

2.6 ENVIRONMENTAL SCIENCE (THEORY)

50 hours ; 2 hours/week

Unit 1 : Multidisciplinary nature of environmental studies ; Definition, scope and importance **2 hours;2-5 marks**

Unit 2 : Natural Resources : Renewable and non-renewable resources :

Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles. **8 hours;5-10 marks**

Unit 3 : Ecosystems

- Concept of an ecosystem.
 - Structure and function of an ecosystem.
 - Producers, consumers and decomposers.
 - Energy flow in the ecosystem.
 - Ecological succession.
 - Food chains, food webs and ecological pyramids.
 - Introduction, types, characteristic features, structure and function of the following ecosystem :-
 - a. Forest ecosystem
 - b. Grassland ecosystem
 - c. Desert ecosystem
 - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
- 6 hours;5-10 marks**

Unit 4 : Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

8 hours; 5-10 marks

Unit 5 : Environmental Pollution

Definition

- Cause, effects and control measures of :-
 - a. Air pollution
 - b. Water pollution
 - c. Soil pollution
 - d. Marine pollution
 - e. Noise pollution
 - f. Thermal pollution
 - g. Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

8 hours;5-10 marks

Unit 6 : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

7 hours;5-10 marks

Unit 7 : Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

6 hours;5-10 marks

Unit 8 : Field work

(Field work Equal to 5 Hrs)

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc

SIX MONTHS COMPULSORY CORE MODULE COURSE IN ENVIRONMENTAL SCIENCE: FOR UNDERGRADUATES

Teaching Methodologies

The core Module Syllabus for Environment Studies includes class room teaching and Field Work. The syllabus is divided into eight units covering 50 lectures. The first seven units will cover 45 lectures which are class room based to enhance knowledge skills and attitude to environment. Unit eight is based on field activities which will be covered in five lecture hours and would provide student first hand knowledge on various local environmental aspects. Field experience is one of the most effective learning tools for environmental concerns. This moves out of the scope of the text book mode of teaching into the realm of real learning in the field, where the teacher merely acts as a catalyst to interpret what the student observes or discovers in his/her own environment. Field studies are as essential as class work and form an irreplaceable synergistic tool in the entire learning process. Course material provided by UGC for class room teaching and field activities be utilized. The universities/colleges can also draw upon expertise of outside resource persons for teaching purpose. Environmental Core Module shall be integrated into the teaching programmes of all undergraduate courses.

Exam Pattern : In case of awarding the marks, the question paper should carry 100 marks. The structure of the question paper being :

Part-A, Short answer pattern	- 25 marks
Part-B, Essay type with inbuilt choice	- 50 marks
Part-C, Field Work	- 25 marks

ENVIRONMENTAL SCIENCE REFERENCE BOOKS

- a) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- b) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
- c) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- d) Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
- e) Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
- f) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- g) Down to Earth, Centre for Science and Environment (R)
- h) Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
- i) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
- j) Heywood, V.H & Weston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

- k) Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
 - l) Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
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 - n) Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
 - o) Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
 - p) Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
 - q) Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
 - r) Survey of the Environment, The Hindu (M)
 - s) Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
 - t) Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (R)
 - u) Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
 - v) Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p
- (M) Magazine (R) Reference (TB) Textbook