Prescribed syllabus for M.Sc. degree in Environmental Science w.e.f. July, 2010

SEMESTER – 1st
I  Basic Ecology
II  Environmental and Natural resources
III  Population Ecology
IV  Biodiversity and Conservation Biology

SEMESTER – 2nd
V  Climate and atmosphere
VI  Biogeochemistry and Hydrobiology
VII  Environmental Chemistry
VIII  Ecophysiology

SEMESTER – 3rd
IX  Environmental and Public Health
X  Environmental Biotechnology
XI  Ecotoxicology and Environmental Safety
XII  Methods of Environmental Analysis

SEMESTER – 4th
XIII  Global Environmental Problems
XIV  Environmental Management
XV  Env. Policies and Law
XVI  Environment and Development

PRACTICAL:
1st Semester  – 50 + 50
2nd Semester - 50 + 50
Field work
3rd Semester – 50 + 50
4th Semester (Project work) – 100
Science of environment includes the understanding of entire natural world and its resources. This course will deal with fundamentals of environmental science. Main emphasis will be on ecological principles, major ecosystem of the world and interactions among different abiotic and biotic factors.

Unit I.
- a. Introduction, definition, history and scope of ecology, divisions of ecology, models in ecology, ecology in India,
- b. Principles of ecology, ecology and ethology, levels of organization, ecology today

Unit I.
- a. Living planet earth, origin and evolution of earth, land forms, volcanoes.
- b. Forests-Boreal coniferous forest biome (Taiga), temperate forest biome, tropical rain forest biome, Indian forests

Unit III.
- a. Grassland biome, desert biome, desertification, frozen world, arctic and Antarctic systems, open oceans, margins of land,
- b. Concept of biosphere, biome, biological realms and biotic provinces, types of ecosystems, major ecosystems of the world (Tundra, Savanna and Steppe)

Unit IV.
- a. Fragile ecosystems-Himalayas, coral reefs, mangroves and polar regions,
- b. Tropic structure of the ecosystem, productivity of the ecosystem, food chain, food web, ecological pyramids, models of energy flow in the ecosystem

Unit V.
- a. Concept of limiting factors, low of minimum, law of tolerance, combined concept of limiting factors, role of temp, radiation, humidity, atmospheric gases, currents and pressure as limiting factors,
- b. Species interactions-symbiosis, neutralism, commensalisms, amensalism, mutualism, protocooperation, competition, parasitism, competitive exclusion principle

Suggested readings
Nature provides different resources i.e. water, food, minerals and energy. Due to anthropogenic activities they are being gradually lost. There is a emergent need to assess the present status of all natural resources and develop strategies for their conservation. This course will first deal with a detailed knowledge on all natural resources and then with their conservation strategies.

Unit I.  
   a. Introduction to natural resources, reserve and resource, resource cycle, renewable and nonrenewable resources,  
   b. Mineral resources, coal, oil, hydrocarbons and natural gas, mineral resources of India, conservation of mineral resources  

Unit II.  
   a. Water resources, hydrologic cycle, water budget ground water potential, surface water resources, conservation of water resources, water harvesting,  
   b. Marine resources, concept of EEZ, mangroves, food and drugs from marine plants and animals, resources of Antarctica  

Unit III.  
   a. Genetic resources agriculture and livestock resources of India,  
   b. Wildlife, wildlife of India, important flora and fauna, endangered species of plants and animals.  

Unit IV.  
   a. Conservation of genetic resources, international and national efforts,  
   b. Fish resources prawn fisheries, fish resources of India, endangered fishes of India, conservation of fish resources  

Unit V.  
   a. Forest resources, Indian forests, national forest policy, conservation of forest resources,  
   b. Energy resources, renewable and nonrenewable energy resources, non conventional energy resources-solar, wind, water and tidal energy, energy from biomass, biogas, nuclear and geothermal energy  

Suggested readings  
*Statistical Handbook* (1993), Department of Agriculture and Cooperation.
Population is not only a social problem but a problem of environmental science as well. It is closely related to development, planning and management of human population. There will be a complete discourse on concepts dealing with population and development and community ecology.

