

# ENVIRONMENTAL SCIENCE

## V SEMESTER

**COURSE CODE: BES22C501**

**COURSE TYPE: (MAJOR/MINOR)**

**COURSE TITLE: Environmental Pollution**

**CREDITS: (Theory-4, Practical -2)**

*Course objectives and Learning outcome: The students in this course will be provided a comprehensive picture of pollution scenario especially air and radiation pollution and its likely impact of pollutants on the environment. Students will be able to achieve competence in the area of prevention and control measures of various types of pollution like air, noise, and electromagnetic.*

**THEORY (4 credits: 64 hours)**

### **Unit I: Air and Noise Pollution**

- 1.1. Air pollution: Sources and classification
- 1.2. Indoor air pollution,
- 1.3. Air quality standards and monitoring: SO<sub>2</sub>, NO<sub>2</sub>, CO, PM and ozone
- 1.4. Noise pollution: sources, measurement and noise standards
- 1.5. Impact of air and noise pollution on human health and environment

### **Unit II: Water Pollution**

- 2.1. Water Pollution: sources and types
- 2.2. Inland water and marine pollution
- 2.3. Biocides and heavy metals
- 2.4. Water quality standards and monitoring
- 2.5. Impacts of water pollution on human health and environment

### **Unit III: Soil Pollution**

- 3.1. Soil pollution: causes and types
- 3.2. Land degradation and desertification
- 3.3. Soil erosion: causes and impacts
- 3.4. Fate of pesticides, fertilizers and heavy metals in soil
- 3.5. Soil quality standards and monitoring

### **Unit IV: Waste and Radiation Pollution**

- 4.1. Solid waste pollution: Causes and effects
- 4.2. Electronic waste pollution
- 4.3. Plastic and microplastic waste pollution: Causes and effects
- 4.4. Radiation exposure (special reference to mobile phones and towers) and human health
- 4.5. Light pollution

**Laboratory Course:**  
**hours)**

**(02 credits: 64**

1. Study of ambient noise levels in different zones
2. Determination of particulate matter (PM) in ambient air
3. Determination of acidity content in water samples
4. Determination of BOD in different water samples.
5. Determination of COD in different water samples.
6. Determination of E. Coli content in different water samples.
7. Estimation of nitrogen and phosphorus in different soil samples
8. Qualitative and quantitative assessment of municipal solid waste

**ENVIRONMENTAL SCIENCE  
V SEMESTER**

**COURSE CODE: BES22C502**

**COURSE TYPE: (MAJOR)**

**COURSE TITLE: Ecosystems (Aquatic/Terrestrial) and their Management**

**CREDITS: (Theory-4, Internship -2)**

*Course objectives and Learning outcome: It offers students a snapshot of the physical, chemical, and biological processes that characterize inland waters such as lakes, streams, rivers, and wetlands and focusses on understanding the relationships between humans and freshwater, and discusses these challenges in Management. It will give a broad outline and deep understanding of different terrestrial systems, components and interactions. This course shall help students in understanding that the structure and function of terrestrial ecosystems is fundamental to their conservation. This course provides a conceptual framework for understanding the range of the world's terrestrial ecosystems and provides practical field experience with major terrestrial ecosystems.*

**THEORY (4 credits: 64 hours)**

**Unit I: Freshwater Ecology**

- 1.1. Streams: Origin and classification
- 1.2. Lakes: Origin, classification and stratification
- 1.3. Wetlands: Origin and classification
- 1.4. Streams, lakes and wetlands: Ecological architecture
- 1.5. Paleolimnology

**Unit II: Management of Freshwater ecosystems**

- 2.1. Monitoring approaches of freshwater habitats
- 2.2. Conservation strategies and Management of lotic systems
- 2.3. Conservation strategies and Management of lakes .
- 2.4. Conservation strategies and Management of wetlands
- 2.5. Conservation of Migratory birds in freshwater ecosystems

**Unit III: Terrestrial ecology**

- 3.1. Global distribution of terrestrial ecosystems
- 3.2. Forest community: Structure and function with productivity patterns
- 3.3. Deserts: Distribution and function with productivity patterns
- 3.4. Grasslands: Distribution and function with productivity patterns
- 3.5. Agroecosystems: Global Scenario

**Unit IV: Management of Terrestrial Ecosystems**

- 4.1. Conservation strategies and Management of forests.
- 4.2. Conservation strategies and Management of Deserts
- 4.3. Conservation strategies and Management of Grasslands
- 4.4. Management challenges for sustainable agro-economy
- 4.5. Reclamation of degraded lands.

