Syllabus for M.E. Entrance in Civil Engineering

Fluid, its physical properties. Ideal and Real fluids. Newtonian and Non-Newtonian fluids.
Principles of fluid statics: Pressure at a point, Absolute, gauge and vacuum pressures. Pressure measurements by manometers, Pressure gauges and Transducers. Total pressure and centre of pressure on plane and curved immersed surfaces. Buoyancy, Floatation, Equilibrium of floating bodies, Metacentre and determination of metacentric height.
Kinematics of flow: Concepts of fluid flow – steady and unsteady flows, uniform and non-uniform flows, laminar and turbulent flows. Rotational and irrotational flows, Vorticity. Condition for two dimensional irrotational flows. Continuity equation in Cartesian co-ordinates. Stream function and Velocity potential for two dimensional flow, Laplace equation. Flownet and its characteristics.
Equation of motion, energy and momentum applications: General hydrodynamic equations, Euler's equation of motion in Cartesian co-ordinates, Bernoulli's equation. Energy equation and its applications, Fluid masses subjected to uniform accelerations. Free and forced vortex flows.
Laminar Flow: Simple solution of Navier Stokes equations, Hagen-Poiseulli's equation, Shear stress distribution, Equation of motion for laminar flows, Stoke's law, Measurement of viscosity, Flow through parallel plates, Laminar flow through pipes, cavitations.
Turbulent Flow: Nature of turbulence, Reynold's momentum exchange concept and Prandtl's mixing length theory, Turbulent flow in pipes, equation for velocity, distribution and friction coefficient, velocity distribution in smooth pipes, rough pipes.

Soil and rock, Soil mass constituents. Definition of water content, Specific gravity, Void ratio, Porosity, degree of saturation, air voids, density index etc. Phase relationship.
Group index, Unified and I.S.Soil classifications, field identification tests. Soil structure, basic clay minerals. Flocculated and dispersed clays.
Bearing capacity of soil. Terzaghi's analysis of bearing capacity of shallow foundations, skempton's and hansen's formula, local and general shear failure. Bearing capacity determination.
Soil water, Permeability of soil and its determination.
Seepage and seepage pressure. Quick sand phenomena. Effective and total pressures. Laplace equation for seepage. Flow net and its uses, Piping; uplift pressure, Principle of drainage by Electro-osmosis. Principle of soil compaction and determination of field density. Field compaction and its control. Vertical pressure distribution in soil. Boussinesq's, equation. Vertical stress due to circular, rectangular and strip loaded areas, Contact pressure distribution.
Foundation: Function of foundation , requirement of foundation . Settlements of foundation Failure of foundation. Shallow & Deep Foundation, Wall foundation, isolated footing, raft foundation & Grillage foundation Pile foundation, pile driving machinery, pile caps.
Mohr circle of stress, shear strength of soil, its strength of sand and clays. Sensitivity and thixotrophy, skemption's pore pressure coefficient. Stress path .
Active, passive and at rest earth pressures, rank and coulomb's earth pressure theories, rebhann's and culmann's construction for cohesionless soil back fill. Uniformally distributed surcharge. Bell's equation for cohesive back fill. Stability of retaining wall, earth pressure on sheet piling and bulkheads.
Stability of slopes. Causes of slope failures. Stability analysis by Swedish and friction circle method for total and effective stresses, Taylor's method. Stability under sudden drawdown condition, Remedial measures.
One-dimensional consolidation of soil, Consolidation test. Terzaghi's one-dementional consolidation theory and its use in predicting rate of settlement. Total and differential settlements. Over consolidated and normally consolidated soils.

Soil stabilisation, Mechanical stabilisation with lime, cement, bitumen, hydroscopic and water proofing chemicals. Electrochemicals and thermal stabilisation.

Sources of water supply, quantity of water per capita variation in seasonal and hourly consumption. Forecast of pollution. Standards of purity for public water supplies. Lakes, canal and rivers intakes. Raw water pumping. Quiescent and continuous flow types of tanks. Design & Theory of various units of water treatment plant. Disinfection – uses of excess lime, ozone, ultraviolet rays, chlorine and chloramines for disinfection, water softening.
Different types of pipes used in water supply practice, joints in pipes, values, distribution of water, Design of distribution system. Alignment, laying and jointing of pipes, Service reservoir and fittings service connection, detection and prevention of wastage of water, Metering, Rural Water Supply & sanitation.
Systems of drainage, Surface drainage, Under drainage, Separate, Combined and Partially combined system. House drainage – conservancy and water carriage systems, Various types of pipes used in waste water waste water management practice, various types of joints , junctions, various types of traps ,water closets, urinals and lavatory basins, waste and antisyphonage pipes. Alignment and gradient of drains. Inspection chambers. Testing of drains. Ventilation of drains.

Layout of sewerage systems, Design of sewerage network, estimation of sewage quantity , estimating storm water by time of concentration method. sewers appurtenances, Manholes, Flushing of sewers. Ventilation of sewers. Aerobic and anaerobic process of treatment. Sewage screening, grit separation, sewage pumping, Various means of disposal of sewage. Septic tank, Imhoft tank, contact beds, percolating filters. Activated sludge process. Nature of sewage sludge. Sludge treatment, sludge gas. Collection and disposal of refuse. Principles, theory and design of various units of waste water treatment plants

Hydrology : Descriptive hydrology, hydrological cycle, hydrologic budget.
Precipitation, measurement and related data analyses, Hydrologic abstractions, Water losses, Evaporation and its estimation, transpiration, evapotranspiration, measurement of evapotranspiration, infiltration. Rainfall Runoff relationships, estimation quantity of runoff, flood estimation. Storm hydrograph, factors affecting flood hydrograph, unit and synthetic hydrographs, its application.

Orientation of buildings. Functional requirements of building. Planning for residential buildings.. Design Loads Concept of Town Planning. Physical Planning and Social Planning.
Causes and effects of dampness, various methods of damp proofing of buildings. Ventilation & Air conditioning: Purpose of ventilation . Methods of ventilation, systems of ventilation. Rate of ventilation. Systems of air conditioning. Acoustics and Sound Insulation : General principles, sound absorbing materials, insulation of walls and floors. Acoustical correction, optimum time of reverberation
Principles of surveying, compass survey, levelling, Plane Table Surveying , Theodolite Surveying, Traverse computation, Systems of co-ordinates, Adjustment of traverse, Tacheometric Surveying. Errors and precision in tacheometric surveying.
Curves: Necessity of curves. Classification of curves-simple, compound, Reverse and vertical curves, transition curves
Hydrographic Surveying, Tunnel Surveying. Correlation of surface and underground surveys.
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