

**DEPARTMENT OF ENVIRONMENTAL SCIENCE**

**P. G. Diploma in Environment Protection & Management [DEPM]**

**New Syllabus**

**2006-2007**

**Paper I : Basic Concepts in Nature**

**Basic concepts in Ecology.**

Definition, principles, scope of ecology and its relation with other divisions of science, sub-divisions of ecology.

**Environmental Science.**

Definition, principles and scope of environment, components of environment, importance of environmental science in changing times, interdisciplinary and multidisciplinary nature of Environmental Science and its applications.

**Ecosystem.**

Concept of ecosystem., biotic and biotic components, structure and function of ecosystem, energy flow in ecosystem, food chain, food web, ecological pyramids and their types, biodiversity and concept of carrying capacity.

**Material Cycles in Ecosystem**

Carbon cycle, oxygen cycle, nitrogen cycle, phosphorus cycle, sulphur cycle, mineral cycle.

**Population Ecology**

Characteristics of population: natality, mortality, density, age distribution and sex ratio, population growth, community ecology, predator-prey relationship.

**Habitat.**

Concept of habitat, ecological niche and guild, species diversity, genetic diversity, ecosystem diversity, ecotones and edge effect, ecological succession, sere and climax.

**Major ecosystems of the world.**

Wetlands, grasslands, marine, desert, mountains, islands . biomes.  
biogeography

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## **PAPER – II : Human Impact on Environment**

### **Environmental degradation, causes and effects.**

Man and his environment, evolution of man with changing environment, major components of environment as lithosphere, hydrosphere, atmosphere and biosphere –Air, Water and soil. General composition, their degradation and effects on man and vegetation.

### **Population pressure.**

Demographic characteristics of population, population dynamics, natality, mortality, sex ratio, population growth and its impact on natural resources, Modernization and population. Joint and nuclear families,

### **Industrialization.**

Development and environment., Causes of for industrialization, changing life styles, regulatory aspects of industrialization, liquid effluents, gases emissions, Nature of industrial effluents, gases emissions, overall effect of pollution on quality of human life, negative impacts of industrialization and urbanization.

### **Air and Noise pollution, Monitoring and Control.**

Air quality standards, General types of air pollutants, Methods of monitoring and control of air Pollution. Sources, measurement, effects and control of noise pollution.

### **Water and soil Pollution, monitoring and control.**

Definition, types, sources and effects of pollution on plants, animals and Human being. Physico-chemical and bacteriological sampling and analysis. Sewage and waste water treatment and recycling. Soil pollution, sampling and control.

### **Solid waste:**

Nature of problem, sources of biodegradable, non-biodegradable wastes, general characteristics, their effects, recycling techniques and management of solid waste and hazardous waste.

### **Measures for Environmental Protection.**

Formal and informal environmental education, awareness for nature conservation and protection, environmental ethics and morality, conservation of natural habitats, National parks and wild life sanctuaries, role of youth and women, role of NGO's waste land development wetland conservation, conservation of forest and wildlife, urban planning and land-use pattern, sources,

### **Environmental Impact Assessment :**

Definition, significance and scope of impact assessment, Need & objective, types of environmental impacts, methods of environmental impacts, major steps in impact assessment procedure, generalised approach to impact analysis, use computer

## **Paper – III : Natural Resources Management**

### **Natural Resources :**

Definition, Resource, types, perpetual & non perpetual, renewable and non renewable, Fuel and Energy Resources, Wildlife resources, their exploitation and impacts on environment, mineral resources and reserves, minerals and population, oceanic mineral resource, exploitation, recycling Environmental Impacts of Exploitation Processing and smelting of minerals.

### **Water Resources :**

Global water balance, Hydrological cycle, Factors influencing the surface water, types of water, Human use of surface & ground water, Origin and composition of sea water, fluctuations of sea level, resources of oceans, Ocean pollution by toxic wastes, Ground water pollution, Natural resources and carrying capacity.

