

INSTITUTE	FACULTY OF SCIENCE
PROGRAM	MASTER OF SCIENCE (CHEMISTRY)
SEMESTER	3
COURSE TITLE	SELECTED TOPICS IN ANALYTICAL CHEMISTRY
COURSE CODE	02CY1506
COURSE CREDITS	4

Objective:

- 1 To understand Principal, instrumentation and application of various hyphenated analytical instruments.
- 2 To gain knowledge regarding how to prepare Standard Operating Procedure
- 3 Aware about electro gravimetry analysis.
- 4 Get idea about ion exchange and gel permeation chromatography.

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

- 1 Capable to provide practical experience in selected Electro Gravimetric methods of analysis.
- 2 Will apply knowledge of ion exchange and gel permeation chromatography.
- 3 Capable to developed separation method and choose different kinds of hyphenated instruments for the analysis.
- 4 Extend skills for preparation of standard operating procedure.

Pre-requisite of course: Students should have knowledge about the various instrumental methods for chemical analysis.

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	Electro Gravimetric Analysis Introduction of Electro gravimetric analysis, Ohm's law, Faraday's first law and Faraday's second law of electrolysis, Polarisation, Causes of polarisation, Measurement of over voltage, Important of over voltage, Electrochemical reduction and oxidation, Polarisation and properties of reacting substances, Electrode materials, Requirements for electrode materials, Choice of cathode materials, Choice of anode materials, Polarisable and non-polarisable electrodes, Theory of electrochemical oxidation and reduction, Principles involved in electro gravimetric analysis (electrolysis at constant current, electrolysis at constant voltage, electrolysis at controlled potential)	15
2	Ion Exchange Chromatography and Gel Permeation Chromatography Ion Exchange Chromatography: Introduction and principle of Ion exchange resins, Cation and Anion exchange resin, Basic requirements of useful resin, Ion exchange equilibrium, Techniques of ion exchange chromatography, Separation factor and Application., Gel Permeation Chromatography: Introduction and principle of Gel chromatography, Technique for gel chromatography, Gel Preparation, Packing of column and Application.	15
3	Hyphenated Techniques Basics of hyphenated instruments, GC-MS, HP-TLC, LC-MS etc. Principle, instrumentation & Applications.	15
4	Preparation of Standard Operative Procedure (SOP) Introduction, Source of SOP, Importance of SOP, Location of SOP, Who writes SOP, Preparation of SOP for SOP, Preparation of various types of SOP such as Calibration of glass measuring cylinder, Change control, Determination of actual weights from certified weights, Calibration of weighing balance, Operation of Weighing balance, Operation of pH meter, Calibration of pH meter and maintenance of pH meter, Operation of HPLC, Calibration of HPLC, Operation of GC, Calibration of GC.	15
Total Hours		60

Textbook :

- 1 A Text-Book of Quantitative Chemical Analysis by Gravimetric, Electrolytic, Volumetric and Gasometric Methods, Olsen John C , Hardpress Publishing, 2013
- 2 Ion-Exchange Chromatography and Related Techniques (Handbooks in Separation Science), Pavel Nesterenko, Colin Poole, Yan Sun , Elsevier, 2023
- 3 Trends in Hyphenated Analytical Techniques, Nagarajan Kandasamy, Dr Ramesh B Bodla, Dr L K Ghosh, LAP Lambert Academic Publishing, 2011

References:

- 1 Introduction to instrumental analysis , Introduction to instrumental analysis , R. D. Broun, McGraw Hill , 1987
- 2 Instrumental methods of chemical analysis , Instrumental methods of chemical analysis , H. willard, L.Meritt, J.A. Dean and F.A. Settle, CBC, 1986
- 3 Fundamentals of Analytical Chemistry, Fundamentals of Analytical Chemistry, Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, Mary Finch, 2014
- 4 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
- 5 Hyphenated and Alternative Methods of Detection in Chromatography, Hyphenated and Alternative Methods of Detection in Chromatography, R. Andrew Shalliker, CRC Press, 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 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

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/playlist?list=PLuTo7Hary5wEfA48MBVXrhssuhkLMYT8c>
- 6 <https://www.youtube.com/watch?v=qZpZO-IEHYA>
- 7 <https://www.youtube.com/watch?v=SDUqYgd1ons>