

B.Sc. Environmental Science
Major/Minor
Semester-I

Paper Title: Environment and Ecology

(4+2 credits)

Paper code: EVS122M

Paper outcome: This paper is designed to introduce the basic concepts of Environment and Ecology leading to better understanding of inter-connections of Environmental Science as a discipline.

Unit 1: Basics of Environment

Environmental science: Scope and importance, Components of environment: Atmosphere, Lithosphere, Hydrosphere, Biosphere (structure and function), Brief account of Cryosphere and Anthroposphere (Built Environment).

Unit 2: Population and community

Concept of population, Population growth (Density dependent and density independent factors), Survivorship curves and age structure, Biotic potential and carrying capacity (r and k strategists), Population interactions: Mutualism, Protocooperation, Commensalism, Competition, Herbivory, Predation, Parasitism, Community: Concept and characteristics, Ecological succession.

Unit 3: Ecosystems

Ecosystem: Concept, Organization and significance, Types of ecosystems, Food chains, Food webs and trophic levels, Ecological pyramids, Energy flow in ecosystems, Ecosystem productivity, Decomposition, Biogeochemical cycles: Carbon, Nitrogen, Phosphorus and Sulphur.

Unit 4: Human ecology

Global and regional human population growth, Theories of human population growth (Malthusian and neo-malthusian), Drivers of human population change, Growth curves and population projections, Earth's carrying capacity and ecological footprint, Brief account of Anthropocene.

Laboratory course

(2 credits)

1. Study of water flow and discharge from any water body
2. Study of meteorological parameters (temperature, humidity, rainfall)
3. Study of the soil profile in any ecosystem
4. Study of vegetation in a particular ecosystem (lake, forest, agricultural, grassland etc)
5. Study of fauna in a particular ecosystem (lake, forest, agricultural, grassland etc)
6. Study of biomass and carbon stock of herbaceous vegetation in any ecosystem (lake, forest, agricultural, grassland etc)
7. Case study of approaches used by any country or region for human population management
8. Field /Environmental visit to understand various environmental components

Bibliography

1. Basics of Environmental Science: Michael Allaby
2. Environmental Sciences (system and solutions): Mckinney and Schoch
3. Environmental Science: Botkin, Keller
4. Environmental Science: Tyler Miller
5. Essentials of Geology: Chernicoff, Fox, Venkatakrishnan
6. Concepts of Ecology: E.J. Kormondy
7. Environment Principles & Applications: Chris Park.
8. Fundamentals of Ecology: E.P. Odum
9. Population Ecology: P.S. Aaradhana
10. Ecology and Environment: P.D.Sharma
11. Ecology, Environment and Resource Conservation, Singh, J.S., Singh, S.P. and Gupta, S.R.
12. Environmental Chemistry, De, A.K.

B.Sc. Environmental Science

Major/Minor

Semester-II

Paper Title: Natural resources and biodiversity

(4+2 credits)

Paper code: EVS222M

Paper outcome: This paper is expected to have a broad understanding of various natural resources including biodiversity in terms of availability and diverse consumptive patterns.

Unit I: Forest and food resources

Importance of forests, Timber and non-timber products, Forest types of India and J&K, Food resources of India: An overview, Green, white and blue revolution, Inland fisheries resources of India, World food problem and food security.

Unit II: Soil and water resources

Soil as a natural resource, Pedogenesis and soil horizons, Soil types of India, Soil and food connect, An overview of Global water resources, Fresh water resources of India (Rivers, lakes, wetlands and Ground water), Population, food grain and water connect, Water resource of J&K (Rivers and Glaciers).

Unit III: Mineral and energy resources

Concept of resources and reserves, Mineral resources and types, Properties of minerals, of Mineral resources in India: distribution and consumption patterns Environmental impacts of mining. Classification of Energy Resources: Renewable (Solar, hydropower and green hydrogen) and Non-renewable (Coal, oil and Natural gas), Global Energy demand and supply, Energy scenario in India.

Unit IV: Biodiversity

Definition and concept, Components (Species richness and evenness), Levels of biodiversity: Organisational (genetic, species and ecosystem) and Spatial (alpha, beta and gamma) Endemism, Global biodiversity hotspots, Values of biodiversity: Direct (Productive and consumptive) and Indirect use (Ecosystem services), Ethical values, Threats to biodiversity, IUCN's Red list (Scheme and Status).

