

SYLLABUS FOR Ph.D. ENTRANCE TEST
DEPARTMENT OF ENVIRONMENTAL ENGINEERING
SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING
JSS SCIENCE AND TECHNOLOGY UNIVERSITY, MYSURU – 570 006

UNIT -1

Properties of fluids and Fluid pressures and Measurement: Newtonian and non-Newtonian fluids, Newton's law of viscosity, surface tension, Pascal's law, pressure-density-height relationship, pressure and its measurements. Pipe losses.

Water resources Engineering: Precipitation, infiltration, runoff, hydrographs, stream gauging methods. Ground water hydrology – basic flow equations, steady state equations for confined and unconfined aquifers, ground water recharge techniques.

Soil Dynamics: Geological minerals and water quality linkages, re-mineralization and demineralization through geo – filtration for water quality. Characterization of soil for waste discharge. Geo-Textiles and its application in Environmental Engineering practices.

UNIT -II

Water Treatment and Supply Engineering

Drinking water quality parameters, Guide lines and Standards. Water Demand and Design Period. Unit Operations - Design principles of Aeration, Sedimentation, Coagulation, Pulsator/ Dissolved Air Flotation, Filtration and Disinfection.

Distribution System - Gravity and pressure flows. Rising main economics, Hydraulic Transients, Hazen-William's equation, Manning's equation, Cole Brooke-White equation. Hardy-Cross and Newton-Raphson method of pipe design. Implications of 24 x 7 water supply.

Wastewater Engineering: - Characteristics of domestic wastewater. Hydraulic designs of sewers.

Unit Operation and Processes: Reaction kinetics, Bio-kinetic Co-efficient and types of Reactors. Design and design criteria – Screens, grit chamber, sedimentation tanks, attached growth and suspended growth systems.

Industrial Wastewater treatment: Process industries – wastewater characteristics. Equalization basin design and applicable unit operations and unit processes. Dissolved Air Flotation, advanced oxidation, Electro-dialysis, Ion exchange, advanced filtration. Electrochemical Coagulation, SBR, MBR, UASB and anaerobic filters. Nutrient removal, wet air oxidation.

Residual waste management: Solid wastes and sludge treatment – Design criteria of aerobic and anaerobic sludge digestion systems, filter presses. Alternate uses and safe disposal of sludge.

UNIT – III

Municipal Solid Waste (MSW): Characteristics of MSW, MSW Rules. Engineering Principles – Waste Generation, Collection, Transportation and Storage, Transfer station – Regional Concepts, DMA, and 5 R management.

Bio Medical Wastes (BMW): Sources, segregation and handling, BMW (Management & Handling) Rules.

Treatment and disposal options for MSW & BMW: Composting, vermi-composting, biogasification, incineration, pyrolysis and plasma technologies. Engineered landfills - gases and leachate control. Community Based Waste Management and Public Private Partnership in MSW and BMW.

Hazardous Waste (HWM): Source, Generation, Characterization and Classification of HWM. Rules, SARA Act, National Priority Law, NCP, HRS, RCRA and Cradle to Grave Concepts. E – Waste (Management & Handling) Rules and Treatment and Disposal. Waste Minimization and Resource Recovery.

UNIT – IV

Environmental Impact Assessment (EIA): EIA as practiced in India and other countries, MoEF & CÇ Guidelines. EIA Process. Methodologies and Techniques in EIA. Environmental Attributes and parameters. Public Participation in EIA.

Disaster Management: Types, assessment, preparedness, prevention and mitigation.

Atmospheric Environmental Engineering: Sources and classification of air pollutants, effects of air pollution, air quality monitoring. Meteorological factors influencing air pollution dispersion and its control. AQI, Pollutant dispersion models. Air pollution control equipments – working, design criteria. Noise pollution – attenuation equations.

Environmental Management Systems (EMS): Organizational structure in India. TQM for Environmental Protection, ISO series of Standards. Project formulation – PERT and CPM. Cleaner Technology, pollution prevention and green engineering concepts. Environmental Communication – NGOs, GOs, PPP, educational institutions.

Occupational Safety and Health: Occupational hazard and control – Human error analysis in causation with hazard analysis, Fault Tree analysis. Emergency response and decision fraction. Occupational health – personnel protective equipment, Occupational Health and safety considerations in industries and treatment facilities.

UNIT – V:

Environmental Systems Optimization: Classification and Environmental engineering applications of optimization. LPP – simplex and dual simplex method, Applications of Transport model and solutions: North-West corner rule, Vogel's approximation method- Application of LPP to wastewater reuse Solid Waste management and air pollution control.

Non-point Sources of Pollution: Groundwater movement and contamination, Urban Storm water – Deposition and accumulation of pollutants on impervious surfaces. Simulation models for non-point sources of pollution. Fugitive air emissions. Quantification and Qualitative analysis of pollutants from agricultural and mining areas. BMP of non-point sources of pollution control.

Fate and Transport of Environmental Pollutants

Mass balance approach, Combined convective and diffusion equations for 1, 2, and 3 D cases. Mixing zone concept – Streeter-Phelp's equation, Expression for critical point, 2-D models. Water quality processes in natural water bodies: Stratified and completely mixed conditions.

O and M of Water and Wastewater Treatment Facilities

Pilot plants, full scale plants, Lay-out styles, UOs and Ups, construction process, BOOT, Passive, Reactive, Predictive and Proactive maintainance, Log Books, SCADA System. O & M of Air and Noise pollution control systems.