52 AQUATIC ENVIRONMENTAL MANAGEMENT

Unit 1: Fundamentals of Environmental Sciences

Definition and scope of environment science, its interrelationship with other sciences and fisheries; Origin and evolution of the earth and its environments-atmosphere, hydrosphere, lithosphere and biosphere; Basic ecological concepts: Habitat ecology, systems ecology, synecology, autecology; Air pollution: Sources and classification of major air pollutants; Climate change: weather and climate, Global warming and greenhouse effect, sources and sinks of greenhouse gases; Impact of climate change on aquatic environment& polar ecosystem; Photochemical smog and SPM; Use of green and sustainable technology; Environmental impacts assessment and environmental auditing; Environmental policies and laws in India.

Unit 2: Aquatic Ecosystem, Biodiversity and Marine Ecology

Productivity and carrying capacity; Trophic relationships, energy flow and nutrient cycling;Ecological stability and homeostasis; Resistance and resilience; Natality and mortality; r and k selection; Categories of biodiversity:Species diversity, genetic diversity and habitat diversity; Biodiversity indices and their significance; Concepts of index of biotic integrity (IBI);Ecosystem services and economic appraisal of biodiversity; International conventions on biodiversity; Environmental economics; Ecological standards;Environmental regulations; Environmental ethics; Disaster Management; Biodiversity hotspots, biosphere reserves, National parks, sanctuaries, marine protected areas;Ramsar convention; Eco-labelling; Ocean acidification;Climate change and food security; Carbon footprint in fisheries and aquaculture; Projected trends of climate change and disaster; International conventions on climate change; Stratospheric ozone layer depletion: effect of UV radiation on human health and ecosystem; Adaptation and mitigation strategies of climate change;Carbon sequestration;Carbon credit; Green technology; Rain water harvesting;Mangrove ecosystem; Sea grass; Sandy beach; lagoon and estuary; Integrated Coastal Zone Management (ICZM); River continuum concept; River linking; Water budget and its significance in water conservation; Constructed wetlands.

Unit 3: Chemical Interaction in the Aquatic Environment and Analytical Techniques

Chemical kinetics; Redox chemistry; Solubility concept; Weathering of rocks; Soil formation; Soil profile, sediment texture;Structure of oxide and silicate minerals, source of charge; Double layer; Ion exchange:Concept and source of cation exchange capacity (CEC); Sediment texture; Chemistry of soil- nutrient interactions and water permeability; Nutrient dynamics: Nutrient holding capacity of sediments and fixation; Processes in the degradation and conversion of organic matter; Transport of substances; Humus and biogeochemical substances;Bio-availability;Bio-accumulation and biomagnifications;Photometric techniques: Theory, instrumentation and application of colorimetry and spectrophotometry; Gravimetric and volumetric analyses: Principles and precautions; Use of stable and radioactive isotopes in environmental analysis.

Unit 4: Aquatic Pollution and Microbiology

Aquatic pollution:Sources, types and their impact; Pollution problems of groundwater resources (arsenic, fluoride, nitrate, pesticides), sources of contamination and management issues; Sewage, radioactive wastes, biomedical wastes, hazardous chemicals, plastics, nanoparticles; Eutrophication; Ecological sanitation: closing the loop;Toxins from fish/aquatic organisms and fish poisoning; Factors influencing toxicity; Ecological effects of toxicants; Metabolism of toxic substances; Comparative toxicology; Genotoxicity; Neurotoxicity; Ecological engineering: concepts and applications, biomanipulation, bioremediation; Restoration ecology and rehabilitation;Wastewaters: Types and characteristics of sewage and industrial effluents; Conventional and advanced treatment methods of waste water; Solid waste management, Biological and chemical methods for recovery of nutrients from liquid and solid wastes; Wastewater utilization for algal cultivation; Waste recycling in aquaculture; Microbial community in freshwater; estuary and marine environment (types and abundance); Factors affecting microbial growth and abundance in aquatic environment; Extremophiles and their significance;Biogeochemical cycling; Microbial interaction; Microbial degradation; Water-borne pathogens of public health importance; Microbial criteria for water quality assessment; Indicator organisms; Principles and applications of bioprocesses; Microbial biomass production; Bio-fertilization; Biocontrol; Genetically-improved strains; Consortia of microbes for environmental protection; Bioreactors; Biosensors as a tool for biomonitoring; Biofuels, fermented products and biogas; Biopesticides, Microbial interaction with chemical pollutants in aquatic environment; Microorganisms as potential bioremediators; IPR issues related to environmental biotechnology; Culture dependent and culture independent approaches in aquatic microbiology;Microbial toxins; Dose-response relationship; Toxicity testing: microcosm and mesocosm tests; Probiotics;Bioprospecting;Disinfection methods.

Unit 5: Fisheries Oceanography

Marine topography;Effects of physicochemical and biological oceanographic factors on adaptation, behaviour, abundance and production of aquatic organisms; Space and time scales in oceanographic analysis; Magnitude of short-term productivity changes in the ocean; Synoptic oceanographic analysis: currents, waves, tides, El Nino- southern oscillation; Stratification, mudbanks, upwelling and circulation patterns; Application of remote sensing and GIS in fisheries; Environmental factors influence the seasonal variations in fish catch in the Arabian Sea and the Bay of Bengal; Fisheries enhancement:Artificial upwelling, ranching, artificial reefs, ocean fertilization.