SEMESTER VII

Common Pool of Discipline Specific Elective Courses
applicable for both B.Sc. Life Sciences and B.Sc. Physical Sciences

DISCIPLINE SPECIFIC ELECTIVE COURSE – 14 (DSE-14):
Industrial Chemicals and Environment

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Industrial Chemicals and Environment (DSE-14)	**04**	**02**	**--**	**02**	Class12th with Physics, Chemistry Biology	**--**

Course Objectives

The objectives of this course are as follows:

The objective of this course is to make students aware about the intricate relationship between industrial processes, the production and use of chemicals, and their profound impact on the environment. Manufacturing, applications, analysis and hazards of the Inorganic Chemicals. Air and Water pollution, control measures for Air and Water Pollutants, Effluents, waste water treatment and Environment.

Learning Outcomes

By studying this course, the students will be able to:

- Understand manufacturing processes, handling and storage of inorganic chemicals.
- Realize hazardous effects of the inorganic chemicals on human beings and vegetation.
- Understand composition of air, various air pollutants, effects and control measures of air pollutants.
- Understand different sources of water, water quality parameters, impacts of water pollution, industrial effluents and water treatment.

UNIT- 1: Inorganic Chemicals: **(8 Hours)**

Inorganic Chemicals: Manufacture, applications, analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potassium dichromate and potassium permanganate

UNIT- 2: Environment and Its Segments **(4 Hours)**

Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur. Major regions of atmosphere, chemical and photochemical reactions in atmosphere.

UNIT- 3: Air Pollution and its Effects **(8 Hours)**

Air pollutants; types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry. Major sources of air pollution, Pollution by SO_2, CO_2, CO, NO, H_2S and other foul smelling gases, methods of estimation of CO, NOT, SOA and control procedures, Effects of air pollution on living organisms and vegetation, Greenhouse effect and Global warming, Environmental effects of ozone, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and halogens, Air pollution control, Settling Chambers, Venturi Scrubbers, Cyclones, Electrostatic Precipitators (ESPs).

UNIT-4: Water Pollution **(10 Hours)**

Hydrological cycle, water resources, aquatic ecosystems, Sources and nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological cycle and ecosystems. Water purification methods. Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro fertilizer. Water quality parameters for wastewater, industrial water and domestic water.

Practicals: **Credits: 02**

(Laboratory periods: 15 classes of 4 hours each)

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD).
3. Determination of Biological Oxygen Demand (BOD).
4. Percentage of available chlorine in bleaching powder.
5. Measurement of chloride, sulphate and salinity of water samples by simple titration method ($AgNO_3$ and potassium chromate).
6. Estimation of total alkalinity of water samples (CO_3^{2-}, HCO_3^-) using double titration method.
7. Measurement of dissolved CO_2 in water samples.
8. Determination of hexavalent Chromium Cr(VI) concentration in tannery wastes/waste water sample using UV-Vis spectrophotometry technique.
9. Preparation of borax/ boric acid

Essential/recommended readings
Theory:

1. Manahan, S.E. (2017),Environmental Chemistry, CRC Press
2. Buchel, K.H.; Moretto, H.H.; Woditsch, P.(2003),Industrial Inorganic Chemistry, Wiley-VCH.
3. De, A.K.(2012), Environmental Chemistry, New Age International Pvt., Ltd.
4. Khopkar, S.M.(2010), Environmental Pollution Analysis, New Age International Publisher.

Practical:

1. Vowles, P.D.; Connell, D.W. (1980), Experiments in Environmental Chemistry: A Laboratory Manual, Vol.4, Pergamon Series in Environmental Science.
2. Gopalan, R.; Anand, A.; Sugumar R.W. (2008),A Laboratory Manual for Environmental Chemistry, I. K. International.

Assessment Methods: All examination and assessments methods shall be in line with the University of Delhi guidelines issued from time to time.