**Internship:****(2 credits: 64 hours)****Course Title:** Hydroponics**Learning Objectives and outcome:**

The Hydroponics Internship aims to provide students with hands-on experience in soilless farming techniques, specifically focusing on hydroponic systems. Students will learn how to manage and operate hydroponic setups, understand the science behind plant nutrition in a water-based environment, and gain practical skills in sustainable agriculture.

Upon completing the internship, students will:

- Understand the different types of hydroponic systems (e.g., nutrient film technique, deep water culture, aeroponics).
- Gain practical skills in setting up, maintaining, and troubleshooting hydroponic systems.
- Learn about plant nutrition and the role of water, nutrients, and light in hydroponic agriculture.
- Explore the economic and environmental aspects of hydroponics as a sustainable farming solution.
- Develop technical skills for monitoring and optimizing plant growth in a controlled environment.

Eligibility:

- Open to students of all departments of the college and other external institutions with a focus on basic, natural, allied sciences and applied sciences.

Duration:

- A minimum of 64 hours training in hydroponic systems is required for the successful completion of the internship.

**Key Areas of Focus:**

1. Hydroponic System Design: Understanding the various system components (tanks, pumps, grow beds, lighting, etc.) and setting up functional hydroponic systems.
2. Plant Selection and Nutrient Management: Learning how to select appropriate crops and mix nutrient solutions tailored to specific plant needs.
3. Environmental Control: Managing factors like pH, temperature, light, and humidity for optimal plant growth.
4. Pest and Disease Management: Understanding common challenges in hydroponic systems and how to address them using sustainable practices.
5. Sustainability and Innovation: Exploring the role of hydroponics in addressing food security, urban farming, and reducing water usage in agriculture.

**Assessment:**

1. Internship Report : Students must submit a detailed report outlining the processes learned, system management, and any challenges faced during the internship.
2. Presentation: A final presentation showcasing the hydroponic setup they worked on, key learnings, and practical experiences.

## ENVIRONMENTAL SCIENCE

### V SEMESTER

**COURSE CODE: BES22C503**

**COURSE TYPE: (MAJOR)**

**COURSE TITLE: Environmental Toxicology**

**CREDITS: (Theory-4, Practical -2)**

**Course objectives and Learning outcome::** *The students are expected to learn about various types of toxins, their absorption, excretion and the mechanism involved in the bioaccumulation, bio concentration and bio magnification of xenobiotic besides their impact on human health and environment.*

### **THEORY (4 credits: 64 hours)**

#### **Unit I: Fundamentals of toxicology**

- 1.1. Toxicology: Concept, scope and goals
- 1.2. Divisions of toxicology
- 1.3. Toxicological interactions
- 1.4. Factors influencing toxicity
- 1.5. Dose - response relationship

#### **Unit II: Ecotoxicology**

- 2.1. Ecotoxicology: objectives, principles and scope
- 2.2. Fate of toxic substances in environment
- 2.3. Natural Toxins and Poisons
- 2.4. Toxicity testing methods
- 2.5. Ethical issues in toxicology

#### **Unit II: Toxicokinetics**

- 3.1. Xenobiotics and recalcitrants: concept and classification
- 3.2. Absorption of xenobiotics, membrane barriers, binding and storage
- 3.3. Excretion of xenobiotics
- 3.4. Biotransformation: Mechanism
- 3.5. Bioaccumulation, bioconcentration and biomagnification of xenobiotics

#### **Unit IV: Toxicants as public health hazard**

- 4.1. Agrochemicals and public health
- 4.2. Food additives and public health
- 4.3. Metal toxicity and human health
- 4.4. Occupational toxicity
- 4.5. Evaluation and control of occupational health hazards

**Laboratory Course :****(2 credits: 64 hours)**

1. Pharmacological importance of various toxic medicinal plants of Kashmir Himalaya
2. Evaluating LD<sub>50</sub> of various toxicants
3. To study the effect of toxic chemicals on seed germination or plant growth
4. Estimation of carbohydrates in biological samples
5. Estimation of proteins in biological samples
6. Assess the impact of pesticides on non-target organisms.
7. Investigate the impact of microplastics on aquatic organisms.
8. Field visit to an alpine ecosystem for collection and habitat assessment of toxic medicinal plants.