**Unit I.**
- a. Definition and characters of a population natality, mortality, population age distribution, biotic potential of a population,
- b. Meta populations, Metapopulation theory, Characters of metapopulation, Landscape and Metapopulation

**Unit I.**
- a. Growth of a population, different growth forms of a population, Factors regulating a population, population dispersal, emigration, immigration, migration,
- b. Human population dynamics, population projections population control and related demographic problems

**Unit III.**
- a. Community, concept of community, definition and characters of community,
- b. Classification of communities, community stratification, vertical stratification, horizontal stratification in aquatic community, stratification of terrestrial communities

**Unit IV.**
- a. Community metabolism, anabolism, catabolism,
- b. Community succession, development of a community in hydrosphere

**Unit V.**
- a. Climax community, climax theories, lithosphere, xerosere,
- b. Communities of the past, ecological succession

**Suggested readings**


This course will offer knowledge on biodiversity and its conservation. Loss of biodiversity is a global problem. Biowealth is the most important resource of a country. Each country has hotspots of biodiversity. Biodiversity has a function to perform in the ecosystem. Biodiversity needs to be conserved immediately. This course will deal with fundamental and applied aspects related to biodiversity conservation and management.

**Unit I.**
- a. Introduction, definition, type-species, genetic and ecosystem biodiversity, biodiversity of forests, grasslands desert, fresh water and ocean systems,
- b. Evolution and genesis of biodiversity, biotic impoverishment, causes of loss of biodiversity, global and Indian scenario.

**Unit II.**
- a. Biowealth- global species diversity, biowealth of India, values of species, genetic and ecosystem diversity,
- b. Hot spots of biodiversity, hot spots of India (North-east, Western Ghats, Andman and Nicobar islands), India's threatened ecosystems (forests, grasslands, desert, wetlands).

**Unit III.**
- a. Biodiversity and ecosystem function, biodiversity and productivity, biodiversity and ecosystem stability, biodiversity and soil fertility, effects of species removal and addition on an ecosystem,

**Unit IV.**
- a. Protected areas-concept of biosphere reserves, national parks and sanctuaries and their functions, integrated protected area system,
- b. Biosphere reserves-biosphere reserves of India, case studies of biosphere reserves-Nanda devi, Thar desert and Silent valley.

**Unit V.**
- a. World conservation strategy, national conservation strategy, special conservation projects-project tiger, project elephant, project hangul,
- b. Biotechnology and biodiversity- *Ex situ* conservation, national and international scenario, bipiracy.

**Suggested readings**


Climate change is the most burning issue threatening the entire human population. Climate change can cause damages to man, wild life, agriculture and other natural resources. It is a high time to understand the delicate relationship amongst man, animals, plants and their climate. This course will offer a detailed knowledge of world climates, a detailed knowledge on changing climates, natural disasters and their management.

Unit I.  
   a. Introduction to atmosphere, composition of the atmosphere, vertical structure of the atmosphere,  
   b. Solar radiation, Earth-Sun relationship, mechanism of heat transfer, heat budget, nuclear and electromagnetic radiations

Unit II. 
   a. Wind, horizontal movement of the air, global circulations, Land and sea breeze, mountain and valley breezes,  
   b. Synoptic-motions, Jet streams, air-masses, different types of air masses, different types of fronts, cyclones-tropical and temperate, anticyclones, thunderstorms, tornadoes and hurricanes

Unit III. 
   a. World climates-wet tropics, tropical wet and dry, the dry climates, the humid subtropical climate, the marine west coast climate, the polar climate, Monsoon,  
   b. The changing climate, natural causes of climate change, impact of global climate change on man and environment.

Unit IV. 
   a. Natural environmental hazards, earthquakes, seismic hazards, reservoir induced earthquakes, seismicity and Himalayan reservoirs,  
   b. Floods, types of floods, general characters of floods, adverse effects of floods, flood problem in India, flood management.

