

## **CBC736 - Advanced Chemical Instrumentation**

### **Aims and Objectives**

The objective of this course is to understand basic concepts and applications of several important instruments and to acquire hands-on experience and skills of the instruments.

At the end of this course, students should be able to:

- Understand principle of separation, columns, detection, and applications of liquid and gas chromatography.
- Understand nuclear spin, resonance, chemical shift, and applications of liquid and solid-state nuclear magnetic resonance.
- Understand Beer's Law, vibration, optics, and applications of ultraviolet-visible, infrared, and Raman spectroscopies.
- Understand electron beam, optics, resolution limit, elemental mapping, and applications of scanning and transmission electron microscopes and atomic force microscope.
- Understand ionization, detection, and applications of mass spectroscopies.
- Understand principle of imaging, confocal imaging, imaging beyond the diffraction limit, and applications of optical microscopes.
- Understand bioanalysis of DNA, peptides, and biomolecules.
- Understand laser, optics, and applications of laser analysis.
- Understand X-ray diffraction, electron density, and applications of X-ray crystallography.
- Interpret images, spectra, and chromatograms obtained by these instruments.
- Be familiar with the operation of these instruments.

### **Syllabus**

This course covers HPLC, GPC, GC, NMR, elemental analysis, UV, IR, Raman, SEM, XPS, TEM, AFM, mass spectrometry (MALDI, DRAT, and ESI), microscopes, bio-analysis, laser, and X-ray crystallography. This course provides the theories of separation, nuclear spins, optics, electrons, ionization, and X-ray, and the skills to operate the instrumentals. The interpretation of the acquired chromatograms, images, and spectra will be practiced. This course consists of 13 hours lecture and 39 hours lab.

### **Assessment**

Continuous Assessment: 100%

- Report (Individual assessment): 80%
- Crystal data solving (Individual assessment): 20%