

Syllabus for Environmental Engineering

ENGINEERING MATHEMATICS

Linear Algebra: Matrix algebra, Systems of linear equations, Eigen values and eigenvectors.

Calculus: Functions of single variable, Limit, continuity and differentiability, Mean value theorems, Evaluation of definite and improper integrals, Partial derivatives, Total derivative, Maxima and minima, Gradient, Divergence and Curl, Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Differential equations: First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Cauchy's and Euler's equations, Initial and boundary value problems, Laplace transforms, Solutions of one dimensional heat and wave equations and Laplace equation.

Complex variables: Analytic functions, Cauchy's integral theorem, Taylor and Laurent series.

Probability and Statistics: Definitions of probability and sampling theorems, Conditional probability, Mean, median, mode and standard deviation, Random variables, Poisson, Normal and Binomial distributions.

Numerical Methods: Numerical solutions of linear and non-linear algebraic equations Integration by trapezoidal and Simpson's rule, single and multi-step methods for differential equations.

Gravimetric analysis, titrametric analysis and instrumental analysis: Significance of pH, Solids, Acidity, Alkalinity, COD, DO, BOD, Hardness, Sulphate, Fluoride, Chloride, Turbidity, spectrophotometry, colorimetry, chromatography.

Water supply & sewage system: Design of water distributions system, design of sewage collection system, sources of water & its quality.

Water & Wastewater treatment:- Primary, secondary & tertiary treatment, screens, grit chamber, coagulation, flocculation, sedimentation, biological treatments of wastewater (aerobic & anaerobic), adsorption, disinfection, filtration, water softening, reverse osmosis, ion exchange method, sludge treatment & disposal.

Air pollution:- Sources & effects of air pollutants, criteria air pollutants, effects of meteorological parameters on ambient air quality, thermal inversion, control of particulates, Ambient Air quality Standards & limits.

Noise Pollution: Noise as a pollutant, measurement of noise, units of expressions, effects of noise, permissible limits.

Environmental Impact Assessment & Legislation: Sustainable Development, EIA as a four step activity, Need for EIA, EIA Notification 2006& its requirement, EPA 1986, Water Act 1974, Air Act 1986 Hazardous Waste Management Rules , Environmental Audit.

Industrial Water Pollution : Principles of water pollution control-Reduction of strength & volume, Neutralization, Equalization, Discharge standards, Effluent Standards, Stream Standards, Effluent Quality and treatment flow sheet for dairy industry, textile process house and distillery.

Municipal solid waste management: Municipal solid waste characteristic, Quantities, composition and generation, engineered system for solid waste management, secured landfill site, energy recovery.

Water requirements: Quality standards, Hydraulic design of sewer, basic unit processes and operations for water treatment, Design of Facilities for Physical, Chemical Treatment of Waste Water. Drinking water standards, water requirements, basic unit operations and unit processes for surface water treatment, Sewage and sewerage treatment, quantity and characteristics of wastewater. Effluent discharge standards.

Domestic wastewater treatment: quantity of characteristics of domestic wastewater, primary and secondary treatment, Unit operations and unit processes of domestic wastewater.

Air Pollution: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits.

Municipal Solid Wastes: collection and transportation of solid wastes.

Solid & Hazardous Waste Management : Definition of hazardous waste, The magnitude of the problem, Risk assessment, Environmental legislation, Characterization and site assessment, Waste minimization and resource recovery, Physico-chemical treatment, Transportation of hazardous waste, Ground water contamination, Landfill disposal.

Environmental Impact Assessment Concept of EIA, Short term versus long term impacts, Cumulative impacts, Environment setting, Prediction & Assessment of impact of physical biological and socio – economic environment projects , Methods of Analysis, Methods of Analysis of impact on environment., Public Participation concept, Notification and its interpretation. Environmental Legislation: Need for environment legislation, National and State level legislation for prevention of air and water pollution, Function of Pollution Control Boards, Difficulties encountered in enforcing legislation. Environment Audit, Objectives, Concepts, Methodologies & Benefits.
