INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS

Course Code: 13CH1145

Course Educational Objectives:
To make the student understand the advanced instrumentation available for chemical analysis.

Course Outcomes:
After studying this course the student would be able to choose the instrument needed for analysis.

UNIT-I (12 Lectures)
AN INTRODUCTION TO INSTRUMENTAL METHODS:
Terms Associated With Chemical Analysis, Classification Of Instrumental Techniques, A Review Of The Important Considerations In Analytical Methods, Basic Functions of Instrumentation, Important Considerations in Evaluating an Instrumental Method.

MEASUREMENTS, SIGNALS AND DATA:

UNIT-II (12 Lectures)
AN INTRODUCTION TO ABSORPTION AND EMISSION SPECTROSCOPY:
ULTRAVIOLET AND VISIBLE SPECTROMETRY-INSTRUMENTATION:  
Radiation Sources, Wave Length Selection, Cells and Sampling Devices,  
Detectors, Instruments for Absorption Photometry.  

ULTRAVIOLET AND VISIBLE ABSORPTION METHODS:  
Fundamental Laws of Photometry, Spectrophotometric Accuracy,  
Photometric Precision, Quantitative Methodology, Differential or  
Expanded-Scale Spectroscopy.  

UNIT-III  (12 Lectures)  
FLAME EMISSION AND ATOMIC ABSORPTION SPECTROSCOPY:  
Introduction, Instrumentation for Flame Spectrometric Methods, Flame  
Emission Spectrometry, Atomic Absorption Spectrometry, Interference  
Associated with Flame and Furnaces, Applications, Comparison of FES  
and AAS.  

INFRARED SPECTROMETRY:  
Correlation of Infrared Spectra with Molecular Structure, Instrumentation,  
Sample Handling.  

UNIT-IV  (12 Lectures)  
MASS SPECTROMETRY:  
Sample Flow in a Mass Spectrometer, Inlet Sample System, Ionization  
Methods in Mass Spectrometry, Mass Analyzers, Ion-Collection System,  
Vacuum System, Isotope- Ratio Spectrometry, Correlation of Mass Spectra  
With Molecular Structure.  

GAS CHROMATOGRAPHY:  
Gas Chromatographs, Derivative Formation, Gas Chromatographic  
Columns, Liquid Phases and Column Selection, Detectors for Gas  
Chromatography.  

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY:  
HPLC Instrumentation, Mobile-Phase Delivery System, Sample  
Introduction, Separation Columns, Detectors.  

X RAY DIFFRACTION:  
General Principles, Braggs equation, Laue photographic method, Rotating
crystal method, Oscillating crystal method, Powder method, Interpretation of the Diffraction pattern, Applications of XRD.

UNIT-V  

CHROMATOGRAPHY: GENERAL PRINCIPLES:
Classification of Chromatographic Methods, Chromatographic Behaviour of Solutes, Column Efficiency and Resolution, Column Processes and Band Broadening, Time of Analysis and Resolution, Quantitative Determinations.

TEXT BOOK:  

REFERENCES: