

Karnataka PG CET Syllabus for Environmental Engineering:

Environmental Chemistry, Biology, and Ecology:

Chemistry:

- Basic concepts of physical chemistry — Osmosis, Dialysis, Adsorption
- Pollution Parameters — pH, COD, BOD, DO, TOC, Nitrogen, Fluoride, Sanitary Significance of Sulphate, Nitrates, and Phosphates.

Microbiology:

- Plantkingdom, Animal kingdom
- Morphology and Growth of Bacteria
- Air, Water and Soil, Microbiology, Virology
- Microbial Metabolism of Pesticides and Heavy Metals.

Ecology:

- Ecosystem concepts, Food Chain and Food Web
- Energy Flow in Ecosystem — Lotic and Lentic Systems, Eutrophication of Lakes
- Population Growth Forms, Carrying Capacity, quantitative Ecology, Concept of Ecosystem
- Environmental Fluid Mechanics And Water Resources Engineering: Fluid properties and classifications, Newton's Law of Viscosity, Fluid Pressure and its measurements; Hydrostatics, Kinematics of Fluids, Bernoulli's equation, Momentum equation
- Flow through Pipes — Darcy's equation, Friction factors, Pipes in Series, Parallel and equivalent pipe, minor losses
- Flow measurements — Orifices, Mouthpieces, Notches, and Weirs
- Flow in Open Channels — Uniform Flow, most economical sections, specific energy, critical flow, hydraulic jump
- Water Hammer in pipes, impact of Jet on Vanes, Turbines — types
- Pumps — Types, working and problems
- Quantitative and Qualitative Hydrologic Cycle, Precipitation and Runoff Estimation
- Unit Hydrographs, Stream Flow Analysis — time series, return period, mass diagrams for computing storage capacity, stream flow measurement
- Groundwater — Definitions, type of Aquifers
- Well Hydraulics — Steady state, the Basic equation of groundwater flow
- Open and Tube wells — type
- Yield estimation, drilling maintenance of borewells
- Artificial recharge, water conservation and Reuse, Soilconservation, Economic aspects of water resource planning

Water Supply and Treatment:

- Drinking and Industrial Water Quality Standards
- Water Quantity based on various demands
- Types of intakes, raising main economics, Pumps in series and parallel
- Hazen William Equations, Types of reservoirs, Preventive maintenance, regional water supply system
- Physico-chemical and Bacteriological characterization of water — surface and sub-surface
- Aeration, coagulation and Flocculation, Sedimentation, Filtration – slow rapid and pressure
- Hardness and colour removal
- Disinfection process — Mode, rate and factors
- Corrosion and corrosion control
- Operation and Maintenance of water treatment system

Wastewater and Treatment:

- Quantity of Domestic Wastewater, characteristic wastewater, Disposal of Sullage water in rural areas
- Classification of Wastewater Treatment Techniques — Unit operations and process; Screening, Grit Chamber, primary, sedimentation
- Biological units: Suspended and fixed growth system, Aerobic and Anaerobic systems, activated sludge process, Trickling filters, RBC, Biofilter, Secondary sedimentation tank, Stabilization ponds — aerobic, facultative and Anaerobic Lagoons, Septic tanks, digesters, sludge drying beds
- Industrial Wastewater Survey
- Variation in Quantity and Quality of Industrial wastewater
- Guidelines for discharge of Industrial Effluent on land into Municipal Sewers and Natural water
- Joint treatment, volume reduction, strength reduction, equalization neutralization and proportioning
- Estimation of process kinetic parameters
- Origin, characteristics and treatment of cane sugar industry, dairy, distilleries and pharmaceuticals
- Wastewater reuse and waste recovery from different industries.

