COURSE TITLE : **ENVIRONMENTAL SCIENCE & DISASTER MANAGEMENT**
COURSE CODE : **2003**
PERIODS/WEEK : **3**
PERIODS PER SEMESTER : **54**

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Renewable and Non-renewable Resources	14
2	Ecosystems	12
3	Environmental Pollution	14
4	Environmental Hazards & Disasters	14
	Total	**54**

Rationale: All member of this biotic system has the privilege for the equitable sharing of natural resources. Man has no right to plunder the natural resources for his for his lone enjoyment. Nonrenewable resources should be carefully used. Our future generations also are entitled for their share. While using the renewable sources we should neither damage the ecosystem nor adversely affect the co-existence other members of the biosphere. Care should be taken to adopt measures necessary for the re-generation of renewable resources. The first module aims at generating an awareness about these aspects which is essential to achieve a sustainable development.

The habitats of all the biotic elements solely depend on the Ecosystem. It is a co-existing and self contained system. The effects on the one component of an Ecosystem affect the existence of many others because of the dependencies at macro and micro level. The system is so delicate and some of these affects have long lasting effects and are irreversible. Hence the impacts of all human intervention on environment should be well studied in advance before their action or implementation. The second module cast light in to these aspects.

Pollution is a major threat to the very same existence of human beings and all other fellow members of the biotic realm. The causes of pollution may be manmade or natural. But the major chunk of pollution is caused due to the manmade actions only and we can do very little to mitigate the ill effects due to the natural causes of pollution. Some effects of the pollution are long lasting spanning over centuries. Some effects have only local impact but most them do not have any geographical boundary but spread over the entire universe pausing threat to the very same existence of this universe. The third module aims at creating awareness about the menace of the pollution and developing an attitude towards alleviate and curb pollution, if at all not possible to eliminate that.

It is the hazards that lead to disasters. The hazards may be due to manmade actions or due to natural causes. Man is only a mute spectator at the nature's fury. But many often the natural calamities cause due to some human intervention in the past and turn in to a disaster. The magnitude of the disaster is often goes rocketing due to the ignorance about its cause and mitigating measures. Module four is all about the causes of the common disasters, preventive and control measures and also ways and means to handle the post disaster operations.

OBJECTIVES:

Up on completion of this course the student should be able to:

Module - I

1. To identify and understand the vital natural resources that are renewable and non-renewable, their importance and the problems due to over exploitation.

    1.1 Identify important forest resources and their uses – Understand: The problems due to over exploitation of forest resources and the impact due to de-forestation with the help case studies – Timber as the main resource from forest-Its uses - Problems due to cutting of trees – Understand the aftermath of construction of dams and carrying out mining operations in forest area and know how it affects the forest as a whole and the natural inhabitants, the tribal people in particular.
    1.2 Understand water as major natural resource and its importance – Sources of water – Surface and sub-surface sources – problems due to over exploitation of water – Identify the causes of flood and draught and the impacts due to that. Conflicts in precipitation obtained, water availability and water demand. Enumerate the advantages and disadvantages due to dams with special reference to large dams.
    1.3 Identify the major mineral resources and enumerate their uses – Problems due to mining operation & abandoned mines and the related environmental impacts– Issues of overexploitation of mineral wealth – Explanation with typical case studies expected.
    1.4 Understand the basic concept of food chain – mutual dependence – World food scenario - Food crisis at Global level – New threats posed by conversion of agricultural land for non-food production activity – Problems due to over grazing – Impacts due to agrarian related activity – Effects due to adoption of modern agricultural technology – Impacts due to the use of chemical fertilizers and pesticides – Causes of water logging & salinity and the effects due to that- Discuss these aspects with the help of case studies.
    1.5 Enumerate the various conventional and non-conventional sources of energy – Role of non conventional and alternate energy sources to meet the growing energy needs of the world – Discuss with the help of case studies.
    1.6 Understand land as a resource – Identify the causes for the degradation of land. Study the manmade and natural causes for land slide, soil erosion and desertification – Discuss their control measures with case studies.
    1.7 Study the individual and collective contributions that can be made for the conservation of natural resources – Discuss the means for an equitable and judicious utilization of natural resources ensuring its availability for future generations - Develop a life style for achieving sustainable development.

Module –II

2. Understand what constitutes an ecosystem – The basic components and concepts of an ecosystem – Its role as the provider of food and habitat.
   2.1 Understand the structure and functions of an ecosystem. Understand the role played by the basic components of ecosystem, the producers, the consumers and the decomposers - Importance of each of these components.
   2.2 Understand the term ecological succession and the hierarchical order followed in any ecosystem.
   2.3 Understand what is meant by a food chain, food web and food pyramid - Importance of food chain – Interdependencies of different components.
   2.4 Understand the basic types, characteristic features, structure and functions of the Forest ecosystem, Grass land ecosystem, Desert ecosystem and aquatic ecosystems (ponds, streams, lakes, rivers, Oceans and estuaries) – Only introduction expected.

