



MADHYANCHAL
PROFESSIONAL UNIVERSITY

Syllabus
for
Ph. D in
Environmental Science

Paper - I

UNIT I. BASIC PRINCIPLES OF ENVIRONMENTAL SCIENCES

Definition, Principles and scope of environmental science, Man and environment, ecosystem, pathways in ecosystem. Physico-Chemical and Biological factors in the environment. Geographical classification and Zones. Structure and composition of Atmosphere, Hydrosphere, Lithosphere and Biosphere. Natural resources and its conservation and sustainable development

UNIT II. FUNDAMENTALS OF ENVIRONMENTAL CHEMISTRY

Stoichiometry, Solubility product, solubility of gases in water, the carbonate system, Unsaturated and saturated hydrocarbons, radio nuclides. Chemical compositions of Air: Classification of elements, chemical speciation, Particles, Ions and radicals in atmosphere, chemical processes for formation of inorganic and organic particulate matter, thermo chemical and photochemical reaction in atmosphere Oxygen and Ozone chemistry, chemistry of air pollutants, photochemical smog

Water Chemistry: Chemistry of water, Concept of DO, BOD, COD, Sedimentation coagulation, Filtration, Redox potential.

Soil Chemistry: Inorganic and organic components of soil, Nitrogen pathways and NPK in soils.

Toxic Chemicals in the environment-Air, Water: Pesticides in water, Biochemical aspects of Arsenic, Cadmium, Lead Mercury, Carbon monoxide, Ozone and PAN pesticides, insecticides, MIC, carcinogens in the air.

UNIT III. ECOLOGICAL CONCEPTS



Definition, Principles and scope of ecology, Human ecology and Human settlement, evolution, origin of life and speciation. Ecosystem: Structure and functions, Abiotic and biotic components, energy flows, food chains, Food, web, Ecological pyramids, types and diversity. Ecological succession, population, Community ecology and Parasitism, Preypredator relationships. Common flora and fauna in India.

Aquatic: Phytoplankton, Zooplankton and Macrophytes. Terrestrial: forest, Endangered and Threatened Species.

Biodiversity and its conservation: Definition, Hotspots of biodiversity, Strategies for biodiversity conservation, National Sanctuaries, Gene pool.

Micro flora of Atmosphere: Air Sampling techniques, Identification of aeroallergens, Airborne disease and allergies.

Environmental Biotechnology: Fermentation Technology, Sericulture Technology, Biofertilizer Technology.

UNIT IV. ENVIRONMENTAL GEOSCIENCES

The Earth system and Biosphere: Conservation of matter in various Geosphere, Lithosphere, Hydrosphere, Atmosphere and Biosphere, Energy budget of the earth, earth's environment, and seasons. Ecosystems flow of energy and matter, coexistent in communities-Food webs, Earth's major ecosystems-terrestrial and aquatic, General relationship between landscape, biomes and climate, Climate of India, Indian Monsoon, El nino, Droughts, Tropical cyclones and Western Disturbances

Geological hazards : Earth's process, Concept of residences and rate of natural cycles, Catastrophic geological hazard, Study of floods, Landslide, Earthquakes, Volcanism and Avalanche, Prediction and perception of the hazards and adjustment to hazardous activities.

Mineral Resources and environment: Global Water Balance, Ice sheets and fluctuating of sea levels, Origin and composition of seawater, hydrological cycle, factor influencing the surface water, Types of Water, Resources of Ocean, Oceans pollution by toxic wastes, Human use of surface water and ground water, Ground water pollution.

Principles of remote sensing and its application of environmental science, Application of GIS in environmental management.

UNIT V. ENERGY RESOURCES

Sun as source of energy, Solar radiation and it's spectral characteristics, Fossils fuels-

conversion, Wind energy, Hydro-energy, Geothermal energy, Solar collector, Photovoltaic, Solar pond, nuclear energy-Fission and fusion, magneto hydrodynamic power, Bio-energy from biomass and biogas, Anaerobic digestion, Energy use pattern in different parts of the World.

Environmental implication of energy uses, CO₂ emissions, Global warming, Air and Thermal pollution, Radioactive waste and radioactivity from nuclear reactors, Impacts of large scale exploitation of Solar.

UNIT VI. POLLUTION

AIR: Natural and anthropogenic source of pollution, Primary and Secondary pollutants , Transport and diffusion of pollutants, gas laws governing the behavior of pollutants in the atmosphere, Methods of monitoring and control of air pollution SO₂, NO_x, CO, SPM, Effects of pollutant on Climate, human beings, plants and animals, Acid rain, Air Quality standards.

Water: Types, Sources and consequences of water pollution, Physio-chemical and Bacteriological sampling and analysis of water quality, Standards, Sewage waste water treatment and recycling .Water quality standards.

Soil: Physico-chemical and Bacteriological sampling as analysis of soil quality, Soil pollution control, Industrial waste effluents, and heavy metals. Their interaction with soil components, Soil microorganism and their functions, Degradation of different insecticides, fungicides and weedcides in soil, Different kind of Synthetic fertilizer (NP& K) and their interaction with different component of soil.

Noise: Sources of noise pollution Measurements of noise and indices, effect of metrological parameters on noise propagation, Noise exposure levels and Standards. Noise control and battement measures. Impact of noise on human health.

Marine: Sources of Marine pollution and control, Criteria employed for disposal of pollutants in marine system-coast management. Radioactive and thermal Pollution.

UNIT VII. ENVIRONMENTAL IMPACT ASSESSMENT

Introduction to environmental impact assessment and environmental Management Plan. EIA guidelines 1994. Notification of Government of India, Impact Assessment Methodologies, generalized approach to impact analysis, Procedure for reviewing environmental impact analysis and statement. Guidelines for Environmental Audit, Introduction to environmental

PAPER -II

General Aptitude (GA)

Verbal Ability: English grammar, sentence completion, verbal analogies, word groups, instructions, critical reasoning and verbal deduction.

Numerical Ability: Numerical computation, numerical estimation, numerical reasoning and data interpretation.