

MPAT-ENVIRONMENTAL SCIENCE

MPAT-2019-2020

UNIVERSITY OF RAJASTHAN, JAIPUR

SUBJECT-ENVIRONMENTAL SCIENCE

Section-A

Definition, principles and scope of Environmental science.

Earth, Man and Environment, Ecosystems, Pathways in Ecosystem.

Physico-chemical and Biological factors in the Environment.

Geographical classification and zones.

Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Mass and Energy transfer across the various interfaces, material balance. First and second law of thermodynamics, heat transfer processes. Scale of Meteorology, pressure, temperature, precipitation, humidity, radiation and wind, Atmosphere stability, inversions and mixing height, wind roses.

Natural resources, conservation and sustainable development.

Fundamentals of Environmental Chemistry : Stoichiometry, Gibbs' energy, Chemical potential, chemical equilibria, acid base reactions, solubility product, solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons, radionuclides.

Chemical composition of Air: Classification of elements, chemical speciation, Particles, ions and radicals in atmosphere, chemical processes for formation of inorganic and organic particulate matter. Thermochemical and photochemical reactions 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.

Principles of Analytical Methods; Titrimetric, Gravimetric, Colorimetry, Spectrophotometry, Chromatography, Gas Chromatography, Atomic Absorption Spectrophotometry, GLC, HPLC, Electrophoresis, X-Rays fluorescence, X-ray diffraction , Flame photometry.

Definition, Principles and scope of ecology, Human ecology and Human settlement, Evolution, Origin of life and speciation.

Ecosystems: 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, Prey predator 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 Parks and Sanctuaries. Gene pool.

Microflora of Atmosphere: Air Sampling techniques, Identification of aeroallergens, Air-borne diseases and allergies.

Environmental Biotechnology: Fermentation Technology, Vermiculture technology, Bio-fertilizer technology.



Section-B

Environmental Geosciences- Fundamental Concepts

Earth systems and Biosphere: Conservation of matter in various geospheres-lithosphere, hydrosphere, atmosphere and biosphere, Energy budget of the earth. Earth's thermal 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.

Earth's Processes and Geological Hazards: Earth's Processes; Concept of residence, time and rate of natural cycles. Catastrophic geological hazard. Study of floods, landslides, earthquakes, volcanism and avalanche. Prediction and perception of the hazards and adjustment to hazardous activities.

Mineral Resources and Environment: Resources and Reserves, Minerals and Population. Oceans as new areas for exploration of mineral resources. Oceans ore and recycling of resources. Environmental impact of exploitation, processing and smelting of minerals.

Water Resources and Environment: Global Water balance, Ice sheets and fluctuating of sea levels. Origin and composition of seawater. Hydrological cycle. Factors influencing the surface water. Types of Water. Resources of Ocean. Oceans pollution by toxic wastes. Human use of surface and ground water, Groundwater pollution.

Land use Planning: the land use plan. Soil surveys in relation to land use planning. Methods of site selection and evaluation.

Environmental Geochemistry: Concept of major, trace and REE, Classification of the trace elements, Mobility of trace elements, Geochemical cycles, Biogeochemical factors in environmental health, Human use, Trace elements and health. Possible effects of imbalance of some trace elements.

Diseases induces by human use of land.

Principles of remote sensing and its application of Environmental science. Application of GIS in Environmental Management.

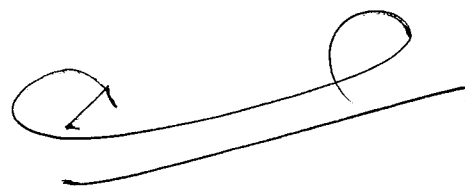
Sun as source of energy: Solar radiation and its spectral characteristics; Fossil fuels-classification, compositions, physico-chemical characteristics and energy content of coal, petroleum and natural gas, Principles of generation of Hydroelectric power, tidal, Ocean Thermal Energy Conversion, wind, geothermal energy; solar collector, photovoltaic, solar ponds; nuclear energy-fission and fusion; magneto hydrodynamic power, bio-energy-energy from biomass and biogas, anaerobic digestion; energy use pattern in different parts of the world.

