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; Riverpollution - 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 andstorm water sewers; Sewer appurtenances; Preliminary, primary, secondary and tertiary sewagetreatment; 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 andparticulate 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 usinggravitational 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 lawand 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 – windrose diagrams, stability, mixing height, topography, dispersion modelling, monitoring.

Solid and Hazardous Waste Management

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

Municipal solid waste management: Sources, generation, characteristics, collection andtransportation, waste processing and disposal (including reuse options, biological methods, energyrecovery 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 andcharacteristics; Waste management practices including storage, collection and transfer.