

Semester- II

Minor/Elective

Environmental science and Basic (4 CREDIT) Concepts of Ecology

Environmental science

1. Introduction of environmental Science: Definition, principles and scope of environmental science, structure and composition of atmosphere, hydrosphere, lithosphere and biosphere.
2. Ecosystems: definition, structure and function of ecosystem, energy flow in an ecosystem, food chain, food web and ecological, case studies of the following ecosystem: forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem.
3. Natural resources: Renewable and Non-renewable resources: land resources and land use change, land degradation soil erosion and desertification. Deforestation: causes and impacts due to mining, dam building on environment, of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, growing energy needs case studies.
4. Biodiversity and conservation: Level of biodiversity- genetic, species and ecosystem diversity, Bio geographic zones of India, biodiversity patterns and global biodiversity hot-spots. India as a mega-biodiversity nation, endangered and endemic species of India. Threats to biodiversity - Habitat loss, poaching of wildlife, man-wildlife conflict, biological invasions, conservation of biodiversity-in-situ ex-situ conservation of biodiversity.
5. Environmental Pollution: Types, causes, effects and controls, air, water, soil and noise pollution. Nuclear hazards and human health risks. Solid waste management-Control measures of urban and industrial waste. Pollution case studies.
6. Environmental Policies & Practices: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environmental laws- Environmental Protection Act- Air (Prevention & Control of Pollution) Act. Water (Prevention & Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, International agreements-Montreal and Kyoto protocols and Conservation of Biological Diversity (CBD).

Basic Concepts of Ecology

Definition of ecology and its relation to humanity.

The environment: Abiotic factors, biotic factors, edaphic factors.

Concept of ecosystem with reference to pond, Grassland, Forest & River ecosystem. Energy flow in ecosystem. Pyramids of number, biomass and energy. Food chain- grazing and detritus, Food web and trophic levels. Biosphere: Hydrosphere, Lithosphere and Atmosphere. Biogeochemical cycles: Carbon and Nitrogen cycles.

Population: Definition and characteristics: density, natality, mortality, migration, emigration and immigration, growth and growth-curves. Dispersion and aggregation. Negative and positive interactions including commensalism, mutualism, predation, competition and parasitism.

Practical

Suggested

books:

1. Odum, E.P: Fundamental of Ecology, Saunders Co. Publ. Indian Ed.
2. Chapman & Reiss: Ecology.
3. Smith, R.L: Ecology & Field Biology.
4. Singh & Kumar: Ecology and Environmental Science, Vishal Publ.
5. Odum, E.P: Fundamental of Ecology, Saunders Co. Publ. Indian Ed.
6. Ecology and Environment by P.D. Sharma.

Semester- IV

Minor/Elective BioInstrumentation, Bio Informatics and Biostatistics

(4+2 Credits)

BioInstrumentation

Principles and Techniques of Microscopy; Magnification and Resolution Parameters of Light, Fluorescent Phase Contrast Scanning, Transmission Electron Microscopy, Tunneling Microscopy and Inverted Microscope, Micrometry, Colony Counting and Microtomy. Laboratory Safety Guidelines.

Centrifugation – Basic Principles of Sedimentation, Types of Centrifuges, Ultracentrifugation, Differential and Rate Zonal Separations, Organellar Separation and Flow Cytometry.

Principle & Applications of Ph Meter, Spectroscopy UV- Vis, Mass Spectrometry (MS) and X-Ray Crystallography.

Chromatographic Techniques, Paper Chromatography, Partition Chromatography, Column Chromatography, Thin Layer Chromatography, Gas Chromatography, Ion Exchange, Affinity Chromatography and Introduction to HPLC,

Electrophoresis: Capillary, Agarose, SDS & Native PAGE, Pulse Field, Immuno-Electrophoresis and Paper Electrophoresis.

PCR & Thermal Cyclers, Nucleic Acid Hybridization: Southern & Northern Blotting, Western Blotting, Autoradiography. ELISA and RIA.

Bio Informatics

Introduction to Computers, Computer Fundamentals (Hardware & Software), Input, Output Devices and Storage Devices, Web Browsers, Search Engines, Flow Charts, Methods and Types of Networks, Intra and Internet, Introduction to MS-Office.

Introduction to Bioinformatics, Scope and Application of Bioinformatics, NCBI Data Model, DNA and Protein Sequence Database, Motif Analysis, Structural Database, Structural Viewers (Rasmol, Rastop, Cn3D, CSHF Chimera, Swiss PDB Viewer, Pymol), Sequence Submission to Database, Literature Database (Pubmed, Biomed Central, Medline), Internet and Biologist. Online Study *E. coli*, *D. melanogaster*, Human Genome, Mice Genome. DNA Chips and their Replications.

Biostatistics

Introduction to Biostatistics, Terminology and Symbols, Research and Types of Research, Applications of Statistics in Biological Research, Data, Collection and Representation of Data (Pie Chart, Bar Diagram, Histogram, Frequency Polygon and Gantt Chart), Measures of Central Tendency (Mean, Median, Mode), Variance, Coefficient of Variation, Standard Deviation, Standard Error of Mean, Analysis of Variation (ANOVA), One Way ANOVA and Two Way ANOVA. Measures of Dispersion, Distribution Patterns (Binomial, Poisson & Normal), Tests of Significance ('T' Test, 'F' Test & Chi-Square Test), Probability, Correlation and Regression Analysis, Introduction to Statistical Software and Handling (SPSS And Excel Data Sheets).

Practical

Suggested books:

1. Introduction to Biostatistics by Dr. Pranab Kr. Banarjee.
2. Bioinstrumentation by L. Veerakumari
3. Bioinformatics: Sequence And Genome Analysis by David W. Mount.
4. Basic Bioinformatics by S. Ignacimuthu Published by Narosa Publishing House New Delhi.