

Detailed Contents of Courses for the M.Engg Programme in Civil Engineering

Coastal Engineering

CE-522 Port Planning and Design

Sea Transportation system, facilities and growth, Port and Harbour functions, classification, components and features, Harbour Planning, size, shape, Dimensional characteristics of entrance, approach channel; Site investigations considering hydrographic, topographic and geotechnical factors. Harbour siting considerations. Hydraulic models. Port buildings. Navigation facilities. Master planning of ports, Planning of Bulk Terminals, Port Administration, Port Management, Port Structures, Port planning for Developing Countries UNCTAD Hand Book, Marine Transport, Merchant Shipping.

CE-523 Coastal Processes

Coastal sediment properties and analysis, long-shore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport in sand dune stabilisation, sediment tracing.

CE-524 Coastal Management

Introduction of key processes operating in the coastal zone and to management techniques appropriate to these processes and environments. Emphasis on policy, regulatory and intergovernmental complexities that characterize coastal zone management in coastal nations.

CE-525 Soil Mechanics in Coastal Engineering

Physical and mechanical properties of weak compressible and loose marine subsoils; Stability analysis of shallow foundations and embankments resting on weak soils. Use of geo-textile fabrics for stability of weak soils; Design criteria and pressure analysis of deep water anchored bulk heads, containers berths and marine cofferdams; Reclamation of large coastal areas using fill materials; Principles and methods for ground stabilisation, compaction equipment and their optimum utilisation; Soil liquefaction due to earthquakes; procedures of determination soil liquefaction and remedial measures.

CE-551 Marine Geology

Major Physiographic division of sea floor, Classification of marine environment; the origin, form and resources of the ocean basin and continental margins, including discussion of seafloor spreading, trenches and island arcs, mountain building; coral reefs and atolls; sedimentation; coastal morphology and the impact of wave action and human activities on beaches, coasts, continental shelves, and submarine canyons. Natural resource potential of oceans.

CE-552 Marine Dredging

Dredge pumps selection, Pumps and system characteristics, cavitations, type of dredging, head loss in horizontal and vertical pipes for two and three phase flow, design of disposal method for dredged material, environment effect of dredging.

CE-553 Off-shore Engineering Analysis

Design and analysis requirements of offshore facilities; Derivation of hydrodynamic loads on rigid bodies; Load on long rigid and flexible cylinders; Viscous forces on cylinders; experimental data; Morison's equation; stroke wave theories; shallow water waves; Selection of appropriate wave theory; Diffraction of waves by currents; Hydrodynamic loads on risers, cables and pipelines.

CE-554 Computational Hydraulics

Review of Basic Fluid Mechanics: Introduction; One, two, three dimensional flows; Steady versus unsteady flow; uniform versus non-uniform flow, Prismatic versus non-prismatic channels; sub-critical, critical, and supercritical flows; turbulent versus laminar flow, Physical properties of fluid and their effects; conservation of mass or continuity equation; Energy and its Dissipation in Open Channels, The Momentum Principle Applied to Open Channel Flows. Non-uniform Flows: Types of non-uniform flows; the general gradually varied flow(GVF)-an ordinary differential equation(ODE); GVF in prismatic channels with lateral inflow and outflow; Sketching GVF in prismatic channels, Numerical methods for solving ODE's; Canal system; simultaneous solution of algebraic and ODEs.

Unsteady Flows: One-dimensional equation for unsteady channel flows (The St. Venant Equation), Determination of mathematical type of St. Venant equations, Numerical Solutions of the unsteady St. Venant equations, Method of Characteristics, Descriptions two and three dimensional unsteady flow systems.

CE-555 Design of Marine Structures

Winds, water, ship and earthquake loads on water-front structures; Basic structural analysis, Design of Offshore and onshore Structures; Principle and methods for the design of tidal and water break barriers such as coastal dike, sea-wall, detached water barrier and jetty.

CE-577 Irrigation System Design and Management

Introduction/overview of irrigation and its purpose: horticulture, urban landscaping, agriculture, soil-water-plant relationships, irrigation water requirements, computation of evapotranspiration by various methods, performance evaluation of irrigation systems, surface irrigation system-design principles, Design of basin, border and furrow irrigation, Trickle irrigation and sprinkler irrigation – design and operation, irrigation management, irrigation and drainage interactions, environmental consideration.

CE-583 Groundwater Engineering

Groundwater origin and Occurrence: Geologic formation and groundwater distribution, Global distribution of groundwater levels. Hydrologic Budget: Surface water, soil water and groundwater budget. Aquifer characteristics: Homogeneous and non homogeneous aquifers, Isotropic and anisotropic aquifers, storage coefficient and specific yield, hydraulic conductivity, transmissivity and their determination. Steady Well Hydraulics: Dupuit-Forchheimer assumptions, Boussinesq equation, differential equations for confined flow, flow equations with vertical accretion, one dimensional flow radial flow, aquifer boundaries, leaky aquifers, one dimensional flow and radial flow in leaky aquifers. Unsteady well hydraulic: Unsteady radial flow towards a fully penetrating well, radial flow in leaky aquifer, drawdown with variable pumping rate, one dimensional flow with distributed recharge. Superposition of wells: Principle of superposition, drawdown due to a well field, pinging near hydrologic boundaries, fully penetrating and partially penetrating well considerations. Pumping test data analysis: Methods, data collection, data analysis, methods of determining aquifer characteristics using test data. Groundwater quality: Water analysis, irrigation water quality criteria, groundwater pollution. Introduction to Groundwater Modeling. USGS MODFLOW, MT3D, etc.