

## **Environmental Chemistry (CHEMISTRY 321) Course Outcomes:**

Upon successful completion of the course the student will be able to:

1. Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soil.
2. Recognize different types of toxic substances & responses and analyze toxicological information.
3. Apply basic chemical concepts to analyze chemical processes involved in different environmental problems (air, water & soil).
4. Describe water purification and waste treatment processes and the practical chemistry involved.
5. Describe causes and effects of environmental pollution by energy industry and discuss some mitigation strategies.
6. Explain energy crisis and different aspects of sustainability.
7. Discuss local and global environmental issues based on the knowledge gained throughout the course.

## **Course syllabus:**

### **1. General Concepts:**

#### **A. Essential chemical concepts**

- Fundamentals (atoms, elements, radicals; states of matter, elemental and chemical bonding, kinetics, gas law, chemical reactions, stoichiometry, units, mass balance)
- Organic chemistry
- Toxic organic compounds (Pesticides, dioxins, Furans and PCBs, Contaminants of Emerging Concern)

#### **B. Biological and Ecological concepts**

- Biological systems
- Ecological systems (Energy flow in ecosystem, food chain, bioconcentration, bioaccumulation, toxicology)
- Nutrient cycles (Global biogeochemical cycles)
- Limnological concepts and eutrophication

### **2. Atmospheric Chemistry**

- Stratospheric chemistry; Ozone layer hole
- Ground level air pollution & Health consequences

### **3. Aquatic Chemistry**

- The chemistry of natural waters
- The pollution and purification of water (drinking water and municipal waste water)

### **4. Energy**

#### **A. Energy and climate change**

- The greenhouse effect
- Fossil fuel energy and global warming
- Renewable energy
- Nuclear energy

**B. Energy and water pollution**

**C. Sustainable abundance or ecological crisis**

## **5. Metals, soil sediments and waste disposal**

- Toxic heavy metals
- Waste, soils and sediments