EXTENDED LECTURE OUTLINES

FES6 121 Environmental Studies and Disaster Management (2+1)

SN	Topics covered	Time in hrs
1	Introduction to Environment - Environmental studies - Definition, components, scope and importance - Multidisciplinary nature of environmental studies	1 class
2	Segments of Environment - Spheres of Earth - Lithosphere - Hydrosphere - Atmosphere - Different layers of atmosphere	1 class
3	Natural Resources definition, classifications of natural resources- renewable and non-renewable resources and examples Major natural resources – (a) Forest resources: forest classifications, importance of forests; problems associated with forest resources - forest fragmentation, deforestation, degradation, shifting cultivations, etc, Possible ways to avoid forest resources degradation. (b). Water resources: sources of water in India - rainfall and snow melt and reasons. Water budget in India- available water and utilization. Per capita water availability over time period. Major rivers of India, perennial and rainfed rivers, factors influencing degradation of water sources. Water crisis in India. Roles of dams and reservoirs and related to water utilization and conservation. Rain water harvesting. (c). Mineral resources: Definition, metallic and non-metallic mineral resources, major mineral resources in India. Conservation of mineral resources, Environmental concerns of mining. Mining in forests. (d). Food resources: plant and animal sources, issues affecting food resources etc	4 classes
4	(e) Energy resources: available resources of energy in India, needs of the energy resources, major areas of energy consumption, energy conservation. Alternative energy sources (f). Land resources: land distribution in the world and India, Land use patterns and urbanization, land degradation and desertification, reasons for desertification, landslides, soil erosion, examples for conflict of land uses in India. (g) Soil Resources: Composition and formation of soil, major soil types in India, land use in Agriculture Role of individuals in natural resources management.	2 classes
5	(i). Ecological succession: stage of successions – types of succession, - primary and secondary succession. Hydrosere, Mesosere and Xerosere successions. Xerosere successions types-Lithosere, Psammosere, Halosere (ii). Ecosystems – definition– basic Structure and function of an ecosystem Energy flow in the ecosystem - Food chains: (a). producers, consumers, decomposers, detritus feeders, feeding relationship, (b). food chain, food web and its importance. Bioaccumulation and Biomagnification. Ecological interactions-definitions, Ecological pyramids- definitions and types. Apex predator. Difference between predator and scavenger (c). Characteristic features, structure and function of different ecosystems; (iii) Ecosystems types, forest ecosystem- Grassland ecosystem- Tropical	1 class

	grass land, Temperate grass lands, polar grass lands (arctic tundra). Desert ecosystem; tropical, temperate and cold deserts. Aquatic Ecosystems - Inland fresh water ecosystem- lentic habitat and lotic habitat, ecological difference between lentic and lotic Fresh water ecosystems - ponds, streams, lakes, rivers, Marine ecosystem- ocean and estuaries.	
6	Biodiversity-Definition, levels of biodiversity genetic, species and ecosystem, values of biodiversity- consumptive, productive, social, ethical, aesthetic and optional values. Measuring biodiversity – richness, diversity indices and alpha, beeta and gama diversity.	1 class
7	Biodiversity at global, national and regional levels. India as a mega diversity country. Hot spots of biodiversity. Biogeographical classification of India. Threats to biodiversity; reasons for biodiversity loss, habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species in India, Conservation measures: In-situ and Ex-situ conservation methods with examples	2 classes
8	Pollution- Definition and Types of pollution a. Air pollution: (a). Primary Pollutants (b). Secondary Pollutants Causes/Sources: (a) Natural Source (b). Man-made Source Effects: (a). Effects on Human health, (b) Effects on Plants, (c). Effects on Aquatic life; (d). Effects on materials. Control measures: Reduction of air pollution at source, Cyclone method, Bag house filters, Wet scrubbers, Electrostatic precipitators. b. Water pollution: definition Causes/Sources: Point source and Non-point source; Sewage, Industrial effluents, Synthetic detergents, Agrochemicals, Oil, etc. Effects: Oxygen demanding wastes, Nitrogen and Phosphorous compounds (Nutrients), Pathogens, Toxic compounds. Control measures: Non-point source-Judicious use of Agro-chemicals, Use of Nitrogen fixing plants, prevent run-off of manure, Separate drainage of sewage and rain water, planting trees Point source Treatment of waste water (Primary, Secondary, trickling filters, Rotating Biological contractors (RBC), Activated sludge process, Advance sewage treatment, BOD, COD. c. Soil pollution: Causes Dumping of various types of materials, Domestic and Industrial Wastes, Pesticides, Radioactive substances. Effects: On human health, Soil fertility and productivity, Soil flora and fauna, Control measures Effluent treatments, Proper collection and disposal of solid wastes, Microbial degradation of biodegradable substances d. Marine pollution: Causes: Rivers, Catchment area, Oil drilling and Shipment Effects: On Sensitive flora and fauna Control measures. Avoiding release of toxic pollutants, run-off from non-point sources, Sower over flows, avoid dumping of tonic materials, Hazardous wastes. Avoid oil drilling. e. Noise pollution: Causes Sources: Various modes of transportation, Industrial operation. Construction activities. Home appliances Effects Interferes with man's communication, Hearing damage,	4 classes