Module - III

3. Understand the definition for environmental pollution and the various causes for that.
   3.1 Understand various components of the environment that is subjected to pollution - Pollution of air, Water and land – Causes for Marine pollution – Pollution caused by Oil sleek, Noise, Temperature and Nuclear hazards.
   3.2 Define the solid waste – Enumerate different constituents of urban and industrial solid waste – Identify the Sources of solid waste and the type – Ill effects due to different types of solid wastes - Understand the various methods of solid waste management – Control at the source – composting – incineration – land fill and deep burial methods – suitability, merits and de-merits of each method.
   3.3 Discuss the role that an individual can play in prevention of pollution and formulate an action plan to implement those measures.
   3.4 Conduct case studies on major disasters that caused environmental pollution, identify the causes and suggest mitigation measures to avert such situation in the past - Conduct case studies on local environment polluting issues – identify the causes and suggest the control measures.

Module –IV

4. Distinguish between hazards and disasters.
   4.1 Define Environmental hazards, Environmental disasters, and Environmental stress - Conceptualize these events and understand how they are inter-related.
   4.2 Identify and classify different environmental hazards and the disasters caused by them based on the cause of origination viz. natural cause and manmade cause.

4.3 Understand the various causes for occurrence of natural hazards such as flood, draught, volcanic eruption, earth quake, land slide, cyclones, lighting and tsunami. Study their effect on the environment.

4.4 Understand the causes and impact due to manmade hazards and the disasters due to that – Identify the causes and consequences due to release of toxic chemicals and radioactive substances - Chemical hazards and disasters – case studies with respect to the disasters occurred at Minimatha, Bhopal and Chernobyl.

4.5 Understand the emerging approaches in disaster management in each of the three stages of disaster management viz. the pre-disaster stage, the emergency stage and the post disaster stage.

4.6 Understand the different operations that are to be attended in the two phases of pre disaster stage (preparedness and mitigation operations).

4.7 Understand the need scope of preparedness operations – Method of preparing hazard zoning map – Land use zoning - Methods of predicting and forecasting – Different early warning systems – How to prepare a disaster preparedness plan – Methods of achieving preparedness through Information, education and communication (IEC).

4.8 Understand the mitigation measures to be adopted during the pre-disaster stage – Disaster resistant house construction – Population restriction in vulnerable areas – Conducting awareness programme.

4.9 Understand various rescue and relief operations to be performed during emergency stage – Trainings to be imparted for the rescue search and the co-ordination of operations at regional and national level – Identify the immediate relief operations to be carried out – Understand various methods for carrying out the assessment surveys.

4.10 Understand various post disaster operations and their means of implementation – The political & administrative aspects – The economic aspects and the environmental aspects

Course Content

MODULE: I 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 forests 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.

MODULE: II Ecosystems
Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers.
Ecological succession, Food chains, food webs and ecological pyramids.
Introduction, types, characteristics 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)

MODULE: III Environmental Pollution
Definition:Causes, effects and control measures of

(a) Air pollution (b) Water pollution
(c)oil 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.

MODULE: IV
Environmental Hazards & Disasters.
a) Meaning of Environmental hazards, Environmental Disasters and Environmental stress.
b. Concept of Environmental Hazards, Environmental stress & Environmental stress & Environmental Disasters.
Types of Environmental hazards & Disasters: a) Natural hazards and Disasters b) Man induced hazards & Disasters.
Causes and Environmental Consequences of the flowing natural HAZARDS – Droughts and Floods.
Volcanic Eruption, Earthquakes, Landslides, Cyclones, Lightning, Tsunami.
Chemical hazards/disasters : Causes and consequences of Release of toxic chemicals, nuclear explosion. Case studies – Minamata tragedy, Bhopal disaster, Chernobyl disaster.
Emerging approaches in Disaster Management – Three Stages
1. Pre-disaster stage (preparedness) : a) Preparing hazard zonation maps, Predictability/forcasting & warning. B) Preparing disaster preparedness plan c) Land use zoning d) Preparedness through (IEC) Information, education & Communication.

Pre-disaster stage (mitigation): a) Disaster resistant house construction b) Population reduction in vulnerable areas c) Awareness
2. Emergency Stage a) Rescue training for search & operation at national & regional level b) immediate relief c) Assessment surveys.
3. Post Disaster stage-Rehabilitation: a) Political administrative Aspect c) Economic Aspect d) Environmental Aspect.

REFERENCE BOOKS

1. Environmental studies – From Crisis to Cure, R. Rajagopalan, Oxford University Press, 2005.
2. Environmentak Science & Engineering, P. Anandan, R. Kumaravelan, Scitech.
3. Environmental Studies for Undergraduate courses, Erach Bharucha, Universities Press.
4. R.B.Singh (Ed). Disaster Management, Rawat Publication, New Delhi, 2000
5. H.K.Gupta (Ed). Disaster Management, Universities Press India, 2003