Unit V.  
   a. Drought, drought classification, effects of drought on man, drought incidences in India,  

Suggested readings

This course deals mainly with the terrestrial ecology. Here a student will be taught different bio-
geochemical cycles, aquatic ecology, the ecology of the sea, wetlands, coastal environments,
and the modern practices of aquaculture. A student will be taught about soil erosion as well as
soil conservation. The course will also discuss the most productive ecosystem of the world i.e.
coral reefs.

Unit I.
  a. The geologic cycle, tectonic cycle, rock cycle, types of rocks, types of minerals,
  b. Soil, pedogenesis soil classification, soil types, soil profile, ecological relations of the
      soil.

Unit II.
  a. Soil erosion, soil erosion in India, Soil conservation, Soil adaptations,
  b. Biogeochemical cycles, mineral cycles, oxygen cycle, nitrogen cycle, sulphur cycle,
     carbon cycle, phosphorus cycle.

Unit III.
  a. Cycle of non essential elements, mercury cycle, arsenic cycle, silicon cycle, recycle
     pathways,
  b. Hydrosphere, hydrologic cycle, water budget, water budget of India, fresh water
     environment, lakes, ponds, rivers, estuaries, estuaries

Unit IV.
  a. Sea—the largest ecosystem, physicochemical aspect of marine environment, 
     Oceanography,
  b. Introduction to aquaculture, practice of aquaculture, environmental effects of 
     aquaculture, introduction to mariculture, environmental effects of mariculture.

Unit V.
  a. Wetlands and coastal environment, problems of wetlands, coastal erosion,
  b. Coral reefs, types of reefs, formation of coral reefs, destruction of coral reefs, 
     conservation of coral reefs.

Suggested readings
Coker, R.E. (1954), *Streams, Lakes and Ponds*, University of North Carolina Press, Chapel Hill,
USA.

Delhi.


323–369, Marcel Dekker, New York.


This course deals with a different chemical process occurring in the environment including atmosphere, hydrosphere, and lithosphere. It deals with those chemical reactions occurring in the atmosphere leading to air pollution, acid rain, photochemical smog etc. Here a student will be taught chemistry of ozone depletion as well as water pollution.

**Unit I.**
- a. Energy, laws of thermodynamics, entropy, enthalpy, Gibb’s free energy, energy and ecological homeostasis,
- b. Osmosis, diffusion, chemical potential, chemical equilibrium, acid base reactions.

**Unit II.**
- a. Heat transfer processes, scale of meteorology, pressure, temperature, precipitation, humidity, radiation and wind,
- b. Chemistry of air-particles, ions and radicals in the atmosphere, thermochemical and photochemical reactions, chemistry of oxygen and ozone.

**Unit III.**
- a. Chemistry of water-concepts of DO, BOD, COD, sedimentation, coagulation, filtration, redox potential,
- b. Chemistry of soil-inorganic and organic components, nitrogen pathways.

**Unit IV.**
- a. Chemistry of air pollutants- CO, CO$_2$, SO$_2$, SO$_3$, NO$_2$, NO$_3$, fly ash, CFCs and other organic compounds,
- b. Chemistry of water pollutants- pH, colour, turbidity, alkalinity, nitrates, phosphates, heavy metals and pesticides.

**Unit V.**
- a. Smog and acid rain-components of acid rain, theory of acid rain, formation and dispersal of acid rain, components of smog, chemistry of smog, photochemical smog,
- b. Chemistry of stratosphere, ozone formation and ozone depletion.

**Suggested readings**


Rowland, F.S. (1990). Stratospheric ozone depletion by chlorofluorocarbons. *AMBIT* 19(6-7): 281-912. This is an excellent summary article of stratospheric ozone depletion that discussed some of the major issues.

Shea, C.P. (1989). Mending the earth’s shield, world watch 2(1): 28-34. This article focuses on solutions to the ozone problem. It is primarily concerned with control strategies to stop ozone depleting chemicals from being emitted into the atmosphere.

