

NETAJI SUBHAS UNIVERSITY OF TECHNOLOGY
NEW DELHI-110078
Department of Chemistry

**FOUNDATION COURSES OFFERED BY DEPARTMENT
OF CHEMISTRY, NSUT.**

COURSE : ENVIRONMENTAL SCIENCE AND GREEN CHEMISTRY

A. OVERVIEW OF COURSE

Name of Course	Environmental Science and Green Chemistry
Offering Department	Department of Chemistry
B.Tech Branches to which this course is offered	All Branches of Sem I and II

OVERVIEW:

The Environmental Science and Green Chemistry course is offered to first-year students of all B. Tech branches. In this course, basic knowledge of Green Chemistry, Environmental Science and Analytical Techniques, their motive and applications in day-to-day life is being provided to I Year students. The objective is to cover a broad spectrum in the field of Environment and Green Chemistry.

This will help the students of these branches to understand the fact that Environmental Chemistry is different from Green Chemistry. While Green chemistry aims to reduce potential pollution at its source by chemically engineering products that minimize such pollution, Environmental Chemistry is simply the study of biochemical and chemical phenomena that occur in the environment. This will give an opportunity to the students to know the occurrence, movements, and transformations of chemicals in the environment.

B. SYLLABUS (THEORY)

Course No	Title of the Course	Course Structure	Pre-Requisite
FCCH0103	Environmental Science and Green Chemistry	L-T-P 3-0-2	None

COURSE OUTCOMES (COs):

After studying this course students will be able to

1. Define various kinds of pollution existing on earth and suggest the methods of their prevention and control.
2. Demonstrate the water quality parameters and methods of treatment of water to make it useful for various purposes such as for drinking, industry, agricultural usage, etc
3. Discuss the 12 principles of green chemistry and appraise how the practice of green chemistry reduces the environmental toxicity which may be resulted from chemical reactions.
4. Recognize different types of green materials and their significance.
5. Identify methods of separation using Chromatography and solvent extraction.
6. Analyze compounds based on spectroscopic methods of analysis.

COURSE CONTENT

UNIT 1

Environmental Sciences: Introduction, Air pollution*, water pollution*, Soil Pollution*, Solid waste management, Nuclear hazards*, Electronic Waste*, Case Studies (Bhopal Gas tragedy and Chernobyl), Bio-remediation.

(*causes, prevention and remedies of all types to be discussed)

UNIT II

Water Chemistry: Water Quality Parameters: Hardness of water and treatment, alkalinity of water, Biological and Bacteriological parameters (COD and BOD), Numericals on Hardness of water based on ions present and EDTA titration method, Numericals on alkalinity of water (total and individual alkalinity, P and M only)

UNIT III

Green Chemistry: Introduction to Green Chemistry, Principles of green chemistry with special emphasis on principles 1, 2, 5, 6 and 9. Real-world cases: surfactants for CO₂, designing for environmentally safe marine antifoulants, Biodegradable plastics and Biodiesel synthesis and use.

UNIT IV

Green Fuels and Bio-Polymer chemistry: Introduction and importance of green fuels, Green hydrogen, Photocatalytic and Photoelectrochemical water splitting, Hydrogen fuel cell, Production of Biodiesel from Jatropha and Biomass-based ethanol, Synthesis and applications of certain: biocompatible polymers - Polylactic Acid, Cellulose and Polyvinyl alcohol (PVA), Nanomaterials; Advantages of biocompatible materials over synthetic materials.

UNIT V

Analytical Techniques in Chemistry: Introduction to Chromatography, Adsorption (TLC and column chromatography) Chromatography, Partition Chromatography (paper chromatography) and examples of mixtures to be separated using both types of chromatographic techniques, Introduction to UV-Visible spectroscopy, Instrumentation and Applications.

SUGGESTED READINGS

1. Green Chemistry: Theory & Practice/P.T. Anastas & J.C. Warner/ Oxford Univ Press, 2000.
2. Solar-Driven Green Hydrogen Generation and Storage, Elsevier Science Publisher, 2023.
3. Green Biopolymers and Their Nanocomposite – Dhorali Gnanasekaran, Springer publisher, 2000
4. Applications of absorption spectroscopy of organic compounds by John Robert Dyer, 2019.
5. Organic Spectroscopy by William Kemp, Palgrave Macmillan, 2008.
6. Perspectives in Environmental Studies by A Kaushik and C P Kaushik, New Age International (P) Ltd., Publishers, 2006.
7. A Text Book of Environmental Studies by Shashi Chawla, Himalaya Publishing House, 2017.
8. Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company (P) Limited, 2004.