement: definitions -composition of ordinary cement, functions of ingredients of cement, manufacturing of ordinary cement, storage of cement, hydration of cement, types of cement and their specific uses and properties, tests on cement as per specification, field tests on cement.

Coarse and fine aggregates: sources, functions of fine and coarse aggregate in mortar and concrete, properties of fine and coarse aggregates, bulking of sand, tests on fine and coarse aggregates and objectives.

Mortar: definition, classification and suitability of different mortars.

Cement concrete: ingredients, advantages, grades of concrete, RCC-advantages, uses and properties.

Paints, varnish and distempers: objects of paints, ingredients of paints and their functions, characteristics of good paint, types and brands available in the market, objects of varnishes, ingredients of varnishes and their functions, types of varnishes, objects of distempers, properties of good distempers, types of distemper, cement paints and market forms of cement paint and brands available in market, methods of painting-varnishing and distempers.

Miscellaneous and modern building materials: glass and glass wool, plastic, fibre reinforced plastic, asbestos, asphalt, metal paste, sealants for joints, steel putty, heat insulating materials, electrical insulating materials, sound insulating materials, water proof compounds, thermocol, p.v.c., epoxy, polyurethane, geotextiles, ferro-cement products, cladding materials.

2. SURVEYING

Definition, principles of surveying, chain surveying, compass surveying, leveling, contouring, computation of area and volume, principles of Theodolite surveying, traversing and its plotting and applications.

Trigonometrical levelling, tacheometry - principles and applications.

Curves: types of curves, elements of a simple circular curve, preparation of curve table and setting out of curves by chain and tape and instrument method, obstacle in curve ranging, definition and elements of a compound curve, setting out compound curve and simple problems, definition and elements of a reverse curve, transition curves, requirements and length of transition curve, functions of transition curves.

Modern surveying: remote sensing, global positioning system, geographical information system.

Modern surveying instruments: (i) electronic theodolite (ii) EDM (iii) total station

3. SOLID MECHANICS

Composition and resolution of forces moments and their applications, parallel force and couples. Geometrical properties of sections.

Properties of materials – elasticity, plasticity, hardness, toughness, brittleness, ductility, creep, fatigue, stress, strain, elongation, types of stresses and strains, elastic limit, Hooke's law - stress strain diagram – working stress, yield stress, ultimate stress and breaking stress, factor of safety, linear strain, lateral strain,

volumetric strain and Poisson's ratio, elastic constants- Young's modulus, rigidity modulus & bulk modulus and their relations, bars of varying cross section, composite sections, temperature stresses and strain, strain energy, resilience, proof resilience and modulus of resilience, equation for strain energy stored in a body. Bending moment and shear force: theory of simple bending, slope and deflection of beams by moment area method, columns and struts, torsion.

4. CONSTRUCTION TECHNOLOGY

Soils: types of soils and their suitability to construction of the structures, bearing capacity and determination of safe bearing capacity of the soils by plate load test, method of improving the safe bearing capacity, SBC values for various types of soils.

Foundations: definition and purpose of foundation, types of foundations, causes for failure of foundation and preventive measures.

Stone masonry: types and construction and uses of stone masonry.

Brick masonry: types and construction and uses of brick masonry.

Dampness and prevention of dampness: definition and causes of dampness, effects of dampness and prevention of dampness, materials used for damp proof course.

Plastering, pointing and painting: objects of plastering and requirements of good plaster, method of cement plastering, types of plaster finishes, method of pointing and types of pointing, methods of painting, distemping and varnishing on different surfaces.

5. CONCRETE TECHNOLOGY

Ingredients of concrete, water cement ratio, properties of fresh and hardened concrete, concept of design mix, methods of curing, admixtures. special concretes - high performance concrete, self compacting concrete, fiber reinforced concrete, high volume fly ash concrete, foam concrete and ready mix concrete, geo-polymer concrete. Working stress and limit state methods of designing of beam, slabs, columns and footings.

Introduction, types and advantages and disadvantage of prestressed concrete and comparison with RCC.