Toon, O.B. and Turco, R.P. (1991). Polar stratospheric clouds and ozone depletion, “*Scientific American*” 246(6): 68-74. This article provides valuable information concerning polar stratospheric clouds and their importance in ozone depletion, it offers a good explanation of the formation of polar stratospheric clouds and the chemistry that occurs there.
This course deals with eco-physiology discussing relationship between the environment and important physiological processes like diffusion, transport, osmoregulation and nutrient cycles. The relationship between the soil organism and soil, similarly the relationship between aquatic organisms & water and the way they have adapted to their habitat will be taught to students.

Unit I.  
  a. Introduction, osmosis, diffusion, and transport mechanisms, active transport, passive transport, phagocytosis,  
  b. Principles and mechanisms of osmoregulation in plants and animals, role of gills and kidney in osmoregulation.

Unit II.  
  a. Nutrients, trace elements, ion and metal tolerance in plants and animals, deficiency disorders in plants and animals,  
  b. Influence of soil on plant physiology, plant responses of acidic and alkaline soils.

Unit III.  
  a. Influence of water quality on animal physiology, catadromous and anadromous fishes,  
  b. Environmental adaptations, adaptations to fresh water and marine habitats, cold water adaptations.

Unit IV.  
  a. Adaptations to terrestrial habitat, desert adaptations,  
  b. Reproductive adaptations, effects of environment on reproduction.

Unit V.  
  a. Migration, general idea of migration in fish and birds,  
  b. Breeding seasons, photoperiodism and reproduction.

Suggested readings

Health and environment are very closely related subjects. Man is affected by air pollution, water pollution, noise pollution, radioactive pollution, and industrial pollution. This course will teach the students the health effects of these pollutants not only on man but also on animals and plants. It will be focusing on epidemiology as well as occupational health.

Unit I. 
   a. Epidemiology, definition, history of epidemiology, aims of epidemiology, descriptive epidemiology, analytical epidemiology, cohort studies,
   b. Epidemiology of selected communicable disease malaria, tuberculosis, filariasis, AIDS.

Unit II. 
   a. General introduction to bacteria, bacteriophage, virus, viroids, protozoan pathogens,
   b. Pollution- types of pollution, pollution sources and events, priority pollutants, environmental mobility of pollutants, environmental compartments, transport through compartments, transfers, transformations.

Unit III. 
   a. Air pollution- Classification and properties of air pollutants, photochemical smog, acid rain, effects of air pollution and human health, indoor air pollution,
   b. Water pollution- origin of wastewater, domestic water pollution, industrial water pollution, agricultural water pollution, solid waste pollution, thermal pollution, oil pollution, toxic water pollutants and their effects, groundwater pollution.

Unit IV. 
   a. Noise pollution- Sources of noise pollution, industrial noise pollution, domestic noise pollution, traffic noise, other sources of noise pollution effects of noise pollution in man,
   b. Radioactive and thermal pollution- Sources of exposure to radiation, biological effects of radiation, famous incidents of radioactive pollution

Unit V. 
   a. Occupational health- occupational hazards, occupational diseases, pneumoconiosis, preventive measures, lead poisoning (plumbism), occupational cancer, occupational dermatitis, radiation hazards, occupational hazards of agricultural workers, health problems due to industrialization,
   b. Industrial pollution and human health- persistent organic pollutants (POPs), dirty dozens, major POPs, Aarhus protocol.

Suggested readings


Recent developments of biotechnology offer several technologies to deal with environmental problems. There are concepts of bioremediation, biofertilizers, biopesticides, bioenergy and biotechnological applications to conserve biodiversity. This modern course is expected to provide simple knowledge on the management of environmental problems using biotechnological methods.

Unit I.  
a. Introduction to Environmental biotechnology- Definition, history and scope of biotechnology, Genetic engineering, cloning, methods of molecular cloning,
b. Biotechnological processes- Bioconversion, bioaccumulation, biodegradation, Fermentation as a biotechnological process, Concept of bioreactors, Types of bioreactors.

