6. Interpret the Gaussian plume model for the movement of pollutants in the environment.
7. Analyze the principle and applications of black body radiation and Beer–Lambert law.
8. Simulate the meteorogram of any geographical region and interpret it.

Suggestive readings

- Boeker, E. & Grondelle, R. 2011. Environmental Physics: Sustainable Energy and Climate Change. Wiley.
- Borghese, F., Denti, P. and Saija, R., 2007. Scattering from Model Nonspherical Particles:Theory and Applications to Environmental Physics. Springer Science & Business Media.
- Forinash, K. 2010. Foundation of Environmental Physics. Island Press.
- Monteith, J. and Unsworth, M., 2013. Principles of Environmental Physics: Plants, Animals, and the Atmosphere. Academic Press.
- Smith, C., 2004. Environmental Physics. Routledge.

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DISCIPLINE SPECIFIC CORE COURSE – 3: ENVIRONMENTAL CHEMISTRY

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		
ENVIRONMENTAL CHEMISTRY	4	2	0	2	Class X II pass	NIL

Learning Objectives

• Design strategies based on principles of environmental chemistry to The Learning Objectives of this course are as follows:
•Develop concepts of environmental chemistry as a fundamental principle of various environmental processes
•Link pollutant chemistry as a basis of pollution potential of contaminants
•Gain insights into chemical reactions that govern the movement of chemical contaminants across the environmental compartments and develop solutions that influence pollutant chemistry.

Learning outcomes

The Learning Outcomes of this course are as follows:

• Synthesize knowledge on the structure and functions of environmental compartments based on the principles of environmental chemistry
• Acquire analytical and technical skills to recognize and estimate different environmental chemicals
• Apply concepts of environmental chemistry to develop low-cost methods to treat potable and industrial wastewater and manage the quality of water, soil, and air
• Relate and interpret the contaminants exposure and its adverse impacts on living organisms and the health of ecosystems
influence the environmental fate of contaminants
• Discuss global environmental issues in the background of the chemistry of pollutants

SYLLABUS OF DSC-3

UNIT – I Fundamentals of environmental chemistry (10 hours)
Atomic structure, electronic configuration, periodic properties of elements (ionization potential, electron affinity and electronegativity), types of chemical bonds (ionic, covalent, coordinate and hydrogen bonds); mole concept, molarity and normality, quantitative volumetric analysis.

Thermodynamic system; types of chemical reactions; acids, bases and salts, solubility products; solutes and solvents; redox reactions, concepts of pH and pE, electrochemistry, Nernst equation, electrochemical cells.

Basic concepts of organic chemistry, hydrocarbons, aliphatic and aromatic compounds, organic functional groups, polarity of the functional groups, synthesis of xenobiotic compounds like pesticides and dyes, synthetic polymers.

UNIT – II Atmospheric chemistry (8 hours)
Composition of atmosphere; photochemical reactions in atmosphere; smog formation, types of smog (sulphur smog and photochemical smog), aerosols; chemistry of acid rain, case studies; reactions of NO2 and SO2; free radicals and ozone layer depletion, role of CFCs in ozone depletion.

UNIT – III Water chemistry (6 hours)
Chemical and physical properties of water; alkalinity and acidity of water, hardness of water, calculation of total hardness; solubility of metals, complex formation and chelation; colloidal particles; heavy metals in water

UNIT – IV Soil chemistry (6 hours)
Soil composition; relation between organic carbon and organic matter, inorganic and organic components in soil; soil humus; cation and anion exchange reactions in soil; nitrogen, phosphorus and potassium in soil; phenolic compounds in soil.

Practical component (if any) - (60 hours)

1. Prepare buffers/solutions of different molarity and normality using the given stocks solutions

2. Determine the variations in pH of different soils and water samples using various methods.
3. Estimate hardness of given water samples
4. Determine cation exchange capacity of given soils samples
5. Determine the suitability of water for use for agriculture, industrial and domestic purposes based on selected water parameters
6. Estimate contents of selected heavy metals in given water and soil samples and identify their possible sources
7. Analyse variations in air quality index of different regions and correlate with anthropogenic or natural factors
8. Estimate organic matter contents in different soil types
9. Assess soil health based on the concentration of selected macro elements

Suggestive readings

- Beard, J.M. 2013. Environmental Chemistry in Society (2nd edition). CRC Press.
- Connell, D.W. 2005. Basic Concepts of Environmental Chemistry (2nd edition). CRC Press.
- Girard, J. 2013. Principles of Environmental Chemistry (3rd edition). Jones & Bartlett.
- Harnung, S.E. & Johnson, M.S. 2012. Chemistry and the Environment. Cambridge University Press.
- Hites, R.A. 2012. Elements of Environmental Chemistry (2nd edition). Wiley Sons.
- Manhan, S. E. 2000. Fundamentals of Environmental Chemistry. CRC Press.
- Pani, B. 2007. Textbook of Environmental Chemistry. IK international Publishing House.

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