ENVIRONMENTAL CHEMISTRY

(Basic Science Elective)

Course Code: 15BC1103

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Course Outcomes:

At the end of the course, students will be able to:

CO 1: Recall the terms involved in pollution.

CO 2: To understand the different sources and effects of air pollution.

CO 3: Understanding of various sources, types of pollutants causing water pollution.

CO 4: To know Soil, Noise, Thermal and Radioactive Pollutions and their effects.

CO 5: Study of various pollution control measures.

UNIT-I: **(6 Lectures)**

ENVIRONMENT

Concept and scope of environmental chemistry – Segments of environment. Environmental pollution: Concepts and definition – Pollutant, contaminant, receptor and sink – Classification of pollutants - Global, regional, local, persistent and non-persistent pollutants.

UNIT-II: **(10 Lectures)**

AIR POLLUTION

Major regions of atmosphere – Tropospheric pollution and stratospheric pollution – Major air pollutants: Oxides of carbon, nitrogen and sulphur- Hydrocarbons – Chlorofluorocarbons - Particulates. Smog: London smog and photochemical smog. Automobile pollution. Effects of air pollution: Acid rain, green house effect and depletion of ozone layer. Control of air pollution - Alternate

refrigerants – Bhopal Tragedy (a brief study). Causes, symptoms and drugs used for the treatment of air-borne diseases: Chickenpox, influenza, measles and tuberculosis.

UNIT-III: (12 Lectures)

WATER POLLUTION

Hydrological cycle – Importance of water - Aquatic pollution – Visible signs of aquatic pollution – Water pollution due to human activity – Pollution due to sewage, domestic wastes, industrial effluents, agricultural discharge, soaps and detergents. Eutrophication. Types of water pollutants: Biological agents,

physical agents and chemical agents. Biological magnification and bioaccumulation. Water quality parameters: DO, BOD, COD, alkalianity, hardness, chloride, fluoride and nitrate. Toxic metals in water and their effects: Cadmium, lead and mercury - Minamata disaster (a brief study). Water born diseases: Cholera, dysentery and typhoid – Symptoms and medicines.

UNIT-IV: (12 Lectures)

SOIL, NOISE, THERMAL AND RADIOACTIVE POLLUTIONS

Soil pollution: House hold, municipal and industrial solid wastes. Pollution due to plastics, pesticides, biomedical waste and E-waste (source, effects and control measures) – Non-degradable, degradable and biodegradable wastes. Hazardous waste. Noise pollution, thermal pollution and radioactive pollution (source, effects and control measures) – Hiroshima, Nagasaki and Chernobyl accidents (brief study). Endosulfan disaster in Kerala (brief study).

UNIT-V: (10 Lectures)

POLLUTION CONTROL MEASURES

Air pollution control measures – Gravitational settling chamber, fabric filter, wet scrubber, catalytic converters, stacks and chimneys, cyclone collectors, Cottrell electrostatic precipitator, extraction ventilator, zoning and green belt.

Water treatment methods - Primary, secondary and tertiary methods - Aerobic and anaerobic oxidation - Sedimentation, coagulation, filtration, disinfection, desalination and ion exchange - USAB process and deep well injection.

Solid waste management: Recycling, incineration, digestion, dumping, land treatment and composting. Introduction to Green chemistry (elementary ideas only).

Pollution Control Board: Duties and responsibilities (a brief study).

Some Environmental movements: Chipco, Narmada, Silent Valley and Plachimada.

TEXT BOOKS:

1. V.P.Kudesia, *Environmental chemistry*, 2nd Edition, Pragati Prakashan, Meerut, 2003.
2. B.K. Sharma and H. Kaur, *Environmental Chemistry*, Goel Publishing House, Meerut, 1996.

REFERENCES:

1. A.K. De, *Environmental Chemistry*, 6th Edition, New Age International, New Delhi, 2006.
2. S.S. Dara, *A Textbook of Environmental Chemistry and Pollution Control*, 8th Edition, S. Chand and Sons, New Delhi, 2008 (Reprint).
3. S.E. Manahan, *Environmental Chemistry*, 8th Edition, CRC Press, Florida, 2004.
4. P.K. Goel, *Water Pollution: Causes, Effects and Control*, New Age International, New Delhi, 2006.
5. Kochu Baby Manjooran, *Modern Engineering Chemistry*, Kannatheri Publications, 2009.
6. A.K. Ahluwalia, *Environmental Chemistry*, Ane Books India, New Delhi, 2008.