Unit II.  
a. Biodegradation- Non-biological degradation of pollutants, biodegradation by bacteria, biodegradation of organic pollutants, biodegradation of pesticides and carbamates,
b. Bioremediation- Bioremediation of organic contaminants, inorganic contaminants, Bioasorption of metals, bioreduction, phytoremediation, advantages of bioremediation and phytoremediation.

Unit III.  
a. Biotechnology and waste water treatments- Oxidative ponds, aerobic ponds, facultative ponds, activated sludge treatment, the percolating filter, waste water treatment by biofilms, case study of a paper industry-effluent treatment,
b. GMOs, Transgenic animals- Transgenic plants, Transgenic fish, Stress tolerant plants and their significance.

Unit IV.  
a. Biofertilizers & Biopesticides, Integrated Pest Management- Bacterial biofertilizers algal biofertilizers, aquatic fungi biofertilizers, biopesticides, and integrated past management,
b. Energy and biofuels- Energy from biomass, biodisel, biofilters, biosensors and biochips, biofuel cells, endorphins.

Unit V.  
a. Biotechnology and biodiversity- Biotechnology and biodiversity conservation, cryopreservation, seed banks, DNA banks, other types of gene banks, micropropagation,

Suggested readings


All eco-compartments of environment are saturated with chemicals and toxins today. They are causing wide spread problems in major ecosystems. They include metals, pesticides, and other poisons. They can cause problems to man like environmental carcinogenesis and other serious diseases. This course will discuss how to protect the environment from toxicological problems.

**Unit I.**
- a. Ecotoxicology, Examples of ecotoxicology, Scientific approach to ecotoxicology, Entry, movement and fate of pollutants in ecosystems,
- b. Natural toxins, Animal toxins, Snake venoms, Toxins, of other animals, Plant toxins.

**Unit II.**
- a. Environmental factors affecting metabolism of toxins: Physical factors- Temperature, Ionizing radiation, Light, Moisture and Altitude,
- b. General description of toxicants- Metals, Pesticides, POPs, Portals of their entry and toxic effects.

**Unit III.**
- a. Metabolism of toxicants- Phase I reactions, Oxidation, Reduction and hydrolysis of toxic compounds,
- b. Metabolism of toxicants- Phase II reactions, Conjugation, methylation, acylation of toxic compounds.

**Unit IV.**
- a. Genetic poisons, Cytostatic agents, Chromosome damage, Gene mutation,
- b. Ecological risk assessment, Cause effect relationship for DDT, Acid rain and chloro floro carbons.

**Unit V.**
- a. Environmental carcinogenesis, Chemical carcinogenesis, Organic carcinogens, Metal carcinogens, Occupational cancer,

Environmental Safety: General information on environmental protection agency, WHO, National institute of Environmental Health Sciences (NIEHS), Occupational safety and health association.

**Suggested readings**


Environment needs to be monitored and assessed using suitable analytical techniques. There are a variety of modern techniques available to measure air pollution, water pollution, soil pollution and noise pollution. However, a student is to be taught the basic principles involved in their management. Therefore, this course will offer a detailed knowledge on spectrophotometry, chromatography, gravimetry, luminometry, and even the remote sensing.

**Unit I.**
- General methods of environmental analysis: Methods for quantitative analysis; Gravimetric method; volumetric methods; Ultraviolet and visible spectrophotometry; Infrared and Raman spectroscopy; Light scattering techniques; Molecular luminescence methods.
- Air pollution analysis: Sampling of gaseous pollutants; Analysis of aerosols; Analysis of gaseous pollutants; Sulphur dioxide analysis; H₂S analysis; NO-NOx analysis; Ozone analysis; NH₃-analysis; Organic gases and vapour analysis.

**Unit II.**
- Monitoring of ambient air pollution: Air pollution monitoring instruments; Meteorological instruments; Monitoring of sulphur dioxide; Monitoring of NO-NOx; Monitoring of CO, CO₂; Monitoring of hydrocarbons (HC) and ozone; Monitoring of suspended particulate matter.
- Water pollution analysis: Physical examination of water; Turbidity; Hardness; Chemical characterization of water; Biological investigation of water; Biological water quality assessment—Importance, objectives and scope; Biological water quality criteria (BWQC); Steps involved for bio-monitoring of surface water bodies in problem areas in the country.

