Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of B.Sc in Environment Science
Effective from academic session 2023-24

Semester-III	
Major Paper Code: BENVS-301& BENVS-391	
Paper Name: ENVIRONMENTAL BIOLOGY	Maximum Marks: 100+100
Teaching Scheme	Examination Scheme
Lecture hour: 45	End semester exam: 70
Tutorial hour: 0	Continuous Assessment: 30
Practical hour: 30	Practical/Seasonal internal continuous evaluation:40
Total hours: 75	Practical/Seasonal external examination: 60
Credit: 3+2	Mode of Exam: Offline

Course Objective:

1. Describe the scope of environmental biology and its relationship to other sciences
2. Describe the scientific method and explain its uses and limitations as it pertains to environmental biology
3. Identify and apply basic biological and ecological principles
4. Describe the history and future trajectory of human population growth
5. Evaluate the implications of human population growth
6. Characterize air, water, and land resources, describe the threats to these resources, and evaluate possible solutions
7. Characterize biodiversity, describe threats to biodiversity, and evaluate approaches to conservation
8. Describe the status of food resources, including agriculture and fisheries
9. Evaluate alternative energy sources
10. Describe the roles of governmental agencies and non-governmental agencies in affecting environmental policy and patterns of resource use
11. Discuss contributions that an individual can make toward affecting environmental policy and sustainable use of resources
12. Critically evaluate media generated environmental information and contrasting viewpoints on environmental issues

Course Outcome:

1. Knowledge of Environmental Concepts In-depth knowledge and understandings of the discipline or professional area across boundaries of nations with an aptitude to identify, access, analyze and synthesize existing and new knowledge, and integrate them.
2. Scientific Skills: Critically address multifaceted scientific problem and make decision for synchronizing information to formulate innovative and intellectual advances.
3. Environmental Problem-Solving: Address and solve scientific vis-a-vis environmental problems with rational and original thinking considering public health, cultural, and societal factors.
4. Environmental Policy and Regulation: Strong academic integrity, professional code of conduct, ethical values, and sense of responsibility towards societal needs and sustainability.
5. Sustainable Practices: Graduates will be familiar with current environmental scenarios, scientific and technological progress, lifestyle change, and biophysical evolutions with a futuristic view. Commitment to the SDGs in terms of economic welfare, social equity and proactive long-term environment management.

Unit 1: 5 Hours

Levels of organisation, Ecology, Divisions of ecology, approaches in studying ecology, auto ecology and synecology, structure and function, Biogeochemical cycles-types-carbon, nitrogen, phosphorus and Sulphur cycles-anthropogenic influences on these cycles

Unit 2: 10 Hours

Ecosystems- Characteristics of ecosystems - Structure of the ecosystems –Functions of ecosystem- food chain-herbivorous and detritus food chains and food web- biomagnification: Energy flow in an ecosystem, Study of pond and cropland ecosystems; homeostatic and feedback mechanisms. Major Ecosystems: types, structure and composition salient features - Forest ecosystem, Grassland ecosystem, wetland ecosystem and Agro-ecosystem.

Unit 3: 10 hours

Community Ecology; Characteristics of a Community; ecology succession –primary and secondary succession, Natural and man influenced succession, -Hydrarch and Xerarch – Climax vegetation and their theories; Ecotone and Edge effect: Ecological equivalents; Ecotypes and Ecophene; Ecological indicators Migration - emigration, population Ecology: Natalify, Mortality, age distribution, growth curves. Human population and its impact on environment.

Unit4: 10 Hours

Evolution; Definition- Darwin&#39 postulates -Natural Selection-Types-Industrial Melanism Pesticide resistance. Co-evolution; Mimicry - Batesian and Mullerian mimicry, warning coloration Effect of climate (light, Temperature, Wind and water), Edaphic,Topographic and Biotic factors on plants ; Effect of light , Temperature water and soil on animals.

Unit:5 10 Hours

Environmental microbiology and biotechnology-bioloeaching, bioremediation of various pollutants like DDT, heavy metals, surfactants, oil slicks from water and soil, determination of potability of water by MPN method, Biofertilizers and Biopesticides

Practical
Major Paper Code: BENVS-391
Credit: 2

1. study of vegetation sampling methods - euadrat and transects
2. Estimation of frequency, density and abundance of species by quadrat/plot method.
3. Estimation of productivity of water bodies by Gaarder-gran method. '
4. Estimation of productivity of crop plants by harvest method.
5. Determination of leaf area by graphical method.
6. Estimation of terrestrial productivity - Chlorophyll method.
7. Quantitative estimation of planktons and zooplanktons-sedgwick - Rafter method.
8. Isolation of bacteria from water /wastewater using serial dilution method
9. Estimation of coliform bacteria- MPN technique and MF technique
10. Identification of Ecological Indicators.

