

**I.K. Gujral Punjab Technical University  
B. Pharmacy/Batch 2017**

Course Code	Course Title	Teaching Load			Marks		Exam (hrs)		Credits
		L	T	P	Int.	Ext.	Int.	Ext.	
BP811ET	Advanced Instrumentation Techniques	3	1	-	25	75	1	3	4

**Scope:** 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 on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

**Objectives:** Upon completion of the course, the student shall be able to

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

**Module 01**

**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.

**Module 02**

**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, X- ray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.

**Module 03**

**10 Hours**

**Calibration and Validation as Per ICH And USFDA Guidelines**

**Calibration of Following Instruments**

- Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC.

**Module 04**

**08 Hours**

**Radioimmuno Assay**

- Importance, various components, Principle, different methods, Limitation and Applications of Radioimmuno assay

**Extraction Techniques**

- General principle and procedure involved in the solid phase extraction and liquid-liquid extraction.

**Module 05**

**07 Hours**

**Hyphenated Techniques**

- LC-MS/MS
- GC-MS/MS
- HPTLC-MS

**Recommended Books (Latest Editions)**

1. Instrumental Methods of Chemical Analysis by B.K Sharma.
2. Organic spectroscopy by Y.R Sharma.
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors.
4. Vogel's Text book 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.