INSTITUTE	**FACULTY OF PHARMACY**
PROGRAM	**MASTER OF PHARMACY (PHARMACEUTICS)**
SEMESTER	**1**
COURSE TITLE	**MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES**
COURSE CODE	**13MC0101**
COURSE CREDITS	**4**

Objective:

1 This subject deals with various advanced analytical instrumental techniques for identifying, characterizing, and quantifying drugs. Instruments dealt with are NMR, Mass spectrometer, IR, HPLC, GC, etc.

Course Outcomes: After completion of this course, student will be able to:

1 After completion of the course, students can know,
Chemicals and Excipients

2 After completion of the course, students can know,
The analysis of various drugs in single and combination dosage forms

3 After completion of the course, students can know, Theoretical and practical skills of the instruments

Pre-requisite of course:B.Pharm. Degree holder from an Indian university established by law in India from an institution approved by the Pharmacy Council of India and has scored not less than 55 percent of the maximum marks (aggregate of 4 years of B.Pharm.).

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	75	15	10	0	0

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Contents : Unit	Topics	Contact Hours
1	**Unit-1** a. UV-Visible spectroscopy: Introduction, theory, laws, instrumentation associated with UV-Visible spectroscopy, choice of solvents and solvent effect, and applications of UV-visible spectroscopy, b. IR spectroscopy: Theory, modes of molecular vibrations, sample handling, instrumentation of dispersive and Fourier - Transform IR Spectrometer, factors affecting vibrational frequencies, and applications of IR spectroscopy, c. Spectrofluorimetry: Theory of fluorescence, factors affecting fluorescence, quenchers, instrumentation, and applications of fluorescence spectrophotometer., d. Flame emission spectroscopy and atomic absorption spectroscopy: Principle, instrumentation, interferences, and applications.	11
2	**Unit-2** NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy.	11
3	**Unit-3** Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analysers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy	11
4	**Unit-4** Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High-Performance Liquid chromatography g) Affinity chromatography	11
5	**Unit-5** a. Electrophoresis: Principle, Instrumentation, working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Isoelectric focusing, b. X-ray Crystallography: Production of X-rays, Different X-ray diffraction methods, Bragg‘s law, Rotating crystal technique, X-ray powder technique, Types of crystals, and applications of X-ray diffraction.	11
6	**Unit-6** Immunological assays: RIA (Radioimmunoassay), ELISA, and Bioluminescence assays.	11
Total Hours		**66**

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Textbook :

1 Spectrometric Identification of Organic compounds , Robert M Silverstein, John Wiley & Sons, 2004

2 Principles of Instrumental Analysis , Douglas A Skoog, F. James Holler, Timothy A. Nieman, Eastern press, 1998

3 Instrumental methods of analysis , Willard, CBS publishers, 2000

4 Practical Pharmaceutical Chemistry , Beckett and Stenlake, CBS publishers, 1997

5 Organic Spectroscopy , William Kemp, ELBS, 1991

6 Quantitative Analysis of Drugs in Pharmaceutical formulation , P D Sethi, CBS publishers, 1997

References:

1 Pharmaceutical Analysis- Modern methods , Pharmaceutical Analysis- Modern methods , J W Munson, Marcel Dekker Series., 2000

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	25.00	25.00	15.00	15.00	5.00

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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