Conservation and sustainable use of natural resources concepts of conservation and sustainable development- eco-development.

### **Environmental Management.**

Objectives and components of environmental management, need for training, Environmental Impact Statement and Environment Management Plan, Role of remote sensing in environmental management.

### **Watershed Management.**

Concept of watershed management, Need, methods of watershed management, components of watershed management program, Public participation in watershed management. Role of vegetation in watershed management, Watershed management and recharging of ground water.

### **Resource conservation**

Reuse, reduce, regulate, recycle of the natural resources, case studies,

### **Environmental audit :**

Concept and objects, general guidelines for environmental audit, and audit procedure, merits and demerits, social audit and energy audit.

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### **Paper – IV :: (Optional Paper )**

Any **one** of the following papers depending on the basic orientation of the student. The project is also expected to be based on this paper

1. Environmental Stress and Toxicology.
2. Pollution Monitoring and Control.
3. Human Ecology.
4. Conservation of Biodiversity.
5. Environmental legislation.
6. Statistical Ecology and Modeling.
7. Analysis of Environmental Parameters.

#### **Optional Paper I ENVIRONMENTAL STRESS AND TOXICOLOGY**

**Environmental stress** : Impact of changing environment on biota, tolerance levels of organisms to extreme environments, adaptations, limiting factors. Industrial environment and stress, domestic environment and stress, occupational stress and tensions.

**Environmental and occupational health** : Basic principles of environmental health, physiological responses of man to environmental stress, man, machine and environment, ergonomics and occupational physiology, working environment and occupation hazards in industry , case studies, safety measures, risk assessment, risk management, safety management of occupational hazards.

**Toxicology** : Definition. Classification, origin and general nature of toxic agents in environment, metals and heavy metals, metal salts, gaseous products, CO<sub>2</sub>, CO, NO<sub>x</sub>, NH<sub>3</sub>, SO<sub>2</sub> and CCl<sub>4</sub>, radioactive materials pesticides, organofluorines, chlorinated derivatives nitrogen compounds, detergents, plastics and paints, chemical mutagens, teratogens and vapour agents, carcinogens, toxins of animal origin, phytotoxins, hallucinogens and intoxicants

**Eco-toxicology** : Problems and approach, effects of toxicants on ecosystem, impact of heavy metals on composition of micro-benthos, evaluation of resistance to heavy metals, accumulation of heavy metals and detoxification in resistant biota, biomagnification..

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## **PAPER IV - POLLUTION MONITORING AND CONTROL**

### **Introduction to Pollution:**

Concept of pollution, Environmental problems due to pollution, concept of Development, Development and pollution, Major conflicts of Development and Environment, Mining and Environment.

### **Air Pollution and its control:**

Definition, major air pollutants, Classification of air pollutants, their sources and impacts, acid rain, oil pollution, photochemical smog, effects on organisms and on materials, impact of meteorological factors. Methods of air pollution control.

### **Water Pollution:**

Concept, classification, major sources and impacts, oil pollution, thermal pollution, oceanic pollution, eutrophication, water treatment processes,

### **Soil Pollution:**

Soil pollution, causes of soil pollution, soil salinity, sources of soil pollutants, major impacts and remedial measures.

### **Regulatory Aspects :**

Industrial Emissions Liquids & gasses; pollution caused by various chemical industries and its overall effect on quality of human life and the environment water quality management in India. MINAS for sugar industries, distilleries, pesticides industry and mercury from caustic soda industry, Good analytical practices for proper assessment of pollutants.

### **Pollution and its Measurement :**

Nature of industrial effluents, gaseous effluents, method of gas analysis methods of removal of pollutants from gaseous effluents; particulate matter, analysis of natural water, analysis of waste water for free acids and basic; dissolved organic and inorganic compounds like alkali and alkaline salt,  $\text{SO}_4^{2-}$ ,  $\text{PO}_4^{3-}$ ,  $\text{NO}_2^-$  determinations. Industrial effluent treatment recovery and recycle techniques.

### **Removal of BOD and heavy metals :**

BOD its measurement, significance in waste water treatment Activated sludge process. Removal of Nitrogenous pollution, Removal of nitrogen; physico-chemical processes; biological method of pollution control. Analytical methods of small amount of the metal pollutants; copper recovery treatment of waste water to remove heavy methods, recovery techniques.

### **Hazardous waste management :**

Hazardous waste, characterization and site assessment waste minimization and resource recovery, chemical physical and biological, treatment; hazards of improper treatment and disposal method; accidental exposure of dangerous waste and emergency measures.

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## **Optional Paper IV HUMAN ECOLOGY**

### **Concept of Growth and Development,**

Environmental conservation and sustainable development, concept of carrying capacity, Case studies from India & abroad, Dams, industries, roads, harbors etc. Energy recovery and socio economic variable, incremental costs of unplanned development, Eco-development, Western Ghats eco-development plant.

### **Habitats in human history**

Evolution of man with changing environment, hunter gatherer, domestication of plants and animals, pastoralism, agrarian culture, civilization, colonial era, industrial mode, socio economic aspects of development, modernization and environmental issues and their social dimensions, case studies from India and abroad.

### **Indian initiatives:**

Indian ethos of nature conservation, environmental ethics, religion and environment, rituals, festivals. Gandhism, budhism, chipko, silent valley, Narmada, tehari dam, save the western Ghats movement,

### **International initiatives**

International agreements and treaties, Stockholm conference, Ramsar, Montreal Protocol, Kyoto, Earth summit (UNCED) Intellectual Property Rights (IPR), World conservation strategy by IUCN, WWF, & UNEP, Our common future (WECD). Wetlands international, World Watch Institute. Green Peace etc.

### **Environment and Poverty**

Developed and developing countries and environment, Population increase and related problems, alternative technologies, energy needs of the modern society. Food security, quality of life, material life and Futurology:

### **Individual initiative**

Role of individuals, role of NGOs, role of women in conservation, role of individual in daily life nature conservation, coexistence

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**Optional Paper IV**  
**CONSERVATION OF BIODIVERSITY**

1. Definition of biodiversity, wildlife, domesticated organisms, back ground of domestication, biodiversity as a resource, food, fodder, fuel etc. since early civilization.
2. Types of biodiversity, species, genetic and ecosystem diversity, Values of Biodiversity (all seven), biodiversity as life support system Geological distribution of flora and fauna, Zoogeography, biomes, tropical savannah, rain forest, desert, mountain etc.
3. Present status of biodiversity and causes for its degradation, common, rare, endangered, threatened, near extinct, endemic, exotic species, etc
4. Importance of Biodiversity conservation, Status of biodiversity today in the world, in India and in Maharashtra. Causes and consequences of biodiversity loss, popu explosion, developmental activities, pollution, and climate change,
5. Indian ethos of wildlife conservation cultural, spiritual, ethical, utilitarian, tribal culture, concept of Co-existence.
6. 'Ex situ' and 'in situ' conservation, Protected Areas, WLS, NP, Project Tiger, Biosphere Reserves, wilderness areas, Parks, Zoos, wildlife refuges, gene banks, etc.
7. Wildlife Management, Concept, practices, Bio prospecting and IPR sustainable use of wildlife Biodiversity hotspots, Western Ghats, North east Himalayas
8. Threats to and limitations of biodiversity conservation, Wildlife Conservation regeneration and reintroduction, permafrost, biotechnology, Birdlife international's Act, Convention on biodiversity (CBD), CITIES, Wildlife / nature tourism, Wetland International,
9. National and international organizations in biodiversity conservation, BNHS, WWF-India, IUCN, wildlife international, Defenders of Wildlife, Birdlife International, etc.
10. Peoples participation, conservation to pay, people's sanctuaries, sacred groves, urban wilderness, sustained use of biodiversity,