

INTER - DEPARTMENT ELECTIVES OFFERED TO OTHER DEPARTMENTS

19CHEE215-1: APPLIED CHEMISTRY

Learning Objectives

To enable the students to have knowledge about the basic aspects of chemistry

UNIT I

Concept and scope of environmental Chemistry. Environmental segments. Lithosphere, Hydrosphere. Atmospheric reactions. Chemical species and particles present in the atmosphere. Formation of ozone in the stratosphere. Natural cycles of environment, Hydrological cycle, Nitrogen, Phosphorus, Carbon and Sulphur cycles, Radio nuclides in the environment.

UNIT II

Air pollution, classification of air pollutants, acid rain – photochemical smog, particles, sources of important air pollutants man and the environment, Meteorology and air pollution – Precipitation and humidity – air quality standards

UNIT III

Water pollution - classification of water pollutants organic wastes, oxygen demanding wastes. Disease causing wastes-sewage and agricultural run-off water. Inorganic pollutants Character of waste water. Elementary idea of waste water, sedimentation, coagulation chemistry of aerobic and anaerobic processes. Activated sludge, Evaporation, ion exchange adsorption, chemical precipitation.

UNIT IV

Water, boiler feed water, its specifications. Removal of suspended and colloidal impurities, removal of silica and oil, removal of dissolved gases. Injuries due to hazardous chemicals - fire extinguishers.

UNIT V

Preliminary study and application of the following – Fuels, Cement, Glass, Polymers Rubber Paints, Refractories, Ceramics, Oils, Fats, Soaps and Detergents.

Text Books

- 1) A. K. De, Environmental Chemistry, Wiley Eastern, 1990.
- 2) S. S. Dara, A text book of Environmental Chemistry and pollution control, S. Chand & co Ltd.,
- 3) N. Manivasakam, Physico – Chemical examination of water, sewage and industrial effluents.

Course outcomes:

After successful completion students

CO1: will be able to understand the basics of environmental chemistry

CO2: will appreciate the causes of air and water pollution

CO3: will get an idea about removal of impurities

CO4: will be able to understand the principles of basic industrial chemistry

PO and PSO/Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	√	√						√									
CO2	√		√						√								
CO3	√			√						√				√			
CO4	√	√				√	√	√				√	√			√	√

19CHEE315-1: BASIC CHEMISTRY

Learning Objectives:

To enable the students to have knowledge about the various types of isomerisms in organic compounds. Kinetics and thermodynamic aspects of biological reactions and spectroscopic methods used in the study of biomolecules.

Unit-I: Isomerism in Organic Compounds

Types of Isomerism. Tautomerism with special reference to purines. Stereoisomerism. Geometric isomerism with special reference to fumaric and maleic acids. E – Z notation. Optical isomerism, optical activity, enantiomers, diastereomers. Meso and d, l forms. R – S and D – L notation in amino acids and sugars. Conformational analysis, conformation of ethane, butane and cyclohexane.

Unit – II: Thermodynamics

Thermodynamics – basic concepts. First, second and third laws of thermodynamics – enthalpy and entropy, exothermic and endothermic reactions. Free energy – standard free energy. Temperature and pressure dependence of free energy. Equilibrium for biochemical reactions. High energy phosphates and free energy. Redox reactions and free energy changes in biological reactions.

Unit – III: Chemical kinetics

Chemical kinetics – Rate of reactions – first order and second order reactions. Rate of equilibrium and multistep processes. Activation energy and effect of catalysts on reactions.

Unit – IV: Spectroscopy I

Ultraviolet visible spectroscopy. Beer – Lambert law. Chromophores – bathochromic and hypsochromic shifts. Fluorescence, fluorophores. Fluorescence quenching. Basic principles of IR spectroscopy and mass spectroscopy and their biological applications.

Unit – V : Spectroscopy II

Basic principles of NMR spectroscopy, FT NMR ^1H NMR spectra, chemical shift and coupling constant. ^1H NMR spectra of simple organic molecules. Spin decoupling. Nuclear Overhauser effect. Detection of nuclear Overhauser effect by using NOESY spectrum. Applications of ^1H NMR in the study of biomolecules.

Text Books:

1. Concise Inorganic Chemistry, J. D. Lee, Blackwell Science Ltd., London(1999).
2. Principles of Inorganic Chemistry, Puri, Sharma and Kalia, Shoban Lal Nagin Chand & co, New Delhi(1995).
3. Quantitative analysis, R.A. Day and A. L. Underwood, prentice Hall,1999.
4. Descriptive Inorganic Chemistry. Geoff Rayner – Canham, 11nd edition, Freeman company,1999.

