

Detailed Contents of Courses for the Master of Engineering Management Programme

Water Resources Management

CE-556 Water Resources Planning and Management

Introduction, History of water resources planning and development, Importance of water resources planning, Planning objectives, Protocols employed at local, provincial, federal, regional and international levels, Investigation data and analysis, Demand projection, Water productivity parasites and constraints, Land-Water-Human resources interaction, Plan formulation, evaluation and approval, Comprehensive regional planning, Stakeholder involvement in water resources planning, Social and environmental impact assessment, Institutional arrangements for planning and implementation, Engineering economy in water resources planning, Introduction to surface water / groundwater / conjunctive water management.

CE-557 Legal & Financial Aspects of Water Resources

Sources of Water, Uses of Water, General concepts of water governance, International Laws (riparian and prior appropriation doctrines), Legal schemes for securing and allocating water rights in surface water and groundwater for private and public uses in Pakistan, Water Treatise and Accords (Indus Waters Treaty, Water Apportionment Accord, similar case studies), Institutional Framework, Groundwater management regimes, Issues and national water sector strategy, Evolving role of science, economics, and policy in water allocation law, Major paradigm shifts in water governance through integrated water resource management. Legislation on harmful effects of water.

CE-558 Sustainable Water Resources Management

Historical perspective of water use and development, Water facts and trends, Introduction to sustainable development and its importance, Related terminologies, SWRM strategies, Sustaining healthy freshwater ecosystems, Hydrologic aspects of water sustainability, Human impacts on hydrologic ecosystem and mitigation, Water resources – agriculture, environment, and society, Flood control management strategies, Economics of water; value of water, water affordability and marketing. Emerging water management issues and resolutions.

CE-559 Remote Sensing In Water Resources

History and scope of remote sensing, Concepts of remote sensing, Photogrammetry, Satellite characteristics, Remote sensing imagery types, Remote sensing satellites, Image resolution, Pre-processing, Image rectification, enhancement and classification, Accuracy assessment, Applications of satellite remote sensing in water resources i.e., for identifying drainage basin networks, for watershed dynamics analysis, flood inundation modeling and mapping, Evaluation of surface and ground water resources, Image processing software exercises, Introduction to Geographical Information Systems (GIS).

CE-560 Reservoir Operations

Introduction on the functions of reservoirs and possible problems, Operation purposes, Storage-yield concepts; flow-duration curve development, mass-curve analysis and sequent- peak analysis; Flood management and reservoir operation; formation and process of floods, Techniques for flood prevention in reservoirs, Relationship between flood management and reservoir operation, Reservoir simulation for flood control, urban water supply, hydropower and multipurpose operation, Automatic reservoir operation system; Sedimentation in reservoirs, Preventative methods for the sedimentation in reservoirs, Impacts of sedimentation on the function of reservoirs, Management for sedimentation in reservoirs and techniques for capacity restoration, Ecological environment in water reservoirs and protection & restoration techniques.

CE-576 Water Services Management

Water Supply and Sanitation Systems; options, standards and developments with sustainable performance and technical reliability. Water Supply Systems; raw water quality (surface and groundwater) and abstraction, pre-treatment and storage, water treatment processes and plants, water transport and distribution, Sanitation Systems; on-site and off-site sanitation systems, ecological sanitation concepts, sewerage and drainage systems wastewater treatment processes and plants, sludge management (treatment, disposal and reuse), Institutional arrangements and management options for providing water services. Finance issues at utility level; financing water organisations and undertaking cost-recovery.

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-578 Groundwater Resource Management (Prerequisite EM-505 Operations Research)

Introduction to groundwater resources engineering and management, groundwater resources protection and water supply; Technical aspects as well as the legal, regulatory and policy aspects of groundwater resources management; Development of groundwater resource; simulation/optimisation models for GWM; embedding and response matrix approaches, Conjunctive use of groundwater and surface water and planning of groundwater resources projects.

CE-579 Water Quality Management

Water quality parameters-Indicators, sources, causes and effects; Nature of water systems; Objectives and case studies of water quality management; Water quality monitoring, modeling and forecasting in water systems; Management practices and methodologies for reuse, recycling and treatment of contaminated water; A system approach to water quality management: Institutional, environmental, and ethical aspects.