

## B. PHARMACY

### Syllabus ♦ Semester-8

**Elective subject-9** name with code: **13PH0811 Advanced Instrumentation Techniques**

#### Course Objective

This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes theoretical and practical knowledge of modern analytical instruments that are used for drug testing.

#### Course Outcomes

Upon completion of the course, the student shall be able to

1. Understand the advanced instrument used and its applications in drug analysis.
2. Understand the chromatographic separation and analysis of the drug.
3. Understand the calibration of various analytical instruments.
4. Know analysis of drugs using various analytical instruments.

#### Teaching and assessment scheme

Teaching Scheme (Hours)			Credits	Theory/ Tutorial Marks			Practical Marks		Total Marks
Theory	Tutorial	Practical		CSE	IA (I)	ESE (E)	TW	Viva (V)	
3	1	0	4	10	15	75	0	0	100

#### Theory syllabus

**Teaching hours: 45 Hours**

##### Unit-1

**10 Hours**

**Nuclear magnetic resonance spectroscopy:** Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications Mass Spectrometry- Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications.

##### Unit-2

**10 Hours**

**Thermal methods of analysis:** Principles, instrumentation and applications of thermogravimetric analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, Xray Crystallography, rotating crystal technique, single-crystal diffraction, powder diffraction, structural elucidation and applications.

##### Unit-3

**10 Hours**

**Calibration and validation:** as per ICH and USFDA guidelines Calibration of the following Instruments Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC.

##### Unit-4

**8 Hours**

**Radio immune assay:** Importance, various components, Principle, different methods, Limitation and Applications of Radioimmunoassay Extraction techniques: General principle and procedure involved in the solid-phase extraction and liquid-liquid extraction.

##### Unit-5

**7 Hours**

**Hyphenated techniques:** LC-MS/MS, GC-MS/MS, HPTLC-MS.

**Tutorials will be based on the above syllabus.**

**Teaching hours: 15 Hours**

#### Recommended references (Latest edition)

1. Instrumental Methods of Chemical Analysis by B.K Sharma.
2. Organic spectroscopy by Y.R Sharma.
3. Textbook of Pharmaceutical Analysis by Kenneth A. Connors.
4. Vogel's Textbook of Quantitative Chemical Analysis by A.I. Vogel.
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake.
6. Organic Chemistry by I. L. Finar.
7. Organic spectroscopy by William Kemp.
8. Quantitative Analysis of Drugs by D. C. Garrett.
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi.
10. Spectrophotometric Identification of Organic Compounds by Silverstein.