

Indicative Syllabus

Post Code	003
Name of Post	Assistant Engineer/ Manager (Civil) – Trainee
Minimum Educational Qualification	Regular B.E./ B.Tech. or AMIE Degree in Civil Engineering from AICTE/ UGC approved University/ Institute.

1. **Engineering Mechanics:** System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Friction and its applications; Kinematics of point mass and rigid body; Centre of mass; Free Vibrations of undamped SDOF system, Euler's equations of motion; Impulse-momentum; Energy methods; Principles of virtual work.
2. **Solid Mechanics:** Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Theories of failures; Simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, Transformation of stress; buckling of column, combined and direct bending stresses.
3. **Structural Analysis:** Statically determinate and indeterminate structures by force/energy methods; Method of super position; Analysis of trusses, arches, beams, cable and frames; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis.
4. **Construction Materials and Management:** Construction Materials: Structural steel-composition, material properties and behaviour; Concrete-constituents, mix design, short-term and long-term properties; Bricks and mortar; Timber; Bitumen. Construction Management: Types of construction projects; Tendering and construction contracts; Rate analysis and standard specifications; Cost estimation; Project planning and network analysis- PERT and CPM; Cost estimation.
5. **Concrete Structures:** Working stress, Limit state and Ultimate load design concepts; Design of beams, slabs, columns; Bond and development length; Pre-stressed concrete beams; Analysis of beam sections at transfer and service loads.
6. **Steel Structures:** Workings tress and Limit state design concepts; Design of tension and compression members, beams and beam-columns, column bases; Connections-simple and eccentric, beam-column connections, plate girders and trusses; Plastic analysis of beams and frames.
7. **Soil Mechanics:** Origin of soils, soil structure and fabric; Three-phase system and phase relationships, index properties; Unified and Indian standard soil classification system; Permeability-one dimensional flow, Darcy's law; Seepage through soils-two-dimensional flow, flow nets, uplift pressure, piping; Principle of effective stress, capillarity, seepage force and quick sand condition; Compaction of soils in laboratory and field conditions; One- dimensional consolidation, time rate of consolidation; Shear Strength, Mohr's circle, effective and total shear strength parameters, Stress-Strain characteristics of clays and sand; Stress paths.
8. **Foundation Engineering:** Sub-surface investigations- scope, drilling bore holes, sampling, plate load test, standard penetration and cone penetration tests; Earth pressure theories- Rankin

Indicative Syllabus

Post Code	003
Name of Post	Assistant Engineer/ Manager (Civil) – Trainee
Minimum Educational Qualification	Regular B.E./ B.Tech. or AMIE Degree in Civil Engineering from AICTE/ UGC approved University/ Institute.

and Coulomb; Stability of slopes-finite and infinite slopes, method of slices and Bishop's method; Stress distribution in soils-Boussinesq's and Westergaard's theories, pressure bulbs; Shallow foundations- Terzaghi's and Meyerhof's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays; Deep foundations- types of piles, dynamic and static formulae, Axial load capacity of piles in sands and clays, pile load test, pile under lateral loading, pile group efficiency, negative skin friction.

- 9. Fluid Mechanics:** Properties of fluids, fluid statics; Continuity, momentum, energy and corresponding equations; Applications of momentum and energy equations; Potential flow, Laminar and turbulent flow; Flow in pipes, pipe net works; Concept of boundary layer and its growth; Concept of lift and drag.
- 10. Hydraulics:** Forces on immersed bodies; Flow measurement in channels and pipes; Dimensional analysis and hydraulic similitude; Kinematics of flow, velocity triangles; Basics of hydraulic machines, specific speed of pumps and turbines; Channel Hydraulics- Energy-depth relationships, specific energy, critical flow, slope profile, hydraulic jump, uniform flow and gradually varied flow and water surface profiles.
- 11. Hydrology:** Hydrologic cycle, precipitation, evaporation, evapo-transpiration, watershed, infiltration, unit hydrographs, hydro graph analysis, reservoir capacity, flood estimation and routing, reservoir and channel routing, surface run-off models, groundwater hydrology- steady state well hydraulics and aquifers; Application of Darcy's law.
- 12. Irrigation:** Duty, delta, estimation of evapo-transpiration; Crop water requirements; Design of lined and unlined canals, head works, gravity dams and spill ways; Design of weirs on permeable foundation; Types of irrigation systems, irrigation methods; Water logging and drainage; Canal regulatory works, cross-drainage structures, outlet sand escapes.
- 13. Water and Waste Water:** Water and Waste Water Quality and Treatment: Basics of water quality standards - Physical, chemical and biological parameters; Water quality index; basic unit processes and operations for water treatment. Drinking water standards, drinking water treatment, water requirements, basic unit operations and unit processes for surface water treatment, distribution of water. Sewerage System design- Sewage and sewerage treatment, quantity and characteristics of waste water. Primary, secondary and tertiary treatment of waste water, effluent discharge standards, sludge disposal; Reuse of treated sewage for different applications. Domestic waste water treatment, quantity & characteristics of domestic waste water, primary and secondary treatment. Unit operations and unit processes of domestic waste water.

Indicative Syllabus

Post Code	003
Name of Post	Assistant Engineer/ Manager (Civil) – Trainee
Minimum Educational Qualification	Regular B.E./ B.Tech. or AMIE Degree in Civil Engineering from AICTE/ UGC approved University/ Institute.

- 14. Air Pollution:** Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, Air quality standards, Air quality index and limits.
- 15. Municipal Solid Wastes:** Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).
- 16. Noise Pollution:** Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.
- 17. Transportation Infrastructure:** Highway alignment and engineering surveys; Geometric design of highways-cross-sectional elements, sight distances, horizontal and vertical alignments; Geometric design of railway track- Speed and Cant. Concept of Airport run way length, calculations and corrections; taxiway and exit taxiway design.
- 18. Highway Pavements:** Highway materials-desirable properties and quality control tests; Desirable properties and design of bituminous paving mixes; Design factors for flexible and rigid pavements; Design of flexible pavement using IRC:37-2012; Design of rigid pavements using IRC:58-2011; Distresses in concrete pavements.
- 19. Traffic Engineering:** Traffic studies on flow, speed, travel time-delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis, statistical analysis of traffic data; Microscopic and macroscopic parameters of traffic flow, fundamental relationships; Traffic signs; Control devices, signal design by Webster's method; Types of inter-sections and channelization; Highway capacity and level of service of rural highways and urban roads.
- 20. Surveying:** Principles of surveying; Errors and their adjustment; Maps-scale, co-ordinate system; Distance and angle measurement - Levelling and trigonometric levelling; Traversing and triangulation survey; Total station; Horizontal and vertical curves. Photogrammetric-scale, flying height; Remote sensing-basics, platform and sensors, visual image interpretation; Basics of Geographic Information System (GIS) and Geographical Positioning System (GPS)