Laboratory course

(02 credits)

1. Visit to a Natural ecosystem (Forest, National park, Sanctuary, Lake)
2. Case study of Mining area and assessing the impacts (Boulder mining, sand mining, etc.)
3. Waste/water audit of your institution
4. Energy audit of your institution
5. Socioeconomic survey of any town/village
6. Phytosociology of plant communities
7. Identification of major rock types
8. Calculation of species biodiversity (alpha, beta and gamma)

Bibliography

1. Environmental Science: Botkin, Keller
2. Environmental Science: Jackson & Jackson
3. Environmental Science: Tyler Miller
4. Essentials of Geology: Chernicoff, Fox, Venkatakrishnan
5. Concepts of Ecology: E.J. Kormondy
6. Environment Principles & Applications: Chris Park.
7. Fundamentals of Ecology: E.P. Odum
8. Population Ecology: P.S. Aaradhana
9. Ecology and Environment: P.D.Sharma
10. Ecology, Environment and Resource Conservation, Singh, J.S., Singh, S.P. and Gupta, S.R.
11. Environmental Chemistry, De, A.K.
12. Biodiversity of the Himalaya: Jammu and Kashmir State : Dar, G.H. &Khuroo, Anzar, A.

Multidisciplinary Environmental Science
(UG 1st / 2nd / 3rd Semester)

Paper Title: Environmental Issues and Sustainability

(3 credits)

Paper code: EVS022I

Paper outcome: This course is designed to offer a comprehensive understanding of basic environmental issues, drivers of environmental change and management perspective. Furthermore, this paper will help the students to understand key governance and policy interventions needed to improve the wellbeing of the environment. This course will also highlight the role of citizens and eco-movements to achieve the objectives of sustainability.

Unit I: Global environmental issues

Global warming and climate change, Human population explosion, Desertification, Ozone layer depletion, Acid precipitation, Global biodiversity loss

Unit II: Environmental governance and policy

Concept of environmental governance and environmental literacy, Environmental governance at global level (institutional arrangements), Role of NGO's and corporate in environmental decision making, Constitutional provisions for environmental protection (article 21, 48A, 51A (g)), National Environment Policy-2006

Unit III: Environmentalism, citizen science and sustainability

History and development of environmentalism (Biocentrism, Anthropocentrism, Eco centrist), Environmental movements (Greenbelt movement, Chipko, Narmada bachao andolan), Role of citizen science to foster environmental protection, Concept of Environmental justice and stewardship, Ecological footprint and sustainability, Sustainable development goals (overview)

Bibliography

1. Global Warming and Climate Change: Dr. S K Agarwal.
2. Text Book of Environmental Studies for UG Course: E. Bharucha
3. Biodiversity: K.C. Agarwal
4. Atmospheric pollution and climate change: Dr. P C Sinha.
5. Population Ecology: P.S. Aaradhana
6. Environmental Science: Jackson & Jackson
7. Global & General Environment: H.D. Kumar, Swati Kumar
8. Environmental Science: Enger and Smith
9. Basics of Environmental Science: Michael Allaby
10. Environmental Education (Scientific, Social and Legal Aspects) : H. M. Dami
11. Environmental Problems, Policies and Strategies: Jai Prakash; S. K. Srivastava.

NEP 2020 FYUG PROGRAMME WITH ENVIRONMENTAL SCIENCE AS MAJOR/MINOR
III SEMESTER

COURSE CODE: EVS322J

COURSE TITLE: Environmental Chemistry

Maximum Marks: 100

COURSE TYPE: CT-1 (MAJOR)

CREDITS: (Theory-4, Practical -2)

Minimum Marks: 36

Course learning outcome: This course introduces the students to basic analytical chemistry relevant to the course and is designed to equip the students to handle the analytical instruments. Emphasis is laid to have an understanding of the chemistry of atmosphere, water and soil. The students will also learn basic principles of various chemical processes occurring in the different components of the environment.

THEORY (4 credits: 60 hours)

Unit I: Analytical Chemistry

(15 hours)

- 1.1. Stoichiometry
- 1.2. Titrimetry and Gravimetry
- 1.3. Spectrophotometry: UV-Visible
- 1.4. Flame photometry and AAS
- 1.5. Chromatography: Paper and TLC

(15 hours)

Unit II: Atmospheric Chemistry

- 1.1. Evolution of Earth's atmosphere
- 1.2. Ions and radicals in the atmosphere
- 1.3. Inorganic and organic particulate matter
- 1.4. Photochemical reactions in the atmosphere
- 1.5. Thermochemical reactions in the atmosphere

(15 hours)

Unit III: Water Chemistry

- 1.1. Physico-chemical properties of water
- 1.2. Solubility of gases in water
- 1.3. Biochemical oxygen demand and chemical oxygen demand
- 1.4. Carbonate-bicarbonate system
- 1.5. Nutrients in water: Phosphorus and nitrogen

(15 hours)

Unit IV: Soil chemistry

- 1.1. Pedogenesis
- 1.2. Soil profile
- 1.3. Inorganic and organic components of soil
- 1.4. Physical, chemical and biological properties of soils
- 1.5. Soil classification and types

(30 hours)

PRACTICALS: (2 credits)

1. Standardization of reagents – titrants (acids, bases)
2. Experimental verification of Beer-Lambert's law
3. Measurement of ozone gas concentration by ozone sensor
4. Estimation of dry deposition from the atmosphere
5. Determine pH and conductivity of water samples
6. Determination of dissolved oxygen content in water samples
7. Determination of soil texture
8. Determination of pH and conductivity of soil samples