Solid and Hazardous Wastes Management:

- Sources, Composition and properties of Municipal Solid Wastes, Solid Waste Generation, storage and processing at source
- Landfill — Classifications, types, control of gases and leachates, preliminary design of landfills
- Separation, Transformation and recycling — size reduction, density separation
- Thermal processing — combustion, pyrolysis, gasification, energy recovery
- Composting — Aerobic and Anaerobic digestion and energy production; Incineration — Types, processes, heat recovery, incineration products
- Definition, sources and classification of Hazardous waste
- Characterization of Hazardous Waste — Ignitability, Corrosivity, Reactivity, Toxicity, Quantification, Waste Minimization
- Toxicology — Toxic effects, Carcinogens, Ecotoxicology, Toxicology Assessment
- Physico-chemical and Biological treatment — Air stripping, Soil vapor extraction, carbon absorption, steam stripping, stabilization and solidification
- Slurry phase and solid phase treatment
- Thermal methods — combustion, liquid injection; Land disposal and site remediation, monitoring of disposal sites.

Atmospheric Pollution and Control:

- Atmospheric structure and composition, Air pollution episodes
- Sources and classification of air pollutants — Natural and anthropogenic, primary and secondary pollutants
- Properties of major air pollutants along with sources and sinks — particulate and gases, photochemical air pollutants, air pollution due to automobiles
- Air pollution effects on human health and welfare, vegetation, animals, materials and structure/ monuments, visibility problem, acid rain, greenhouse effect, Ozone depletion and heat island effect
- Measurement of air pollutants — Measurement of gaseous and particulate pollutants, sample train, air pollution indices and index

- Air pollution Dipterology — scales, factors like heat, solar radiation, temperature, lapse rate, wind, humidity, precipitation, mixing height, pressure atmospheric stability conditions, wind velocity by profile, windrose diagram
- Atmospheric dispersion of stack effects — Plume rise, effective stack height, plume rise formulations, gaussian dispersion coefficients, ground level concentration
- Air pollution control equipment — settling chambers, inertial separators, cyclones, fabric filters, scrubbers, ESP
- Control of gaseous pollutants — adsorption, absorption, combustion and condensation

Transport Processes and Water Quality Assessment:

- Process Dynamics — Transport and Reaction Process, Material Balance, Kinetic Approach to Equilibrium
- Mechanics of Mass Transport — Diffusive Mass Transport and convective Mass Transport in Molecular and Turbulent Flow Regimes
- Chemical Thermodynamics — Free Energy, Entropy Formation, Effects of Ionic Strength on the value of equilibrium constant
- Simultaneous reactions
- Factors affecting equilibrium concentration and their temperature effects
- Process Kinetics — First order reaction, parallel, reversible and enzyme reaction
- Gas Absorption and Adsorption, Particle treatment, Ion exchange and electro dialysis
- Groundwater Quality — Basic Differential Equation, 1-D and 2-D approaches
- Ultimate Disposal of wastewater in water bodies and on land
- Wastewater disposal in rivers — effects of Oxygen demanding outfit I, pipe and diffuser outfall
- Wastewater disposal in Lakes — Steady state 'DO' analysis for completely mixed and stratified lake, nutrient loading
- Wastewater disposal in estuaries — characteristics of Estuarine flow regime
- Wastewater disposal on land — application rate, leaching factor, SAR, Microbial effects on soils
- Subsurface Water-Quality Assessment Impacts of point source, discharge and leachate from landfill sites.

Environmental Impact Assessment:

- Introduction — Rapid and comprehensive EIA, Need of EIA studies
- Baseline data
- Hierarchy in EIA, Statutory requirements of ETA
- Advantages and Limitation of EIA, Step-by-step Procedure for conducting EIA
- Objective and Scope of EIA
- Environmental attributes, Public participation in EIA, Environmental, and Disaster Management Plans; Project Activities — Attribute, Activity relationships, Matrices and BEES
- Impact Quantifications — Hazardous Waste Dumpsites, Sanitary Landfilling
- EIA of Infrastructural Projects — Highways, Airports, Watersupply and Sanitation, Wastewater treatment; ETA of Construction projects — Effects and Mitigation
- EIA of Water Shed Development Programme (Reservoirs, Dams, Irrigation and Agricultural Activity)
- ETA of Power projects — Hydro, Thermal and Nuclear
- EIA of Industrial Developmental Process.