DEPARTMENT OF ENVIRONMENTAL SCIENCE & ENGINEERING

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR

Entrance Test Syllabus for Admission in Ph.D. in Environmental Science & Engineering

Unit- I Ecology and natural resources

Biosphere, Population and communities, ecological succession, ecological niche. Ecosystem, biogeochemical cycles systems analysis and ecological modeling. Biodiversity: Importance, threats to biodiversity, conservation practices, Indian Scenario, National Parks & Sanctuaries, mineral resources-reserves, prospects and problems. Energy resources, Physical resources, biological resources.Application of Remote Sensing and GIS in Environmental Science

Unit- II Environmental Chemistry

Physical Environment: origin, composition and characteristics of water, hydrological cycle, Heat Budget of earth, lapse rate and vertical stability of atmosphere, different types of rocks and their formation, soil formation, different land use patterns, Atmospheric Chemistry : Chemical composition of atmosphere, the changing global atmosphere, green house gases and global warming, gaseous transformation in the atmosphere and removal mechanisms, residence-time, acid-rain, ozone layer depletion, nuclear winter, Photochemical smog, Water Chemistry: Water quality parameters, standards, solubility of gases in water, carbonate system, Water acidity and carbon-dioxide in water, alkalinity, BOD, COD, DO determinations, water pollution due to heavy metals, organic pollutants, pesticides and radionuclides, Soil Chemistry: Chemical Weathering, soil clays, CEC, soil acidity, salinity and sodicity, Chemical and mineralogical properties of soils, Soil profile.

Unit-III Environmental Microbiology and biotechnology

Characteristics of major groups of micro-organisms-bacteria, fungi, algae, protozoa, viruses and bacteriophages (in brief), role of microbes in C, N, S & Fe cycling,. Microbiology of aerobic waste water treatment process.Bioremediation- approaches and techniques. Basic Techniques in genetic engineering: Restriction endonucleases, Restriction analysis, Southern blotting and hybridization, Gene identification and isolation; Genomic library, Use of reverse- transcriptase, c DNA library construction and screening, ELISA

Unit-IV Environmental Engineering

Basic mathematics for environmental Engineers, concept of unit operations and processes, concept of material and energy balance,Concepts of flow diagrams and layout of wastewater treatment plants, Design of secondary biological treatment units: Design criteria of Aerobic Process, design of Suspended growth processes: Activated sludge processes, secondary settling tank and stabilization pond, Design of Trickling Filters and Rotating Biological Contractors.General design criteria for Anaerobic Treatment Process, Design of Suspended and Attached, Growth anaerobic Process, Design of Upflow anaerobic sludge blanket process (UASB), Design of sludge treatment units and sludge drying beds. Design for air pollution control devices (Gravity settling chambers, Cyclone and Fabric filters, Electrostatic precipitators, Catalytic converter and Scrubbers).

Unit-V Environmental pollution, Monitoring and Abatement

Water Pollution, Marine pollution, thermal pollution, Soil Pollution, Air Pollution, Noise Pollution
Monitoring and control of air, water and soil samples.

Unit-VI Environmental Impact Assessment

Introduction: Principles, Origin and development of EIA. Essential components of EIA: Project screening, establishing the environmental baseline, impact identification, impact prediction, evaluation and mitigation, participation, presentation and review, monitoring and auditing in EIA processes. Problems of EIA in developing countries, EIA guidelines of Ministry of Environment and Forest (MoEF). Environmental Policy and Laws
Environmental Conventions and Treaties : Stockholm Conference, The Rio Earth Summit, 1992 ; Convention on climate change ; Agenda 21; Montreal Protocol, Kyoto Summit, 1997 ; World Summit on sustainable development, 2002 ; Movements (Chipko, Apiko&KhejarliKaKhadana) , Public Interest Litigation, Basel Convention and CDM-Carbon footprints.

Unit-IV Instrumentation

Principles, working and applications of AAS, Gas Chromatography, Flame Photometry, HPLC, Spectrophotometry, X-ray Diffraction. Principles, working and applications of Microsocopy-Phase contrast, fluorescent, polarization, SEM.

Current Environmental Affairs