

INSTITUTE	FACULTY OF SCIENCE
PROGRAM	MASTER OF SCIENCE (CHEMISTRY)
SEMESTER	1
COURSE TITLE	ANALYTICAL CHEMISTRY-I
COURSE CODE	02CY0410
COURSE CREDITS	4

Objective:

- 1 To understand the scope and principle of Analytical Chemistry and various electroanalytical methods including radio scattering methods. The emphasis is placed on physico-chemical principles of these methods and their application in chemical analysis.

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

- 1 To develop an understanding of the range and theories of instrumental methods available in analytical chemistry.
- 2 To develop knowledge pertaining to the appropriate selection of instruments for the successful analysis of complex mixtures.
- 3 To develop an understanding of the role of the chemist in measurement and problem solving in chemical analysis.
- 4 To extend skills in procedures and instrumental methods applied in analytical tasks.

Pre-requisite of course: Before learning analytical chemistry, student should aware about basic principles and theories of analytical chemistry, instrumental methods of analysis and other UG level chemistry.

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	Basics of Analytical chemistry Introduction, The role of analytical chemistry, Classification of analytical methods based on their physical property measurement (classical and instrumental), Difference between classical Analytical methods and instrumental Analytical methods, Advantages and disadvantages of classical and instrumental methods, Key factors for the selection of Analytical methods, Statistics in Analysis, Types of errors Accuracy, Precision, Mean or average, Mean deviation or average deviation, Standard deviation, Variance, Coefficient of variance, Spread or range, Confidence interval and limit, Rejection of result or Q-Test, Confidence interval tests of significance or Student T-Test, Chi-square test, F-test, Minimisation of errors, Significant figure and computation statistical evaluation of data, Computation rules-method for reporting analytical data, Numericals.	15
2	Radiation scattering methods and its applications Introduction, Reflection, Refraction, Scattering, Transmission, Electromagnetic radiation, Refractive index, Principle and Instrumentation of Turbidimetry and Nephelometry, Choice between Turbidimetry and Nephelometry analysis, Factor affecting to measurement of turbidimetry and Nephelometry. Turbidimetric titration. Application and advantages of scattering method.	15
3	Colorimetry, Amperometry, Polarimetry and Karl Fischer Introduction, Plane polarized light, Optical activity, Specific rotation, Optical rotation, circularly polarized light, Reference electrode, Indicator electrode, Amperometry, Amperometry titration, Equivalence point, Principle and theory of Karl Fischer technique, Principle and theory of colorimetry and Polarimetry, Advantages and applications of Colorimetry, Amperometry, Polarimetry and Karl Fischer.	15
4	Flame Photometry and Atomic Absorption Spectroscopy Introduction, Principle and theory of Flame photometry and AAS, Instrumentation of Flame Photometry and AAS, Types of burners used in Flame Photometry and AAS, Important characteristics and requirements of Flame, Factor affecting and Interferences in Flame photometry and AAS, Limitations, advantages and application of Flame photometry and AAS.	15
Total Hours		60

Textbook :

- 1 Textbook of Analytical Chemistry , Syed Aftab Iqbal and Ameera Al Haddad, Discovery Publishing Pvt.Ltd, 2011
- 2 A Textbook of Analytical Chemistry, Y. Anjaneyulu and K. Chandrasekhar, BSP BOOKS, 2019
- 3 Electrochemical Methods: Fundamentals and Applications, Allen J. Bard and Larry R. Faulkner , Wiley, 2001

References:

- 1 Analytical Chemistry Basic Techniques and Methods, Analytical Chemistry Basic Techniques and Methods, Priti Malhotra, Springer , 2023
- 2 Fundamental of analytical chemistry , Fundamental of analytical chemistry , B.B.L. Srivastava, IP Innovative Publication Pvt. Ltd., 2019
- 3 Instrumental Methods of Chemical Analysis, Instrumental Methods of Chemical Analysis, V. K. Ahluwalia, Springer , 2023
- 4 Electrochemical Methods: Fundamentals and Applications, Electrochemical Methods: Fundamentals and Applications, Larry R. Faulkner, Allen J. Bard , Wiley , 2000
- 5 Atomic absorption spectroscopy: A practical guide, Atomic absorption spectroscopy: A practical guide, R. J Reynolds (, Griffin, 1970

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	25.00	25.00	10.00	10.00

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 https://www.youtube.com/watch?v=YY5tpD3HNII&list=PLMGIC1yM49sHKPo0zhdfg_zGmcOm_jXfj
- 5 https://www.youtube.com/watch?v=AbWm_wxh7Jk&list=PLM9MYDnWpEaOe0qo3HhD8Iql_mj404kvh
- 6 <https://www.youtube.com/watch?v=I6eZb6s0XW4>
- 7 <https://www.youtube.com/watch?v=bMNYt0rE5FE&list=PLrClzikuKeOkae-F-jJN6R3zUFaYh1Kk>
- 8 <https://www.youtube.com/watch?v=GYoos95PGAc&list=PLAFyoFAPvecAb3QorkyyHu4xAoMeGampz>