COURSE TITLE : ENVIRONMENTAL SCIENCE & DISASTER MANAGEMENT
COURSE CODE : 3001
COURSE CATEGORY : C
PERIODS/ WEEK : 3
PERIODS/ SEMESTER : 45
CREDIT : 3

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Renewable and Non-renewable Resources	10
2	Ecosystems	10
3	Environmental Pollution and its control	13
4	Hazards, Disasters and Mitigation measures	12
TOTAL		**45**

SPECIFIC OUTCOME

MODULE - 1: Renewable and Non-renewable Resources

1.1.0 Understand the various types of natural resources and problems due to over exploitation.

1.1.1 List various resources supplied by forest.
1.1.2 Explain various uses of forest resources.
1.1.3 Identify the problems due to over exploitation of forests.
1.1.4 Explain the problems due to de-forestation.
1.1.5 Identify the social and ecological problems due to dams.
1.1.6 Identify various sources of fresh water.
1.1.7 State the importance of water as a resource.
1.1.8 Explain the problems due to over consumption of water.
1.1.9 Identify the causes of flood and drought.
1.1.10 Explain the reasons for the conflicts over water.
1.1.11 Describe the advantages and disadvantages due to large dams.
1.1.12 List various mineral resources.
1.1.13 State the problems due to mining.
1.1.14 Explain the environmental impacts due to mining.
1.1.15 State the reasons for global food crisis.
1.1.16 Explain impacts on food production due to adoption of modern agricultural practices.
1.1.17 Explain the problems due to the use of artificial pesticides and fertilizers.
1.1.18 Identify the causes for water logging, salinity and Eutrophication and the problems due to that.
1.1.19 Explain the world energy scenario and energy demands
1.1.20 List various conventional and non-conventional sources of energy.
1.1.21 Distinguish between renewable and non renewable sources of energy.

1.1.22 State the importance of renewable energy.
1.1.23 Explain the importance of energy conservation.
1.1.24 Define sustainable development and state its importance.
1.1.25 Explain why land is considered as a resource.
1.1.26 List the different types of resources from land.
1.1.27 Identify the causes for land degradation.
1.1.28 State the reasons for soil erosion, land slide and desertification.
1.1.29 Describe the control measures for land degradation.
1.1.30 Describe the role of an individual in conservation of resources and achieving sustainable development

Module – 2: Ecosystems

2.1.0 Understand the components of various types of ecosystem and interrelation between the components.

2.1.1 Define an Ecosystem.
2.1.2 Explain the biotic and abiotic components of an ecosystem.
2.1.3 Identify the producers, consumers and decomposers in an ecosystem.
2.1.4 Explain the role of producers, consumers and decomposers in an ecosystem.
2.1.5 State the meaning of what is meant by Biomes.
2.1.6 Explain the phenomenon Ecological Succession.
2.1.7 Explain food chain and food web.
2.1.8 State the inter dependence of each link in a food chain.
2.1.9 Explain the ecological pyramid.
2.1.10 Explain Biomagnifications and its impacts.
2.1.11 Explain the types, structure and characteristic features of forest ecosystem
2.1.12 Explain the types, structure and characteristic features of grassland ecosystem
2.1.13 Explain the types, structure and characteristic features of desert ecosystem
2.1.13 Explain the types, structure and characteristic features of aquatic ecosystem
2.1.14 Describe the importance of biodiversity and the need to conserve it.
2.1.15 Illustrate the effects of urbanization – Heat islands, stress on land and water
2.1.16 Identify the causes of global warming and the effects due to that.

Module – 3: Environmental Pollution and its control

3.1.0 Understand various factors which cause environmental pollution and their control measures.

3.1.1 Define environmental pollution.
3.1.2 Identify the factors contributing air pollution.
3.1.3 State the role of air pollution in global pollution.
3.1.4 Explain the affects of air pollution.
5.1.5 State various methods to control air pollution.
5.1.6 Explain the functioning of air pollution control devices.
3.1.7 Identify the sources contributing to water pollution.
3.1.8 State the role of water pollution in global pollution.
3.1.9 Explain the affects of water pollution.
5.1.10 State various methods to control water pollution.
5.1.11 Explain the functioning of water pollution control devices.
3.1.12 Identify the sources contributing oil pollution.
3.1.13 State the role of oil pollution in marine pollution.

3.1.14 Explain the affects of oil pollution.
5.1.15 State various methods to control oil pollution.
3.1.16 Identify the factors contributing marine pollution.
3.1.17 State the role of marine pollution in global pollution.
3.1.18 Explain the affects of marine pollution.
5.1.19 State various measures to control marine pollution.
3.1.20 Identify the factors contributing noise pollution.
3.1.21 State the role of noise pollution in environmental stress.
3.1.22 Explain the affects of noise pollution.
5.1.23 State various measures to control noise pollution.
3.1.24 Identify the factors contributing thermal pollution.
3.1.25 State the role of thermal pollution in global warming.
3.1.26 Explain the effects affects of thermal pollution.
5.1.27 State various measures to control thermal pollution.
3.1.28 Identify the major nuclear hazards occurred in the world.
3.1.29 State the global affects of nuclear radiation.
3.1.30 Explain the local affects of nuclear pollution.
3.1.31 Identify various categories of solid wastes.
3.1.32 Explain various methods of solid waste management specific to each category of waste.
3.1.33 Explain the effects due to solid waste pollution.
3.1.34 Explain EIA and the need for EIA while implementing projects.
3.1.35 Identify the factors to be considered for conducting EIA of a mini-project.
3.1.36 Explain the role of each individual to control various aspects of environmental pollution.
3.1.37 Explain the case studies of cause and effect of each category of pollution.