**Unit III.**
- Soil pollution and pesticide analysis: Role of micronutrients in soil; analysis of micronutrients in soil; Trace elements analysis in soil; Pesticides and pollution; Pesticide analysis; Chromatographic characterization of pesticides; Polarographic analysis of pesticides; Spectroscopic analysis of pesticides, Noise pollution measurement.
- Noise measurement; Noise mapping; Anechoic chamber; Environment and noise measurements.

**Unit IV.**
- Spectrophotometry, Principles of spectrophotometry, Beer-Lambert relationship; Instrumentation; Applications of spectrophotometry; Atomic spectroscopy; Flame emission photometry; Atomic absorption spectrophotometry.
- Chromatography: Liquid-solid chromatography; Liquid-liquid chromatography; Paper chromatography; High performance liquid chromatography (HPLC); Gas-liquid chromatography; Applications of GLC.

**Unit V.**
- Remote sensing: Principles of remote sensing; Applications of remote sensing in environmental analysis (Forest, wild-life, soil and atmosphere).
- Statistical methods: Measurement of central tendencies (Mean, mode, media and range), standard deviation, standard error, significance difference, Z-test, t-test.

**Suggested readings**
Environment does not know political boundaries. Therefore, the entire biosphere is suffering from some common problems. These problems include green house effect, ozone depletion, loss of biodiversity, land degradation, and pollution of different eco-compartments. They are to be studied from global perspectives. It is very essential for a student of environment science to know these problems in order to manage them. Therefore, this course becomes very attractive from environmental management point of view.

Unit I.  
\begin{itemize}
  \item a. Introduction to global environmental problems, global warming, global warming and climate change, environmental effects of global warming,
  \item b. Green house effect, green house gases, differential green house effect, green house gases and climate change.
\end{itemize}

Unit II.  
\begin{itemize}
  \item a. Ozone umbrella, ozone depletion over Antarctica, Anthropogenic damage to ozone, ozone depleting substances (ODS),
  \item b. Health effects of ozone depletion and increased UV-B radiation.
\end{itemize}

Unit III.  
\begin{itemize}
  \item a. Montreal protocol, saving the ozone layer conference London, Declaration of Hague, Kyoto protocol,
  \item b. Biotic impoverishment, loss of biodiversity at global and natural level, biodiversity convention
\end{itemize}

Unit IV.  
\begin{itemize}
  \item a. Land degradation, deforestation and desertification drought,
  \item b. Marine pollution, marine pollution in India, global water crisis
\end{itemize}

Unit V.  
\begin{itemize}
  \item a. Important international events-UN conference on Human environment 1972, Earth Summit, 1992, Brudland Commission report, Kyoto Conference, 1997,
  \item b. El-Nino, its effects on global climate, climate change, IPCC
\end{itemize}

Suggested readings


The answer to all environmental problems is its management. It should be scientific and economical. It should follow the international rules and be acceptable to all countries. Therefore, this course introduces the common concept of environmentalism. Moreover, the practical aspects like EIA, environmental auditing and sustainability will be taught in this course. The contents of the course include management of atmosphere, water, soil, solid waste, forest, wild life, aquatic resources, agricultural resources and even the ocean. Modern concept of environmental management including remote sensing will be studied in this course.

**Unit I.**
- a. Concepts of environmentalism, carrying capacity and sustainable development, need for sustainable development, the relationship between socioeconomic system and ecosystem, sustainable future,
- b. Environmental impact assessment – Definition, History of environment impact assessment, Content of EIA, Methods of EIA, and Limitations of EIA.

**Unit II.**
- a. Environmental auditing – Methods of environmental auditing, implementation of audit policy, environmental auditing as a component of environmental management system,
- b. Management of atmosphere – Air quality, monitoring, monitoring methods and instruments.

