



ST. XAVIER'S COLLEGE (AUTONOMOUS)

Re-accredited with 'A+' by NAAC (4th Cycle) | Affiliated to Gujarat University

DEPARTMENT OF CHEMISTRY MULTIDISCIPLINARY COURSE SYLLABUS

Multidisciplinary Course: Sustainable Environment

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
IC-1201 Sustainable Environment	4	0	0	10 + 2 from a recognized board in any stream	Basic of Environmental Science

I. Learning Objectives

On completion of this course, the student will be able

- LO-1. To understand the 12 principles of Green Chemistry and identify greener solvents and use of biocatalysts and will gain the knowledge of biogeochemical cycles.
- LO-2. To remember fundamental concepts of general chemistry, laboratory practices and describe its behavior in the environment analysis. To explain the general properties of water and develop awareness about water quality criteria and standards.
- LO-3. To know the causes and effects of soil pollution and learn about insecticides and pesticides and its adverse effects on soil due to its excessive use. Analyze the prevention and control measures of using them.
- LO-4. To know natural resources which are used and gain knowledge of conventional and non-conventional energy.

II. Course Outcomes

On Completion of this course, the student has been able to

- CO-1 To understand the basic function of the water, carbon, nitrogen, phosphorus, sulphur, and oxygen cycles. To learn about the environmental status and principles involved in green chemistry, bio-catalytic reactions.
- CO-2 Get acquainted with Principles of Environmental Analysis and to understand the general properties of water and develop awareness about water quality criteria and standards, and their relation to public health and environment.

- CO-3 To be able to learn about soil and their effect on plant's health and become aware about causes, effects and remedies to prevent mitigation of soil pollution. To identify the types of insecticides and pesticides and their effects on pollution.
- CO-4 To understand the need of energy conversion and the various methods of energy storage and to describe the environmental aspects of conventional and non-conventional energy resources.

III. Course Content

UNIT – 1: Biogeochemical cycles and Green Chemistry

1. Environmental Biogeochemical cycles

Introduction- Biosphere and characteristics of Biosphere, Biogeochemical cycles – Features, Active and passive pools of the cycles, Carbon cycle, Nitrogen cycle, Sulphur cycle, Oxygen cycle and Phosphorus cycle.

2. Green Chemistry

Introduction; Basic principles of green chemistry; Designing of green synthesis; Green Chemistry Using Bio Catalytic Reaction – Biochemical oxidations and applications of enzymes; Green solvent – Supercritical carbon dioxide.

UNIT – 2: Environmental Analysis and Water analysis

1. Principles of Environmental Analysis

Solution Concentration, (Normality, Molarity, ppm, equivalent weight etc.) Titrimetric method: Types of titration and titration curve acid – base titration – conductometric titrations.

2. Water analysis

Characteristics of water, Physical and chemical properties, Sampling, Preservation, measurement of water quality, Important water Quality parameters and methods for their determination- turbidity, free chlorine, nitrogen content, determination of pH, electrical conductivity, acidity, alkalinity, total hardness, Calcium, Magnesium, dissolved oxygen, BOD, COD, total solids (TDS, TSS) free carbon dioxide.

UNIT – 3: Soil and Agricultural Pollution

1. Soil pollution

Introduction, major routes of soil pollution, Important pollutants in soil, Causes of pollution, effects of soil pollution.

2. Agriculture pollution

Introduction, General aspects of pesticides and insecticides, Main cause of agriculture pollution, Fertilizers and environmental hazards from the fertilizers, Prevention of agricultural pollution.

UNIT – 4: Sources of Energy

1. Introduction to Natural Resource

Definition, Concept of natural resources and classification of resources-Renewable and non-renewable resources, Advantages and disadvantages of Renewable and non-renewable resources.

2. **Conventional Energy Sources and Non-Conventional Resources**

Conventional Energy Sources and Technology: Coal, petroleum; natural gas, nuclear energy, Non-conventional resources; solar, water, wind, tidal, geothermal resources, biomass energy Natural resources and development.

IV. Suggestive Readings

1. Environmental Chemistry – II Edition by A.K. De
2. Principles of Environmental Science by Watt, K.E.F. (1973), McGraw-Hill Book Company
3. Environmental Science by Nobel, B.J. and Kormandy, E.J. (1981), The Way the World Works, Prentice-Hall Inc., N.J.
4. Environmental Science by Turk A., Turk, J. Wittes J.T. and Wittes, R.E. (1978).
5. Ecology & Environment by P.D. Sharma.
6. Environmental Science: An Introduction by G. T. Miller-1991

V. Suggestive Online Links / Readings

1. <https://swayam.gov.in>
2. https://www.iscnagpur.ac.in/knowledge_learning_files/5.7_General_Open_Access_e-Resources.pdf
3. <https://ndl.iitkgp.ac.in>
4. <https://nptel.ac.in/course.html>