

INSTITUTE	FACULTY OF SCIENCE
PROGRAM	MASTER OF SCIENCE (CHEMISTRY)
SEMESTER	3
COURSE TITLE	ESSENCE OF CHROMATOGRAPHY
COURSE CODE	02CY1502
COURSE CREDITS	4

Objective:

- 1 To understand the scope, principle, Instrumentation and application of various chromatographic methods such as LC, GC, TLC and PC

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

- 1 Capable to understand the range and theories of instrumental methods available in analytical chemistry
- 2 Able to select appropriate instrument for the successful analysis of complex mixtures.
- 3 Capable to develop separation method of analysis.
- 4 Trouble shoot analytical problems occur during analysis.
- 5 Expand skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments.

Pre-requisite of course: Students aware with the concepts of various physical and chemical separation techniques.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Liquid Chromatography Introduction, History, Classification, Principle & basic theory of chromatography, Column adsorption chromatography, Partition chromatography, Band broadening & column efficiency, Factors affecting, Plate theory & Rate theory of chromatography, Types of Liquid chromatography,, Theory, principle and Instrumentation of HPLC, Types of column, Column efficiency, Pumps, Various types of detector, Injection system, Isocratic and gradient elution, Normal phase and Reverse phase liquid chromatography,, Development of HPLC and UPLC method, Choice of stationary and mobile phase, Difference between HPLC and UPLC, Applications.	20

Contents : Unit	Topics	Contact Hours
2	Gas Chromatography Introduction, Types of Gas chromatography, Theory principle and Instrumentation of gas chromatography, , Carrier gas, Injection port, Types columns, Solid inert support, Stationary phase, Mobile phase, Role of Detectors, Thermal conductivity detector, Flame Ionization detector, Flame photometric detector, Development of GC method, Column silanization, Factor affecting to separation, Temperature programming, Application.	15
3	Thin Layer Chromatography Introduction, Theory, Principle and Instrumentation of TLC, Method for the preparation of thin layers on plates, Application of sample on the chromoplates, Choice of adsorbent, Choice of mobile phase, Detecting reagent, Developing chamber, Developing and detection, Ascending, Descending and two dimensional TLC development, Impurity profiling with the help of TLC, Applications	15
4	Paper Chromatography Paper Chromatography - Introduction, Types of PC, Theory, principle and technique of PC, Types of paper, Modification of the paper, Choice of solvents, Rf value measurement, Sample application, Precautions in PC, Quantitative estimation by PC, Applications	10
Total Hours		60

Textbook :

- 1 Introduction to Modern Liquid Chromatography, Lloyd R. Snyder, Joseph J. Kirkland, John W. Dolan, Wiley, 2009
- 2 Textbook of Gas Chromatography [A], Rajbir Singh , Mittal Publications, 2016
- 3 Paper Chromatography, Joseph Sherma, Gunter Zweig, Elsevier, 2013
- 4 Handbook of Thin-Layer Chromatography (Chromatographic Science), Bernard Fried, Joseph Sherma, CRC Press Inc, 2003

References:

- 1 Chromatography: Concepts and Contrasts, Chromatography: Concepts and Contrasts, James M. Miller, John Wiley & Sons, 2009
- 2 Introduction to instrumental analysis , Introduction to instrumental analysis , R.D.Broun, McGraw Hill , 1987
- 3 Instrumental methods of chemical analysis , Instrumental methods of chemical analysis , H. willard, L.Meritt, J.A. Dean and F.A. Settle, CBS, 1986
- 4 Fundamentals of analytical chemistry , Fundamentals of analytical chemistry , D.A.Skoog, D.M. West and H.J. Holler , Mary Finch, 2014
- 5 Instrumental methods of chemical analysis, In; Introduction to Analytical chemistry, Instrumental methods of chemical analysis, In; Introduction to Analytical chemistry, Sharma BK, Goel Publishing House Meerut, 2004

References:

- 6 Chromatographic Methods, Chromatographic Methods, A. Braithwaite, J.F. Smith, Springer Science & Business Media, 2012

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 and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	30.00	30.00	10.00	0.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, ecourses, Virtual Laboratory.
- 5 Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory.
- 6 All students in the laboratory must wear safety goggles and lab coats during lab session.

Supplementary Resources:

- 1 <http://www.nptel.ac.in/courses/104103069/#>
- 2 <http://ocw.mit.edu/courses/chemistry/>
- 3 <http://vlab.amrita.edu/index.php?sub=2>
- 4 http://www.vlab.co.in/ba_labs_all.php?id=9
- 5 <https://www.youtube.com/watch?v=VLOytdaAjs&pp=ygUlbgIxdWlkIGFuZCBnYXN0Y2hyb21hdG9ncmFwaHkgd2ViaW5hcG%3D%3D>
- 6 <https://www.youtube.com/watch?v=7eVE9Oaiq74>
- 7 <https://www.youtube.com/watch?v=KKTDzJNFtr4>