**Unit III.**
- a. Water management – Water resources and hydrological cycle, water quality and pollution, sustainability of water resources, eutrophication,
- b. Soil and solid waste management – Reclamation of soil, management of soil erosion, soil management, Bramage and irrigation, soil management and plant nutrition, prevention and elimination of hazardous wastes, policies and techniques of waste management

**Unit IV.**
- a. Sustainable agriculture – From natural ecosystem to agri ecosystems,
- b. Sustainable forest management – Ecological problems of the forests, Sustainable management of forest.

**Unit V.**
- a. Sustainable fish management – The economic fisheries multidimensional fish management, fish biology to fish ecology,
- b. Management of ocean management – Coastal areas, CZR, marine resources, sustainable use and conservation of marine resources, coral reefs and mangroves.

**Suggested readings**
Environment is a global concern. Therefore, several countries have developed respective environmental policies and legislative measures to deal with the local problems under the global umbrella. India too has national environmental policies, national forest policies and a full set of environmental laws to combat air pollution, water pollution, noise pollution, industrial pollution and the laws to protect fish and wild life. These policies equip the person to deal environmental problems at a local level.

Unit I.
   a. Environmental protection, issues and challenges at Global level and national level, Environmental protection in India,
   b. Environmental protection Act, Provisions in constitution of India, Acts and rules regarding air pollution control and protection in India.

Unit II.
   a. Acts and rules regarding water pollution control and protection in India,
   b. Indian Forest act and its provisions.

Unit III.
   a. Indian Fisheries act and its provisions,
   b. Wild Life protection act and its provisions.

Unit IV.
   a. Aims and objectives of Department of Environment, Forests and Wild Life (Govt. of India),
   b. Important National and International NGOs and their role in Environmental Education and Protection-UNEP, IUCN, EPA, WWF.

Unit V.
   a. Environmental auditing, principles and methods of environmental auditing,
   b. Case studies on environmental protection, Chipko movement, Apiko movement, Bishnoi Community, Save Narmada Project.

Suggested readings


Agarwal, K.C. (1995), Environmental Pollution and Law, Agro Botanical Publisher, Bikaner.
The last course of environment and development is directly related to human development. The course content include environmental economics, environmental politics, environment and food, environmental tourism, environmental sociology, environmental education and also introduces the newly emerging environmental challenges. It is expected that by going through these courses a student will be able to manage all environmental problems in totality.

Unit I.
- a. Relationship of man with nature – Major human cultural changes, Agricultural revolution, Industrial revolution,

Unit II.
- a. Environment and politics – Global environmental policy, National environmental policy, Environmental policy in United States of America, Environmental groups,
- b. Environment and Human health – Biological hazards, Human diseases in developed and developing countries, Different systems of medicine, Social and preventive medicine.

Unit III.
- a. Environment and food – Sources of food, Ecological perspectives of agriculture, Word food supply, Aquaculture and Mari culture,
- b. Environment and tourism – Ecological importance of wilderness and landscapes, Landscape as an ecosystem, Landscape planning and management, Sustainable tourism.

Unit IV.
- a. Environmental sociology – Environmental ethics, Anthropocentricism, Judeo-Christian ethic, Traditional Env. Ethics, Biocentrism, Ecocentrism, Gandhian concept of ecology,

Unit V.
- a. Human ecology – History of human ecology, Ethnobiology, Ethnozoology, Disappearing human ecosystems,

Suggested readings
ENVIRONMENT AND DEVELOPMENT

1. Human population explosion- reason for the explosion population growth in rich and poor nations.
2. Environmental and social impacts of growing population the demographic position, factors affecting demographic transition.
3. Development- In rich and poor nations promoting the development in poor countries, role of world bank
4. Tools of development – education, improving health, faculty planning their combined effects
5. Economic policy – wealth on nations, effects of economic policy on environment economic ethics
7. Agriculture and environment – Major types of food production, increasing food production, sustainable agriculture