

# ENVIRONMENTAL SCIENCE (877)

## Aims:

1. To help the student appreciate man's place in the natural systems.
2. To provide a wide understanding of knowledge resources relevant to environment protection and conservation.
3. To permit in-depth study of certain environment related areas.
4. To place environmental concerns in a technological, social, political and economic context.
5. To provide a context for understanding the role of the individual values in conservation.
6. To provide a context for the individual student to reflect on his/her beliefs and values in relation to the environment.
7. To provide an opportunity to acquire interdisciplinary skills, knowledge and understanding and to apply this logically and coherently in the field of environmental conservation.
8. To encourage student initiative and resourcefulness in action leading to environmental protection and conservation.
9. To present environmental concerns in a challenging way and thereby encourage students to consider careers in the environmental field.

## CLASS XI

There will be two papers in the subject.

**Paper I:** Theory- 3 hours ... 70 marks

**Paper II:** Practical/ Project Work- ... 30 marks

### PAPER I - THEORY

*There will be a written paper of 3 hours duration carrying 70 marks divided into two parts.*

***Part 1 (20 marks)*** will consist of ***compulsory*** short answer questions from the entire syllabus.

***Part 2 (50 marks)*** will be divided into three sections. Each section will consist of ***three*** questions. Students will be expected to answer ***five*** questions choosing at least ***one*** from each section.

### SECTION A

#### 1. Modes of Existence

- (i) Modes of existence and resource use: hunting - gathering; pastoral; agricultural; industrial.
- (ii) Their impact on natural resource base: energy resources; material resources; scale of catchment; quantity of resources used.
- (iii) Their social organisation: size of group; kinship; division of labour; access to resources.

(iv) Their ideology and idiom of man-nature relationship.

(v) Their ecological impact: land transformation; habitat; diversity; modification of biogeochemical cycles; modification of climate; substantial use.

(vi) An appreciation of the coexistence of all four modes of existence in contemporary India.

(vii) Ecological conflicts arising therein.

#### 2. Ecology

- (i) Concept of an ecosystem: definition; relationships between living organism, e.g. competition, predation, pollination, dispersal, food chains, webs; the environment - physical (soil, topography, climate); biotic - types of relationships (competition, mutualism, parasitism, predation, defence); soil types and vegetation; co-evolution and introduction of species.
- (ii) Habitats and niches: Gause's competitive exclusion principle; resource partitioning.
- (iii) Flow of energy: efficiencies - photosynthetic - tropic - assimilation - production; tropic levels; generalised model of the ecosystem;

ecological pyramid (numbers and biomass); food webs.

- (iv) Nutrient cycles: generalised model; a study of carbon, nitrogen cycles (biological and geological); man's intervention; pollution as disruption of these cycles; ecosystem as a source of material and sink waste for human societies; ecological succession - causes (autogenic, allogenic and human) - patterns of successions.
- (v) Biomes: terrestrial; fresh water; marine; a survey of the biomes of India and their inhabitants.

### 3. Pollution

- (i) Disruption of nutrient cycles and habitats: atmospheric pollution; human activities that change the composition of the atmosphere; connection between pollution and development; local and global effects (greenhouse effect, ozone depletion) and their impact on human life; burning of fossil fuel products - effect on ecosystem and human health.
- (ii) Pollution control approaches - prevention and control: as applied to fossil fuel burning; the role of PCBs; industrial pollution control - principles - devices - costs - policy incentives; combating global warming; the international political dimensions; third world interest; impact on economic growth.
- (iii) Water pollution: water cycle; pollution of surface water, ground water, ocean water; industrial pollution and its effects; domestic sewage and its treatment - techniques and appropriate technology; marine ecosystem protection and coastal zone management; soil pollution - sources - effects.

## SECTION B

### 4. Legal Regimes for Sustainable Development

- (i) National legislative frameworks for environment protection and conservation; survey of constitutional provisions (including directive principles); national laws; state laws in India.

- (ii) International legal regimes: on trade and environment (GATT, WTO, IPR, TNC's, regional arrangements and preferential trade arrangements); on climate; on common resources (forests, bio-diversities, oceans and space); international institutions (UNEP, UNCTAD, WHO, UNDP, etc.); international initiatives (Earth Summit, Agenda 21).

### 5. Technology and Environment

- (i) Technological evolution and models: hi-tech; low-tech; intermediate; appropriate; traditional; interaction between technology, resources, environment and development; energy as a binding factor; the need for reorienting technology.
- (ii) Renewable energy: limitations of conventional sources; sources of renewable energy and their features (solar, wind, biomass, micro-hydel and muscle power).
- (iii) Health: incidents of disease as an indicator of the health of the environment; prevention of diseases by better nutrition, sanitation, access to clean water, etc.; communicable and non-communicable diseases; techniques of low cost sanitation; policy and organisation to provide access to basic health service for all; the role of traditional and local systems of medicine.
- (iv) Biotechnology: potential; limitations.

## SECTION C

### 6. Design and Planning for Environmental Conservation and Protection

- (i) Ecosystem analysis: understanding complex systems; critical and state variables as system indicators; indicators of inter-relationships; successions and systems resilience; predicting and assessing system responses to impacts and their interventions; rapid appraisal methods.
- (ii) Human environment interactions: quality of life vs. quality of environment; environmental issues and problems; role of belief and values; analysing brief statements for underlying values; issues analysis - separating symptoms from problems; problem identification;

identifying the players and their positions; understanding interacting problems and identifying critical control points; problems analysis; identifying variables (human behaviours, values, ecological, etc.); determining the relationships between variables; formulating questions for research; planning research; generating problems, solution, briefs and specifications.

(iii) Evaluation and assessment of impacts: approaches and techniques of environment and social impact assessment; environment impact assessment as a planning tool and a decision making instrument; interpreting environment impact assessments.

(iv) Design of solutions: generating solution options; overcoming blocks in thinking; generative and lateral thinking; using criteria (social, political, ecological, technological, economic) to rank and prioritise solution ideas; check solutions for economic, social and technical viability; collation of solution into coherent plans; planning sequence and cost.

## **PAPER II - PRACTICAL/PROJECT WORK**

Guidelines for Practical/Project Work are given at the end of this syllabus.