Environmental implication of energy use; CO₂ emissions, global warming, air and thermal pollution; radioactive from nuclear reactors; Impacts of large -scale exploitation of Solar, Wind, Hydro and Ocean energy.

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, Acid rain, Air Quality standards.

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



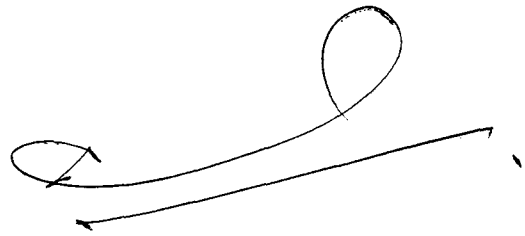
Water quality standards.

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 microorganisms and their functions, degradation of different insecticides, fungicides and weedicides in soil, Different kind of synthetic fertilizer (N, P & 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 abatement measures. Impact of noise on human health.

Marine: Sources of marine pollution and control, Criteria employed for disposal of pollutants in marine system-coastal management.

Radioactive and Thermal Pollution.



Section-C

Introduction to environmental impact analysis.

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 Planning.

Base line information and prediction (land, water, atmosphere, energy etc.).

Restoration and rehabilitation technologies.

Land use policy for India.

Urban planning for India, Rural planning and land use pattern.

Concept and strategies of sustainable development.

Cost-Benefit analysis.

Environmental priorities in India and sustainable development.

Sources and generation of solid wastes, their characteristics, chemical composition and classification, Different method of disposal and management of solid wastes (Hospital Waste and Hazardous wastes) Recycling of waste material. Waste minimization technologies.

Hazardous Waste Management and handling Rule, 1989, Resource Management, Disasters Management and Risk analysis.

Environment protection-issues and problems, International and national efforts for environment Protection, Provision of Constitution of India regarding Environment (Article 48A and 51A).

Environmental Policy Resolution, Legislation, Public Policy Strategies in pollution control, Wildlife Protection Act 1972 amended 1991, Forest Conservation Act, 1980, Indian Forest Act (Revised) 1982, Air (Prevention and Control of Pollution) Act, 1981, Water (Prevention and Control Pollution) Act, 1974 as amended up to 1988 and rules 1975, Environmental (Protection) Act, 1986 and Rules 1986.

Scheme of labeling of environment friendly products (Eco mark), Public Liability Insurance Act, 1991 and Rules 1991.

Basic elements and tools of Statistical analysis, Probability, sampling, measurement and distribution of attributes, Distribution-Normal t and x, Poisson and Binomial; Arithmetic, Geometric and Harmonic means; moments; Matrices, simultaneous linear equations; tests of hypothesis and significance.



Introduction to environmental system analysis, Approaches to development of model; linear simple and multiple regression model, validation and forecasting, Model of population growth and interaction, Lotka-Volterra model, Leslie's matrix model, point source stream pollution model, box model, Gaussian plume model.

Environmental Education and Awareness.

Environmental ethics Global imperatives.

Global environmental problems-Ozone depletion, global warming and climatic change.

Current Environmental issues in India. Context: Narmada Dam, Tehri Dam, Almethi Dam.

Soil erosion, Formation and reclamation of Usar, Alkaline and Saline Soil.

Waste lands and their reclamation.

Desertification and its control.

Vehicular pollution and urban air quality.

Depletion of Natural Resources.

Biodiversity conservation and Agenda-21.

Waste disposal, recycling and power generation, Fly ash utilization.

Water Crises-conservation of water.

Environmental Hazards, Eutrophication and restoration of Indian lakes.

Rain water harvesting.

Wet lands conservation.

Epidemiological issues (i.e Goiter, Fluorosis, Arsenic).