Module – 4: Hazards, Disasters and Mitigation measures

4.1.0 Understand various hazards & disasters, their affects and mitigation measures.

4.1.1 Define Hazard, Disaster, Vulnerability, Risk and Capacity.
4.1.2 Explain the relation between Hazard, Disaster, Vulnerability, Risk and Capacity.
4.1.3 State the factors influencing vulnerability and risk.
4.1.4 Explain assessment, evaluation and management of risk.
4.1.5 Identify the classifications of hazards based on various aspects.
4.1.6 Explain the causes for different types of disasters.
4.1.7 List the effects of each type of disaster on human beings and ecosystem.
4.1.8 Illustrate major hazards under each category occurred in world as case study.
4.1.9 Explain the disaster management operation cycle.
4.1.10 Identify and explain various operations to be carried out during pre-disaster phase.
4.1.11 Identify and explain various operations to be carried out during emergency phase.
4.1.12 Identify and explain various operations to be carried out during post-disaster phase.
4.1.13 Explain the relationship between disaster and development.
4.1.14 Illustrate how health and disaster management are interrelated.
4.1.15 Explain the Institutional frame work of disaster management in India at National, state and district level and the role of each body.
4.1.16 Explain hazard zonation map.
4.1.17 Explain new & emerging approach in disaster management – Use of Early warning systems base on IT enabled services like GIS, GPS, MIS, DDS, Remote sensing etc.
4.1.18 Illustrate the community based disaster preparedness programmes as a mitigation measure.

4.1.19 Explain various preventive measures for disaster risk reduction.
4.1.20 Explain the need for safety audit - onsite and offsite safety audits to be done and formulation of emergency plans.
4.1.21 Explain the management plan for transportation accidents.
4.1.22 State the use of TREM card in accidents involving hazardous goods transport.
4.1.23 State the role of regulatory frame work and code of practice in disaster management.
4.1.24 Explain the role played by various acts related to disaster management.

CONTENTS

MODULE - 1: Renewable and Non-renewable Resources

Natural resources and associated problems:

(a) Forest resources: Use and overexploitation, deforestation, case studies, mining, dams and their effects on Forests, Environment 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 Mining and extraction of mineral resources, case studies.

(d) Food resources: World Food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, Genetically modified crops – boon or bane, fertilizer-pesticide problems, water logging, salinity, Eutrophication, Case studies.

(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Importance of energy conservation and sustainable development.

(f) Land resources: Land as a resource, land degradation, role of land use planning in sustainable development, human induced landslides, soil erosion and desertification.

(g) Role of individuals in the conservation of natural resources. Equitable use of resources for sustainable development.

(Students shall conduct a case study of any resource utilization as an assignment)

MODULE - 2: Ecosystems

Concept of an ecosystem, structure and functions of biotic and abiotic components of an ecosystem, producers, consumers and decomposers. Biomes, Ecological succession.

Food chains, food webs and ecological pyramids, Biomagnifications.

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, ox-bow lakes, rivers, estuaries, oceans)

(e) Concept of biodiversity - Importance of biodiversity conservation

(f) Urbanization and impacts on environment (Heat island, stress on water and soil), global warming, climate change, sea level rise.

(Students shall study the characteristic features of any local ecosystem as an assignment)

MODULE - 3: Environmental Pollution and its Control

Definition of Environment and Environmental Pollution. 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. Case studies in each type of pollution. Environmental stress.

Solid waste management: Causes, effects and control measures of urban and industrial wastes.

Introduction to Environment Impact Analysis. Role of an individual in prevention of pollution.

(Students should conduct the case study of any local pollution issue and suggest remedial measure as an assignment)

MODULE - 4: Hazards, Disasters and Mitigation measures

Define: Hazard, Disaster, Vulnerability (Physical, Economic and Social vulnerability), Risk, Capacity and inter-relationship between them. Factors influencing vulnerability and risk. Risk management, assessment and evaluation.

Classification of disasters, causes and consequences – Natural disasters (cyclone, earth quake, tsunami, flood, drought, land slide, lightning, forest fire, volcanic eruption) and Human-induced disasters (Air, road & rail accidents, boat capsize, oil spill, building collapse, fire, industrial hazards, chemical hazards, explosion, war). Classification of disasters based on the origin (Water & climate based, geological origin, Chemical/industrial/nuclear disasters- Hazchem & MAH(Major Accident hazard) units, biologically related disasters, human induced disasters/accidents) - Case studies of each type of disaster.

Disaster management cycle - Operations in each phase – Pre-disaster phase (Planning, Preparedness, Prevention & Mitigation), Structural and Non-structural mitigation measures (Structural eg. Dams, embankment, stone walls, Installing early warning systems, disaster resistant constructions and non-structural - eg. Insurance, IEC-information-education-communication, land use zoning, preparedness plan, mock drills, costal shelter plantation) – Emergency phase (communication, evacuation, rescue search & relief operation, medical assistance) – Post disaster phase (Reconstruction and rehabilitation, economic & environmental aspects, Administrative & political aspects) - Relationship between disaster and development – Health and disaster management plan, holistic approach.

Disaster profile of India - Institutional frame work of disaster management in India (National, state and district level) – Hazard zonation map - New & emerging approaches in disaster management – Use of information technology (GIS, GPS etc) in disaster management - Community based disaster

preparedness - Disaster risk reduction - Safety audits, onsite and offsite emergency plans – Management of transportation accidents, use of TREM card.

Regulatory frame work and code of practice (Petroleum act-1934, Factories act-1948, Insecticide act-1968, Explosives act-1984, Environmental protection act-1986, Coastal regulation zone (CRZ) Act-1991, Disaster management Act-2005).