Indicative Syllabus of Civil Engineering

(1) Building Materials:

Stone, Lime, Glass, Plastics, Steel, Ceramics, Fly Ash, Basic Admixtures, Timber, Bricks and Aggregates: Classification, properties and selection criteria; **Cement:** Types, Composition, Properties, Uses, Specifications and various Tests; **Lime & Cement Mortars and Concrete:** Properties and various Tests; Design of Concrete Mixes: Proportioning of aggregates and methods of mix design.

(2) Solid Mechanics:

Elastic constants, Stress, plane stress, Strains, plane strain, Mohr's circle of stress and strain, Elastic theories of failure, Principal Stresses, Bending, Shear and Torsion.

(3) Structural Analysis:

Basics of strength of materials, Types of stresses and strains, Bending moments and shear force, concept of bending and shear stresses; Analysis of determinate and indeterminate structures; Trusses, beams, plane frames; Rolling loads, Influence Lines, Unit load method & other methods; Free and Forced vibrations of single degree and multi degree freedom system; Suspended Cables; Concepts and use of Computer Aided Design.

(4) Design of Steel Structures:

Principles of Working Stress methods, Design of tension and compression members, Design of beams and beam column connections, built-up sections, Girders, Industrial roofs, Principles of Ultimate load design.

(5) Design of Concrete and Masonry structures:

Limit state design for bending, shear, axial compression and combined forces; Design of beams, Slabs, Lintels, Foundations, Retaining walls, Tanks, Staircases; Principles of pre-stressed concrete design including materials and methods; Earthquake resistant design of structures; Design of Masonry Structure.

(6) Construction Practice, Planning and Management:

Construction - Planning, Equipment, Site investigation and Management including Estimation with latest project management tools and network analysis for different Types of works; Analysis of Rates of various types of works; Tendering Process and Contract Management, Quality Control, Productivity, Operation Cost; Land acquisition; Labour safety and welfare.

(7) Flow of Fluids, Hydraulic Machines and Hydro Power:

(a) Fluid Mechanics, Open Channel Flow, Pipe Flow:

Fluid properties; Dimensional Analysis and Modelling; Fluid dynamics including flow kinematics and measurements; Flow net; Viscosity, Boundary layer and control, Drag, Lift, Principles in open channel flow, Flow controls. Hydraulic jump; Surges; Pipe networks.

(b) Hydraulic Machines and Hydro power -

Various pumps, Air vessels, Hydraulic turbines – types, classifications & performance parameters; Classification of hydroelectric power plant, Run of the river plants without pondage, Run of the river plant with pondage, storage reservoir plants, pumped storage plants, general arrangement of a hydroelectric project and its operation, Power house – classification and layout, storage, pondage, control of supply.

(8) Hydrology and Water Resources Engineering:

(a) Hydrology:

Hydrological cycle, Ground water hydrology, Well hydrology and related data analysis; Streams and their gauging; River morphology; Flood, drought and their management; Capacity of Reservoirs.

(b) Water Resources Engineering:

Multipurpose uses of Water, River basins and their potential; Irrigation systems, water demand assessment; Resources - storages and their yields; Water logging, canal and drainage design, Gravity dams, falls, weirs, Energy dissipaters, barrage Distribution works, Cross drainage works and head-works and their design; Concepts in canal design, construction & maintenance; River training, measurement and analysis of rainfall.

(9) Environmental Engineering:

(a) Water Supply Engineering:

Sources, Estimation, quality standards and testing of water and their treatment; Rural, Institutional and industrial water supply; Physical, chemical and biological characteristics and sources of water, Pollutants in water and its effects, Estimation of water demand; Drinking water Standards, Water Treatment Plants, Water distribution networks.

(b) Waste Water Engineering:

Planning & design of domestic waste water, sewage collection and disposal; Plumbing Systems; Components and layout of sewerage system; Planning & design of Domestic Waste-water disposal system; Sludge management including treatment, disposal and re-use of treated effluents; Industrial waste waters and Effluent Treatment Plants including institutional and industrial sewage management.

(c) Solid Waste Management:

Sources & classification of solid wastes along with planning & design of its management system; Disposal system, Beneficial aspects of wastes and utilization by Civil Engineers.

(d) Air, Noise pollution and Ecology:

Concepts & general methodology.

(10) Geo-technical Engineering and Foundation Engineering:

(a) Geo-technical Engineering:

Soil exploration - planning & methods, Properties of soil, classification, various tests and interrelationships; Permeability & Seepage, Compressibility, consolidation and Shearing

resistance, Earth pressure theories and stress distribution in soil; Properties and uses of geo-synthetics.

(b) Foundation Engineering:

Types of foundations & selection criteria, bearing capacity, settlement analysis, design and testing of shallow & deep foundations; Slope stability analysis; Earthen embankments, Dams and Earth retaining structures types, analysis and design, Principles of ground modifications.

(11) Surveying and Geology

(a) Surveying:

Classification of surveys, various methodologies, instruments & analysis of measurement of distances, elevation and directions; Establishment of control point by triangulations and traversing measurement and adjustment of errors; Field astronomy, Global Positioning System; Contour and Map preparation; Photogrammetry; Remote sensing concepts; Survey Layout for culverts, canals, bridges, road/railway alignment and buildings, Setting out of Curves.

(b) Geology:

Basic knowledge of Engineering geology & its application in projects.

(12) Transportation Engineering:

Highways: Planning & construction methodology, Alignment and geometric design; Traffic Surveys and Controls; Principles of Flexible and Rigid pavements design.

Tunnelling: Alignment, methods of construction, disposal of muck, drainage, lighting and ventilation.

Railways Systems: Terminology, Planning, designs and maintenance practices; track modernization.

Harbours: Terminology, layouts and planning.

Airports: Layout, planning & design.