Syllabus of the Admission test for PhD Admission ODD SEM (2021-2022) for candidates having Environment background

Syllabus of Environment

Compulsory area:

Basics of Environmental Science and Engineering: Atmosphere, Biosphere, Hydrosphere, Lithosphere; Environmental issues and challenges, Natural and anthropogenic sources of organic and inorganic pollutants, Gibbs energy, chemical potential, chemical equilibria, acid base reactions, buffers and buffer index, pE-pH diagrams, redox potential, solubility product, solubility of gases in water, the carbonate system, Measurement and detection techniques of water and wastewater quality parameters, Determination of SPM, RMP, SOx, NOx and CO in ambient air.
Drinking water standards and wastewater characteristics, Drinking water standards and wastewater characteristics, Sources of water pollution: groundwater and surface water. Domestic water and wastewater treatment. Treatment options and selection of appropriate methods; Physico-Chemical treatment: Screening, Flow equalization, Filtration, Coagulation, Flocculation and settling, Chemical precipitation, Sedimentation, Design of Flocculator, settler. Biological treatment: Fundamental of biological treatment process; Activated sludge process – basics of operation and trouble shooting, Design of activated sludge treatment system. Trickling filter: Basic operation and trouble shooting, Designing Trickling filter system, Anaerobic sludge blanket system: Operation and Principle; Sludge disposal and treatment; Nutrients Removal from wastewater. Ion-exchange; Disinfection of water; Membrane separation; Adsorption. Environmental Standards and Laws.
Air qualities and their pollution parameters; Sampling and measurement of air pollution parameters: Ambient air sampling, Stack sampling, Monitoring equipment, Analysis of air pollutants. Meteorology of Air pollution control: Solar radiation, Heat balance, Wind velocity, Turbulence, Wind profile, Humidity, Temperature; Atmospheric stability: Lapse rate, Inversion, Plume shape, Maximum mixing depth, Air pollution dispersion modelling, General ideas in Air Pollution Control. Air pollution control methods, equipment, design and engineering: Particulate emission control – Gravity settling chamber, Cyclone separator, ESP, Bag filter, Venturi scrubber. Control of gaseous emission; Control of gaseous pollutants – Control of VOC, Control of NO_X, Control of SO_X, Control of CO & CO_2; Pollution from mobile sources, problems, effects, testing and control, preventive measures. Noise – sources, measurements, effects and occupational hazards, Standards, Noise mapping, Noise attenuation, Prediction equations, Control measures, Legal aspects of noise.
Solid waste sources: Industrial, Mining, Agricultural and Domestic (Urban) wastes. Municipal solid waste management: Waste generation, collection, storage, transfer, treatment and disposal; MSWM Rules. Solid waste characterization and reduction, reuse and recycling, resource recovery and utilization; Life cycle assessment of waste. Processing of MSW: Unit operations; Segregation; Shredding and screening plastic waste, refuse derived fuel composting biofuel production; incineration and energy recovery. Landfill design and operation: site selection, design and operations, equipments, costs, liner and covers, leachate control and treatment, gas recovery and control, landfill monitoring and reclamation; Incinerator. Biomedical waste categorization, generation, collection, transport, treatment and disposal. Hazardous waste: Characteristics

including classification and generation, Collection, Treatment, Monitoring, Disposal; Remediation of contaminated sites; radioactive waste management. Groundwater quality and transport, porosity and permeability,

Optional area:

Water and wastewater treatment: Water and wastewater quality standards, guideline and impact on health; Removal of emerging pollutants from water and wastewater by physicochemical processes; Fundamental knowledge on kinetic and equilibrium study; knowledge on modelling of batch and continuous mode experimental data.

Assessment of Groundwater Resource and contamination : Application of Darcy's law, Flownet analysis, Well hydraulics, groundwater modelling, Advection, Dispersion, Diffusion, Redox, Thermodynamics in chemical equilibrium, CEC, Solubility

Remote Sensing and GIS: Interaction of EMR with atmosphere and target, Spectral signature of various land cover features, Visual image interpretation, Thermal and Hyperspectral remote sensing, Spatial data and attribute data, their sources, Digitising , editing and structuring of map data, Topology creation, Concepts of adjacency, connectivity and containment, Single and multi layer raster and vector anlysis, Application of remote sensing and GIS in groundwater.