

# GUJARAT TECHNOLOGICAL UNIVERSITY

M. Pharm  
SEMESTER: I

**Subject Name: Phytochemical Investigation Techniques**

**Subject Code: MPM103T**

**Scope:** This subject deals with extraction and separation techniques useful for phytochemicals. It further elaborates various physicochemical and spectral techniques useful in structure elucidation of phytoconstituents.

**Objectives:** Upon completion of this course the student should be able to

1. Devise and Select proper extraction technique for a given class of phytochemicals
2. Understand various chromatographic techniques useful in separation of phytochemicals
3. Design and use proper separation technique for given class of phytochemicals
4. Develop analytical method for phytochemical based on HPLC and GC
5. Understand and apply various structure elucidation techniques for phytochemicals.

Sr No	Course Contents	Total Hrs
1	Phytochemical extraction techniques: Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction e.g. microwave assisted extraction, Supercritical Fluid Extraction, Accelerated Solvent Extraction etc. and their industrial applicability Extraction methods and chemical identification tests for the alkaloids, saponins, phenolics, oligosachharides, polysachharides, peptides, proteins etc.	12
2	Separation Techniques: separation techniques in phytochemical research and drug discovery. Chromatography: General principles, classification of chromatographic techniques, normal and reversed phase, bonded phase chromatography, stationary phases, activity of stationary phases, elutropic series, and separation mechanisms. Principles, instrumentation, practical aspects, analytical and preparative aspects, selection of stationary and mobile phases, method development and optimization, applicability, advantages and disadvantages of 1. Column Chromatography 2. Flash Chromatography 3. TLC/HPTLC 4. Counter Current Chromatography 5. Size Exclusion Chromatography 6. Ion exchange chromatography 7. Ion Pair and Affinity chromatography	15

	etc. with respect to phytopharmaceuticals	
<b>3</b>	HPLC and GC - Analytical and preparative aspects, selection of stationary and mobile phases, method development and optimization, applicability, advantages and disadvantages Introduction to hyphenated techniques such as GC-MS, LC-MS, HPTLC-MS etc. and their application in phytopharmaceuticals	9
<b>4</b>	<b>Structure elucidation of Phytochemicals:</b> General strategies for structure elucidation phytochemicals with few examples. <b>Chemical methods:</b> Determination of carbon skeleton, dehydrogenation, oxidative methods in structure elucidation, reductive methods in structure elucidation. <b>Chemical methods:</b> General methods for structure elucidation of steroids, terpenoids, alkaloids with few examples. <b>Ultraviolet spectroscopy:</b> Rules to calculate max, advanced techniques and applications in structure elucidation with examples. <b>Infra-red spectroscopy:</b> Various factors affecting frequency, functional group identification, applications in structure elucidation with examples.	12
<b>5</b>	<b>Mass Spectrometry:</b> Various ionization modes EI, CI, FAB etc. fragmentation patterns, HRMS, applications in structure elucidation with examples. <b>NMR spectroscopy:</b> <sup>1</sup> H and <sup>13</sup> C <b>shift</b> , prediction of chemical shifts, coupling constants, Karplus curve, advanced 1D NMR experiments such as NOE, DEPT etc. 2D NMR experiments and applications in structure elucidation with examples. <b>Structure elucidation Examples</b> from alkaloids, flavonoids, and sterols etc.	12

#### REFERENCES:

1. Methods in Biotechnology, Natural Product Isolation by Sarker, Latif, Gray
2. Methods in Biotechnology, Natural Product Isolation by Richard Canell
3. Spectroscopy by Pavia, Lampman, Kriz, Vyvyan
4. Spectrometric Identification of Organic Compounds by RM Silverstein
5. Organic Spectroscopy by William Kemp
6. Spectral Data for Structure Elucidation
7. Various Reviews and Research Papers