	Physiological and Psychological changes Control measures: Reduction in source of noise, Noise controlling machines, use of sound absorbing silencers, Planting trees, Law enforcement. f. Thermal pollution: Causes: Industries, Thermal Power plant, Nuclear Power plants, Refineries. Effects: Effect on dissolved oxygen content, High temperature, Composition of flora and fauna, Metabolic activities of aquatic animals, fish migration. Control measures. Cooling ponds. Spray ponds, Cooling towers. g. Light pollution: causes and effects of light pollution, Management options	
9	Solid Waste Management: Classification of solid wastes-based on the matter, based on degrading feature, environmental impact, sources, etc Structure of waste, Watse management methods-waste collection, Solid Waste management methods- land fill, Composting, Incineration, Pyrolysis, Biogas production, 3Rs, Waste to energy. Sources of industrial and urban wastes. Consumerism and waste product: Two types of conditions of population and consumerism.	3 classes
10	Social Issues and the Environment: Definition and concepts from unsustainable to sustainable development; Key aspects of sustainable development: 1. Inter-generational equity 2 Intra-generational equity. Measures for sustainable development: (a) reduce, reuse, recycle approach (b) promoting environmental education and awareness (c) resource utilization as per carrying capacity. Urban problems related to energy: The energy demanding activities residential and commercial lighting, transportation means, modern lifestyle, industrial plants, large amount of waste generation. Urban problems related to w ater. Water budget, conservation, rain water harvesting, watershed management. Case studies of water management in India	3 classes
11	Environmental ethics: Issues and possible solutions Environmental issues namely - Climate change: Global warming, greenhouse gases, greenhouse effect, Different Green House Gases and their concentrations, Role of different greenhouse gases on global Temperature-Global Warming Potential, sources and sinks of CO_2 in the atmosphere- Fossil fuel, Alternate sources of energy. Acid rains: how acid rain occurs and reasons, consequences of acid rain. Ozone layer depletion: location, role of ozone layer, reasons for ozone layer depletion. Control measures. Nuclear accidents and holocaust.	2 classes
12	Salient features of Environmental protection act 1986, Wildlife protection act 1972, Air act 1981, Water act 1974, Forest conservation act 1980,1988, Enforcement of environmental legislation-major issues Public environmental awareness. Methods to propagate environmental awareness: (a) Among students through education. (b) Among masses through mass media. (c) Among planners, decision makers and leaders.	1 class
13	Human Population and the Environment: Population growth, population characteristics and variation among nations. Population explosion Indian scenario, Environment and human health, Factors: infectious organisms, chemicals, noise, radiations, diet, settlement. Human rights, Value education, Women and Child welfare.	3 classes
14	Role of information technology in environment and human health: Database on environment and health, information systems: environmental information systems, national management information system, Important websites of	1 class

	organizations, Environmental Information System (ENVIS), National Management Information System (NMIS).	
15	Disaster management - Disaster definition - Types of disasters. 1. Natural disaster - causes, environmental, social and economic damage, preventive and remedial measures with respect to, Geological disasters - Avalanches, Earthquakes, Volcanic eruptions, Heat and Cold waves. Hydrological Disasters – Floods Meteorological Disasters - Cyclonic storms, Droughts	3 classes
16	2. Man-made disasters - causes, environmental, social and economic damage, preventive and remedial measures with respect to, a) Transport - Road accidents, Rail accidents, Sea accidents (Maritime, Shipwreck), Air accidents. b) Industrial - Nuclear disaster, Chemical disasters. c) Health - Biological disasters, Famines and Epidemics d) Fire: Building fire, Coal fire, Forest fire, Oil fire	4 classes
17	Disaster Management: Mitigation strategies at national and global levels: emergency warning and different systems, preparedness, evacuations, emergency management, risk reduction, Humanitarians aid.	1 class
18	Role of NGOs, and media - capacity building on prevention, mitigation and preparedness, Recovery- reconstruction, rehabilitation.	1 class
19	Role of Central- policy and financial and logistic support. State: Rescue, relief and rehabilitation. District and local administration; to prepare management plan, constitution of disaster management committees. Disaster response of Armed forces, Police and other organizations-Implementing the law and order based on the disaster.	2 classes