INSTITUTE	**FACULTY OF PHARMACY**
PROGRAM	**BACHELOR OF PHARMACY**
SEMESTER	**8**
COURSE TITLE	**ADVANCED INSTRUMENTATION TECHNIQUES**
COURSE CODE	**13PH0811**
COURSE CREDITS	**4**

Objective:

1 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: After completion of this course, student will 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 the calibration of various analytical instruments.

4 Know analysis of drugs using various analytical instruments.

Pre-requisite of course: 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.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	0	75	15	10	0	0

Contents : Unit	Topics	Contact Hours
1	**Nuclear magnetic resonance spectroscopy:** 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.	10

DR. RAMESH BHANAJIBHAI PARMAR
Digitally signed by (Name of HOD)

DR. LALJI HAKUBHAI BALDANIYA
Digitally signed by (Name of Dean/ Principal)

Contents : Unit	Topics	Contact Hours
2	**Thermal methods of analysis:** 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.	10
3	**Calibration and validation:** 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.	10
4	**Radio immune assay** 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.	8
5	**Hyphenated techniques:** Hyphenated techniques: LC-MS/MS, GC-MS/MS, HPTLC-MS.	7
Total Hours		**45**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Tutorials** Tutorial 1, Tutorial 2, Tutorial 3, Tutorial 4, Tutorial 5, Tutorial 6, Tutorial 7, Tutorial 8, Tutorial 9, Tutorial 10, Tutorial 11, Tutorial 12, Tutorial 13, Tutorial 14, Tutorial 15	15
Total Hours		**15**

Textbook :

1 Instrumental Methods of , Chemical Analysis , by B.K Sharma., 1981

References:

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.

References:

9 Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi.

10 Spectrophotometric Identification of Organic Compounds by Silverstein.

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	30.00	25.00	15.00	10.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and the need of students. The teacher in addition to the conventional teaching method by the blackboard may also use any tools such as demonstration, role play, quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done based on continuous evaluation of students in the laboratory and classroom

3 Students will use supplementary resources such as online videos, NPTEL videos, MOOCs/ e-courses, virtual laboratories.

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