

Department of Civil Engineering

Syllabus for Environmental Engineering Specialization

Water & Wastewater Treatment and Management

Water and wastewater quality parameters; Eutrophication and thermal stratification in lakes; River pollution - Oxygen sag curve; Water treatment methods - screening, sedimentation with and without coagulation, filtration, desalination, disinfection; Water distribution and storage; Point and non-point sources of wastewater; Population forecasting methods; Design of sewer and storm water sewers; Sewer appurtenances; Preliminary, primary, secondary and tertiary sewage treatment; Sludge generation, processing and disposal methods; Sewage farming. Sources and characteristics of industrial effluents; Concept of Common Effluent Treatment Plants (CETP); Wastewater recycling and zero liquid discharge. Kinetics and reactor design: Mass and energy balance, Order and rate of reactions, Batch reactors, Completely mixed flow reactors, Plug flow reactors.

Air Pollution

Structure of the atmosphere; Natural and anthropogenic sources of pollution; Atmospheric sources, sinks, transport; Indoor air pollution; Effects on health and environment; Air pollution: gases and particulate matter; Air quality standards; Primary and secondary pollutants; Criteria pollutants, ambient and source standards, air quality indices, visibility. Particulate pollutants: measurement and control methods; Control of particulate air pollutants using gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), Electrostatic precipitators (ESP). Gaseous Pollutants: Measurement and control methods; Control of gaseous contaminants: absorption, adsorption, condensation and combustion; Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons; Vapour-liquid and vapour-solid equilibria; Diffusion, Fick's law and interfacial mass transfer.

Automotive emission controls, fuel quality, diesel particulate filters, catalytic convertors. Air quality management: Point, line and area sources; Inventory; Influence of meteorology – wind rose diagrams, stability, mixing height, topography, dispersion modelling, monitoring.

Solid and Hazardous Waste Management

Integrated solid waste management; Waste hierarchy; Rules and regulations for solid waste management in India.

Municipal solid waste management: Sources, generation, characteristics, collection and transportation, waste processing and disposal (including reuse options, biological methods, energy recovery processes and landfilling).

Hazardous waste management: Characteristics, generation, fate of materials in the environment, treatment and disposal. Soil contamination and leaching of contaminants into groundwater. Management of biomedical waste, plastic waste and E-waste: Sources, generation and characteristics; Waste management practices including storage, collection and transfer.