Title of the Course: Environmental Chemistry

Course Code: ENV 626
Number of Credits: 03
Effective from AY: 2022-23

Prerequisitesfor the course:	Students who have undergone M. Sc. Part I (Environmental Science).	
Objectives:	1. To introduce fundamentals of environmental chemistry and environmental pollution. 2. Awareness of harmful effects of pollutants and control measures.	
Content:	**Module I** Introduction: Environmental segments (Lithosphere, Hydrosphere, Atmosphere, and Biosphere). Biogeochemical cycles (hydrogen, carbon, nitrogen, oxygen, phosphorus, and sulphur). Introduction to Air, Water and Soil Pollution. Air pollution: Air pollutants (primary and secondary), photochemical reaction, Acid rain, Ozone layer depletion, global warming. Carbon monoxide, nitrogen oxides, sulphur dioxide and hydrocarbons (sources, harmful effects, analysis and control measures). Particulate matters (inorganic, organic and radioactive), health hazards, analysis, control devices (Gravitational settlings, particulate air filters, centrifugal separators, wet scrubbers). Case study: London smog and Los Angeles smog. **Module II** Water pollution: Water analysis (salinity, hardness, pH BOD, COD, colour, turbidity, taste and odour); Water pollutants: nitrates, phosphates, phenols, cyanides, heavy metals (Cd, Hg) and analysis methods. Lake and river water treatment, municipal waste water treatment and industrial effluent treatment (from pesticides, pharmaceutical and electroplating). Case study - DDT, Kepone, Minamata. Soil pollution: Inorganic and organic components in soil, Reactions in soil, waste pollutants in soil. Excess usage of agrochemicals, soil contamination with pollutants Pesticides (toxicity, biochemical effects and control measures). **Module III** Introduction to Environmental Hazards: Plastics (harmful effects, preventive measures and control measures), Microplastics and Nanoplastics, E-waste (impact on environment, harmful effects and control measures) Radioactivity (contamination of radioactivity, radiation hazards, control measures). Waste Management: Waste Management (sources and types of solid wastes, disposal techniques, collection methods, waste management approach). Energy Resources and Conservation of energy resources: Energy Resources and Conservation Renewable and non-renewable energy resources, growing energy need, sun as source of energy, solar radiation and its spectral characteristics, fossil fuels classification, composition. Principle of generation and conservation of conventional and non-conventional energy. Energy from biomass and biogas, energy conservation policies.	15 hrs. 15 hrs. 15 hrs.
Pedagogy:	Lectures/tutorials/seminars/assignments/presentations/self-study.	

References / Readings:	1. De, A. K. (2005). *Environmental Chemistry* (Third Edition). New Age International Publishers, New Delhi, 2. Salker, V. (2017). *Environmental Chemistry* (First Edition). Narosa Publishing House, New Delhi. 3. Sharma, K. (2003). *Environmental Chemistry* (First Edition). GOEL Publishing House, Meerut. 4. O'Neill, P. (2009). *Environmental Chemistry* (Third Edition). Blackie Academic and Professional, London. 5. Khopkar, S. M. (2005). *Environmental Pollution Analysis* (First Edition). New Age International Publishers, New Delhi.	
Course Outcomes	1. Students will be able to understand the basic environmental chemical processes. 2. Students will be able to explain the origin and harmful effects of toxic chemicals in the environment.	