Suggested Books:

1. Fundamentals of Ecology: E.P. Odum
2. Aquatic Ecosystems: Kumar, A P H Pubh
3. Renewable Energy - Environment and Development: M.Dayal; Konark Pub. Pvt.Ltd
4. Sapru R.K. 1987. Environment Management in India. Vol.I& II. Ashish Pub. House.
5. Agarwal & Rana S.V.S 1985. Environment & Natural resources, society of Biosciences.

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Major Paper Code: BENVS-302	SEM-III
Paper Name: ENVIRONMENTAL POLLUTION & CONTROL	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Lecture hour: 45	End semester exam: 70
Tutorial hour: 30	Continuous Assessment: 30
Practical hour:	Practical/Seasonal internal continuous evaluation:
Total hours: 75	Practical/Seasonal external examination:
Credit: 5	Mode of Exam: Offline

Course Objective:

1. Apply the principles of waste minimisation, source reduction, material use and recovery in the design of solid and hazardous waste management systems.
2. Develop technical knowledge and apply design skills related to solid waste generation, collection and disposal.
3. Develop technical knowledge and design skills related to hazardous waste treatment and management.
4. Assess pollution problems caused by emerging pollutants and apply control approaches needed through solving real problem in civil and environmental engineering practice.
5. Demonstrate ability to use appropriate equipment and techniques in the identification and control of environmental pollution.

Course Outcome:

1. Knowledge of Environmental Concepts: Understand the different kinds of Pollutions and their sources through study of Climate and Air Pollution Studies, Hazardous Waste & Environmental Toxicology and Soil Pollution and different laws about pollution.
2. Scientific Skills: Understand the different kinds of Pollutions and their sources through study of Climate and Air Pollution Studies, Hazardous Waste & Environmental Toxicology and Soil Pollution and different laws about pollution
3. Environmental Problem-Solving: Uunderstand different technologies like biotechnology, water and Wastewater treatment technology to find the solutions and their applications in the abatement of Pollution and other environmental problems.
4. Environmental Policy and Regulation: Compile a precise decision on choosing the right solution or alternative solution related to environmental pollution-based problems.
5. Sustainable Practices: Determine the environmental impact due to different developmental projects and find solution to eliminate these impacts.

Unit 1: 2 Hours

Introduction:
Definition of pollution; pollutants; classification of pollutants.

Unit 2: 6 Hours
Air pollution: Ambient air quality: sources and types of air pollutants (primary and secondary); monitoring and standards (National Ambient Air Quality Standards of India); National air quality index; smog (case study); effects of different pollutants on human health (NOx, SOx, PM, CO, CO2, hydrocarbons and VOCs) and control measures; indoor air pollution: sources, effects on human health and remedial strategies. Vehicular pollution and control strategies.

Unit 3: 6 Hours
Water pollution: Sources of surface and ground water pollution; emerging pollutants: micro plastics, biphenyl-A, antibiotics; water quality parameters and standards; organic waste and water pollution; eutrophication; DO, BOD and COD; effect of water contaminants on human health (nitrate, fluoride, arsenic, heavy metals, pesticides); water borne diseases; concept and working of effluent treatment plants (ETPs);thermal pollution and its effects.

Unit 4: 4 Hours
Soil pollution: Causes of soil pollution and degradation; effect of soil pollution on plants, animals and human health; control strategies.

Unit 5: 5 Hours
Noise pollution: sources; frequency, intensity and permissible ambient noise levels; effect on communication, impacts on life forms and humans - working efficiency, physical and mental health; control measures.

Unit 6: 4 Hours
Radioactive: Radioactive material and sources of radioactive pollution; effect of radiation on human health (somatic and genetic effects).

Unit 7: 6 Hours
Marine pollution: Marine resources and their importance; sources of marine pollution; oil spill and its effects; coral reefs and their demise; coastal area management; existing challenges and management techniques (planning, construction, environmental monitoring of coastal zones), London Convention on the prevention of marine pollution.

Unit 8: 7 Hours
Pollution control: Activated Sludge Process (ASP) – Trickling Filters – oxidation ponds, fluidizedbedreactors, membrane bioreactor neutralization, ETP sludge management; digesters, up flowanaerobicsludge blanket reactor, fixed film reactors, sequencing batch reactors, hybrid reactors, bio scrubbers, bio trickling filters; regulatory framework for pollution monitoring and control; case study: Ganga Action Plan; Application of clean technologies for pollution control.

Unit 9: 5 Hours
Environmental Disasters: Minamata Disaster, Love Canal Disaster, Bhopal Gas Disaster, 1984, Chernobyl Disaster, 1986, Fukusima Daiichi nuclear disaster, 2011.

Suggested Books:

1. Wastewater Engineering – Treatment and Reuse, Metcalf & Eddy, Inc., Revised by G. Tchobanoglous, F. L. Burton, and H. D. Stensel, 4th edition. Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.
2. Air Pollution Control Engineering, N. de Nevers, 2nd Edition. McGraw Hill, Singapore, 2000.
3. Environmental Noise Pollution, P. E. Cunniff, McGraw Hill, New York, 1987.