**INSTRUMENTAL ANALYSIS**

**Course Description**:The course aims to give students an introduction to the basic theoretical and practical of instrumental methods of analysis. CHEM 23254

 **Textbooks:**

1. D. A. Skoog, F. J. Holler and T. A. Nieman : "Principles of Instrumental Analysis", 5th Edition
2. Daniel C. Harris , “ Quantitative Chemical Analysis” , 6th or 7th Edition.

 **Lectures Coverage:**

1. **Introduction to Instrumental Methods**
2. **An Introduction to Spectrometric Methods**

- Electromagnetic radiation, Electromagnetic spectrum, Diffraction; Transmission and refraction of radiation, Photoelectric effect, Line; Band and continuum spectra, Atomic and molecular absorption,…

1. **Component of Optical Instruments**

- Sources of radiation, Wavelength selector, Sample container, Types of radiation transducers, Signal processors and readouts, Principles of FT-optical measurements, …

1. **Atomic Absorption Spectrometry(AAS)**

- Atomic spectra, Atomic line broadening, Atomization and sample introduction methods, Flame atomizers, Electrothermal atomization, Radiation sources in AAS, Interferences in AAS, Background correction methods, …

1. **Atomic Emission Spectrometry**

- Flame emission spectrometry (AES), Inductively coupled plasma (ICP), Emission spectroscopy based on Arc and Spark sources …

1. **An Introduction to Ultraviolet-Visible Molecular Absorption Spectrometry**

- Beer’s law, Limitation and deviation of Beer’s law, Instrumentation, Single and double beam instruments …

1. **Applications of Ultraviolet-Visible Molecular Absorption Spectrometry**

- Types of absorbing electrons, chromophores, quantitative analysis by absorption measurements, Photometric titrations …

1. **Molecular Luminescence Spectrometry**

-Theory of fluorescence and phosphorescence, Rates of absorption and emission, Variables that affect fluorescence and phosphorescence, Effect of concentration

on fluorescence intensity, Instrumentation, Chemiluminescence, …

1. **An Introduction to Infrared Spectrometry**

- Mechanical model of a stretching vibration , Quantum treatment of vibrations, Vibrational coupling, Instrumentation, Applications of infrared spectrometry

1. **Raman Spectroscopy**

- Theory of Raman spectroscopy, Instrumentation, Comparison between IR and Raman spectroscopy, Applications, …

1. **Nuclear Magnetic Resonance Spectroscopy**

- Theory of Nuclear magnetic resonance, FT-NMR, Origin of chemical shifts, Splitting in NMR spectroscopy, NMR Applications,…

1. **Molecular Mass Spectrometry**

- Ion sources , Isotope peaks, Mass spectrometers, Application of Mass spectrometer,…

1. **An Introduction to Chromatographic Separations**
2. **Gas Chromatography**
3. **High-Performance Liquid Chromatography**