

GENERIC ELECTIVES (GE-12)

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Environmental Biotechnology & Management GE-12	4	2	0	2	Class XII pass	Nil

Learning Objectives:

The course aims to build awareness of:

- various global and regional environmental concerns due to natural causes and/or human activities.
- different types of pollution and their impacts on the environment.
- existing and emerging technologies that are important in the area of environmental biotechnology to fulfill Sustainable Development Goals.

Learning Outcomes:

After completion of course the student will be able to:

- demonstrate awareness about emerging concerns such as climate change, waste management; biodegradation of xenobiotic compounds; bioremediation, etc.
- relate applications of biotechnology for alleviating the environmental concerns
- appreciate the scientific, ethical and/or social issues
- understand the national and international legislations, policies and role of public participation in Environmental Protection

Unit 1: Environment

5 hours

Basic concepts and issues, global environmental problems - ozone layer depletion, UV-B, greenhouse effect and acid rain due to anthropogenic activities, their impact and biotechnological approaches for management. Fate of pollutants in the environment, Bioconcentration, Biomagnification.

Unit 2: Microbiology of waste water treatment 7 hours

Aerobic process - activated sludge, oxidation ponds, trickling filter. Anaerobic process - anaerobic digestion, anaerobic filters, up-flow anaerobic sludge blanket reactors. Treatment schemes for waste waters of dairy and sugar industries.

Unit 3: Xenobiotic compounds 7 hours

Organic (Bio degradation of petroleum products and pesticides) and inorganic (metals, phosphates, nitrates). Bioremediation of xenobiotics in environment - ecological consideration, Bioaccumulation and Biosorption of metals

Unit 4: Treatment of toxic compounds: Role of immobilized cells/enzymes, microbial remediation 5 hours

Biopesticides, bioreactors, bioleaching, biomining, biosensors, biotechniques for air pollution abatement and odour control. Bioindicators and Bioprospecting

Unit 5: International Legislations, Policies for Environmental Protection **3 hours**

Stockholm Conference (1972) and its declaration, WCED (1983) and Brundtland Report (1987), Rio Earth Summit-UNCED (1992) and its declaration, Montreal Protocol - 1987, Kyoto Protocol- 1997. Environmental ethics

Unit 6: National Legislations, Policies for Pollution Management **3 hours**

Water Pollution (Prevention and Control) Act-1974, Air Pollution (Prevention and Control) Act-1981, National Environmental Policy - 2006, Central and State Pollution Control Boards: Constitution and power.

Practicals:

60 hours

1. To determine the pH and total hardness of water samples collected from different places (polluted and non-polluted sites)
2. To determine the salinity of water samples (polluted and non-polluted sites)
3. To determine the dissolved oxygen of two water samples.
4. To determine the alkalinity of water samples.
5. To determine the pH and rapid field test of soil samples (Chloride, Nitrate, and Sulphate).
6. To study microbes suspended in air and water samples.
7. A visit to any educational institute/ industry to understand the uses of microbes in environmental management and a report to be submitted for the same.

Suggested Readings:

1. De, A. K. (2022). Environmental Chemistry, 10th Edition, New Delhi. New Age International Pvt. Limited
2. Dennis, A., Seal, K.J., Gaylarde, C.C. (2004). Introduction to Biodeterioration, Cambridge University Press
3. Ahmed, N., Qureshi, F.M., Khan, O.Y. (2006). Industrial and Environmental Biotechnology, Horizon Press
4. Rochelle, P.A. (2001). Environmental Molecular Biology, Horizon Press.
5. Jadhav, H.V., Bhosale, V.M. (2015). Environmental Protection and Laws, Himalaya publishing House Pvt Ltd.
6. Trivedi, P. C. (2006). Biodiversity Assessment and Conservation, Agrobios Publ.
7. Rana, S.V.S. (2015). Environmental Biotechnology, Rastogi Publications, India.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.