Concrete mix design: introduction, properties of concrete, methods of proportioning concrete mix.

special concrete: ferro cement concrete, fiber reinforced concrete and its types, light weight concrete, polymer concrete and its types, foam concrete, high strength concrete.

Concreting under special conditions: introduction, cold weather concreting, hot weather concreting, under water concreting, concreting in alkali soils.

Handling and transportation of concrete, construction and earth moving equipments.

6. HYDRAULICS, HYDROLOGY, IRRIGATION AND WATER RESOURCES ENGINEERING

Fundamentals of hydraulics: classification and properties of fluids, pressure and its measurements.

Flow of fluids: types of flow, discharge and continuity equation, energies in fluid motion, Bernoulli's theorem, horizontal venturimeter. Flow through orifices, mouthpieces, channels and pipes, flow over notches and weirs.

Pumps: working principle of reciprocating, centrifugal and deep well pumps, maintenance of pumps.

Hydrology: Hydrologic cycle, precipitation and its types, rainfall and its distribution, measurement of rainfall, rain gauges types (Simon's rain gauge and floating type rain gauge), mean annual rainfall and method of computation of average rainfall, water losses, run-off and its measurements, factors affecting run-off.

Irrigation water requirement of crops: quality of irrigation water, base period, duty, delta and their relationship, crop seasons - rabi and kharif, factors affecting duty, methods of improving duty, irrigation efficiency.

Irrigation system and methods of irrigation: introduction, gravity irrigation, lift irrigation, well irrigation, tank irrigation and tube well irrigation, subsurface irrigation, surface irrigation, sprinkler irrigation, drip irrigation, advantages and disadvantages of various methods, tube wells, open wells and their types.

Reservoirs and dams: site selection for reservoirs and dams, earthen dams, gravity dams, typical cross section of a gravity dam and earthen dam, forces acting on gravity dams, spillways and spillway gates, reservoir sedimentation, maintenance and restoration of tanks.

Distribution works: canal and its classification, different methods of canal alignment, layout of canal system, canal lining and types, canal drops, sluices and escapes, maintenance of canals.

Cross drainage works: functions and necessity, selection of site, types of cross drainage works, aqueduct, siphon, super passage, level crossing, inlet and outlet .

Diversion and river training works: definition of various diversion head works, location, layout and components of diversion head works, weirs, barrage and their differences, body wall of a weir, divide wall, sketches and description, approach channel, canal head regulator, fish ladder, marginal bunds, guide banks, weir protection works, definition, importance and necessity of river training works.

Ground water engineering: introduction, occurrence of ground water and importance, definition of porosity, ground water yield, specific yield, specific retention, permeability, transmissibility, types of aquifers, measurement of yield, methods of measurement, artificial recharge of ground water and its methods, ground water pollution, protection of wells.

Water resource management: water and rain water conservation, rain water harvesting, flood water management, water quality management, fresh water management, waste water management and ground water management, cloud seeding, watershed management and its importance.

7. ENVIRONMENTAL ENGINEERING

Environment and ecology, water requirement, sources of water, intake works and conveyance of water, quality of water, purification of water, water pollution and control.

8. TRANSPORTATION ENGINEERING

Introduction to highway engineering, alignment and surveys of roads, geometrics of roads. rigid pavements and flexible pavements.

Tunnel engineering: introduction, tunnel surveying, size and shape of tunnels, construction of tunnels, tunnel lining, ventilation of the tunnels, drainage of tunnels.

9. DESIGN OF STEEL AND MASONRY STRUCTURES

Introduction to steel structures, design of bolted joints, design of welded joints, design of steel beams, design of steel columns, design of steel column bases, design of steel compression member, design of steel tension members.

Analysis and design of masonry dams, analysis and design of retaining walls.

10. ESTIMATING AND COSTING

Introduction to estimation, specifications, analysis of rates, detailed and abstract estimate. detail estimates and abstract of cost of culverts, lined canal, tank weirs, tank sluice.

11. CONSTRUCTION MANAGEMENT

Construction planning and organization, contracts and tenders, measurement of works and stores management, inspection and quality control, safety in construction works, entrepreneurship and management.