Course outcomes:

After successful completion students

CO1: will be able to understand the basics of applied chemistry

CO2: will appreciate principle of isomerism

CO3: will get idea about applications of thermodynamics

CO4: will able to understand the principles of basic spectroscopy

PO and PSO/Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	√	√						√									
CO2	√		√						√								
CO3	√			√						√				√			
CO4	√	√				√	√	√				√	√			√	√

19CHEE315-2: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Learning Objectives:

The objective of the course is to develop knowledge in instrumental methods of chemical analysis, understand basic principles, instrumentation and simple applications of spectrochemical, electrochemical, techniques for the application of biology and agriculture.

Unit I: Atomic spectroscopy

Principle of atomic absorption spectroscopy, flame photometry, EDX and elemental analysis.

Unit II: Structure Determination

Basic idea on x-ray crystallography, Single crystal structure solving, Structure determination using mass and NMR techniques.

Unit III: Separation Techniques

Solvent extraction-ion-exchange method-principle of chromatography-column, thin layer and gas chromatography, principle methodology and simple applications, elementary idea about HPLC and GC.

Unit IV: Spectrochemical Techniques

Absorption of light - Beer's law – UV - Visible and IR spectrophotometry - principle instrumentation and simple applications in Biology.

Unit V: Electroanalytical Techniques

Basic principles and instrumentation of Cyclic voltammetry, conductometry, potentiometry - simple applications in biology and environment.

Text books:

1. Instrumental methods of chemical analysis, G. Chatwal and S. Anand, Himalaya Publishing House, New Delhi, 1999.
2. H.W. Willard, L.I. Meritt, J.A. Dean and P.A. Settle, Instrumental Methods of Analysis, CBS Publishers, 7th Edn., 1996.

Course outcomes:

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

- CO1 Analyze the experimental data and present it systematically
- CO2 Describe and adopt suitable separation techniques
- CO3 Identify and assess quantitatively using various spectrochemical and electrochemical methods
- CO4 Predict the physical and chemical principles upon which the analytical measurement is based

PO and PSO/Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
C01	√	√						√									
C02	√		√						√								
C03	√			√						√				√			
C04	√	√				√	√	√				√	√			√	√

VALUE ADDED COURSE (OFFERED BY DEPARTMENT OF CHEMISTRY)

19CHEX15: PHYTOCHEMISTRY AND BIOLOGICAL ACTIVITIES OF MEDICINAL PLANTS

Learning objectives:

To learn about phytochemistry and biological activities of medicinal plants

UNIT-I:

Extraction – purification of bio-active compounds from plants – cold & hot extraction – Soxhlet extraction – crude extracts purification by various solvents.

UNIT-II:

Isolation of bioactive compounds – chromatographic techniques – thin layer chromatography – liquid chromatography – HPLC and UPLC.

UNIT-III:

Structural analysis of bioactive compounds – IR spectroscopy – Mass spectrometry – NMR spectroscopy.

UNIT-IV:

Herbal medicine – History of herbal medicine – different types of herbal medicine – Ayurveda, Siddha and Unani – Pharmacological action – clinical research and traditional uses of Indian medicinal plants – *Eclipta alba*, *Gymnema Sylvestre*, *Ocimum sanctum*, *Curcuma longa*.

UNIT-V:

Phytopharmaceuticals and their health benefits – anthocyanins, carotenoids, lycopene, isoflavones, polyphenols, omega 3 - fatty acids, biological effects of resveratrol.

Text books

1. Harbone, J.B. 1998. *Phytochemical Methods: A guide to modern techniques of plant analysis*, 3rd edn., Springer (India) Private Limited, New Delhi.
2. R.M. Silverstein, F. X. Webster – *Spectroscopic identification of organic compounds*, John-Wiley, 1998
3. H. H. Willard, L. L. Meritt, J.A. Dean, *Instrumental Methods of analysis*, 1987
4. V. M. Godte (2000), *Ayurvedic pharmacology and therapeutic uses of medicinal plants*, Bharathiya Vidya Bhavan, Mumbai
5. R. C. Grewal (2000), *Medicinal Plants*, Campus Books International, New Delhi
6. A. Majumdar (2000), *Home remedies in Ayurveda*, Amar Granth Publications, New Delhi

Course Outcomes:

After completion of the course, student will

CO1: understand the concepts of phytochemistry

CO2: able to appreciate the medicinal values of plants

CO3: know the various techniques involved in the phytochemistry

CO4: familiarize the bio-active components present in the plants

PO and PSO/Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	√	√						√									
CO2	√		√						√								
CO3	√			√						√				√			
CO4	√	√				√	√	√				√	√			√	√