

## **Credit distribution, Eligibility and Pre-requisites of the Course**

<b>Course title &amp; Code</b>	<b>Credit s</b>	<b>Credit distribution of the course</b>			<b>Eligibility criteria</b>	<b>Pre-requisite of the course (if any)</b>
		<b>Lectur e</b>	<b>Tutorial</b>	<b>Practical/ Practice</b>		
<b>Environmental Biochemistry</b>	<b>04</b>	<b>02</b>	<b>00</b>	<b>02</b>	<b>Class XII with Science</b>	<b>NIL</b>

### **Learning Objectives**

This course will provide understanding of environment around and which pollutants are of concern to us. It will provide knowledge of sustainability and methods which can help to improve the sustainability. It will also make students understand how toxicity can be monitored in our body and how our body copes to detoxify its internal system. It will also introduce methods which can be used to monitor the pollutants in various samples.

### **Learning outcomes**

On successful completion of the course students will be able to:

- Describe various components of the environment.
- Evaluate the local and global scale of environmental problem.
- Explain the biological, chemical and physical processes relevant to environmental problems.
- Apply the hands on experience of some quantitative and qualitative research tools gained to assess and analyse the environmental problems

### **Theory**

**Credits: 2**

**Total Hours- 30**

**Unit 1: Introduction to Environment and the Pollutants**

**(9 Hours)**

Components of Environment - Atmosphere, Hydrosphere, Lithosphere and Biosphere. Global Warming and Climate change. Ozone depletion. Normal Chemistry of - Air, Water, Soil. Environmental Toxins-Physical Pollutants- Noise, Light and Radiation and Air Pollutants- Carbon Monoxide, Lead, Nitrogen Oxides, Ozone, Particulate Matter, Sulphur Dioxide, Methane Volatile Organic Chemicals (VOC); Water Pollutants - Volatile Organic Chemicals (VOC), Heavy Metals, Insecticides, Herbicides/ Endocrine Disruptors; Soil Pollutants-

Heavy metals, Herbicides/pesticides, Polyaromatic Carbon (PAH), Microplastics; Source, Effect and Impact on Flora, Fauna including Human Beings. Definition of Terminologies: Air Quality Index (AQI) Suspended Particulate matter (SPM), Water Quality Index (WQI), Air Pollution Tolerance Index (APTI), Anticipated Performance Index (API).

**Unit 2: Environment and Xenobiotics** **(7 Hours)**

Understanding the principle of Toxicity. Concept of Dose and Response (LD50). Process of Bioaccumulation, Bioaugmentation and Biotransformation. Impact of pollutants on human health Mammalian Detoxification by Liver to Organic Chemicals (Heavy Metals, Endocrine Disruptors, Microplastics).

**Unit 3: Sustainability and its Enhancement** **(8 Hours)**

Concept of Sustainability and Enhancement of Sustainability, Waste Management (Refuse, Reduce, Reuse and Recycle), Sewage treatment and Industrial effluents (tanning and electroplating), Bioremediation- Introduction and Types of Bioremediations- Phytoremediation, Microbial Bioremediation, In-situ Remediation, Ex-situ Remediation.

**Unit 4: Techniques to Analyse Pollutants** **(6 Hours)**

Determination of pollutants in soil, water, air, blood by following Analytical Techniques: Flame Photometer; Atomic Absorption Spectroscopy (AAS); Inductive Coupled Plasma (ICP -OES & MS); Gas Liquid Chromatography (GC-MS); Ion Chromatography; High Performance Liquid Chromatography (HPLC); UV spectrophotometer; Biosensors and its application in pollution detection; Metagenomics.

**2.3 Practical:**

**Credits: 2**

**Total Hours - 60**

1. Evaluating APTI and API of Herbs/Shrubs/Trees
2. Evaluating seasonal variations of AQI and SPM
3. Evaluating C/N/P/K content of soil by Spectrophotometry/Titrimetric method
4. Detecting Microbial Contamination of water
5. Composting of waste (Leaf/Kitchen Waste/Cow dung) and Detecting Maturity by pH and Electric conductivity (EC) content changes
6. Studying Enzymatic Activity (amylase/urease) in the soil sample due to microbial activity
7. Student Environment Projects.

#### **2.4 Essential readings:**

- Basic Concepts on Environmental Chemistry by Des. W. Conwell (2005) 2<sup>nd</sup> edition, CRC press, ISBN 9781498770484
- Environmental Chemistry by Stanley E. Manahan, 11<sup>th</sup> Edition, Taylor and Francis, 2022, ISBN 9780367560546
- Biodegradation and Bioremediation by Alexander Martin, 2<sup>nd</sup> Edition, Academic Press, ISBN 978-0-12-049861-8
  
- Fundamentals of Ecology author Eugene Odum, Cary W. Barrett, 5<sup>th</sup> edition Cengage learning India. ISBN 9788131500200
- Environment and Ecology author P.D. Sharma, 12<sup>th</sup> Edition, Rastogi Publication. ISBN 978-93-5078-068-8

#### **3. Keywords**

Environment, Climate Change, ozone depletion, Waste Management, Bioremediation, Toxicity, Bioaccumulation, Bioaugmentation, Biotransformation, Detoxification, Biosensors.

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