

Faculty of Science and Humanities

M.Sc.(Chemistry)Semester-II

Effective from Academic Year 2026-27

Branch Name:	M.Sc. Chemistry
Program Code:	SC203
Course Name:	Selected Topics in Physical Chemistry-II
Course Code:	2SC2030203
Pre-requisite Course:	Basics Physical chemistry up to B.Sc.

Course Objectives:

- To learn the Student are fundamental principles of thermodynamics including laws, entropy, spontaneity, and thermodynamic processes.
- Learn the principles, instrumentation, and applications of pH measurement, conductometry, and potentiometry.
- To learner should be able to apply statistical methods and probability concepts to chemical systems, including partition functions and different statistical distributions.
- Understand the principles, mechanisms, and applications of electrophoretic separation techniques.
- Develop analytical and problem-solving skills related to physicochemical measurements and theoretical concepts.

Teaching and Examination Scheme:

Teaching Scheme(Hours per week)					Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit		Theory(Marks)		Practical(Marks)		Total (Marks)
			T	P	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
4	-	-	4	-	50	50	-	-	100

Subject Contents:

Unit	Contents	Lecture	Weightage
1	Fundamentals of Thermodynamics Terms used in chemical thermodynamics, Zeroth law of thermodynamics, State:First law of thermodynamics, spontaneous and non-spontaneous process, Reversible and irreversible process, Second law of thermodynamics, Nernst heat theorem, Third law of thermodynamics, Comparison of Nernst heat theorem with third law of thermodynamics, Concept of entropy.	12	25%
2	pH, Conducto and Potentiometry pH metry(Principle of instrumentation and mechanism of pH by glass electrode), Potentiometry, Conductometry , types of electrodes and explanation of the nature of titration curves	12	25%

3	Chemical Statistics Introduction, Probability, Fundamentals of statistical methods, Thermodynamic probability, Sterling's theorem, Partition function: Partition function and thermodynamic functions, Translation partition function, Rotational partition function, Vibrational partition function, Types of statistics: 1)Maxwell-Boltzmann statistics, 2) Bose-Einstein statistics, 3) Fermi-Dirac statistics	12	25%
4	Electrophoresis: Principle, Method and Applications Principles of electrophoresis, theory and applications of Poly-acrylamide gel electrophoresis, micelles capillary zone electrophoresis, electro kinetic electrophoresis, Iso-electric focusing. Applications of Electrophoresis.	12	25%

Text Books:

1. Instrumental method of Chemical Analysis by B.K.Sharma
2. A Text Book of Physical Chemistry; A.S. Negi, S.C. Anand; New Age International (P) Limited, New Delhi, 2002

Reference Books:

1. Electroanalytical Chemistry. John Wiley & Sons, New York by Basil H. Vassos, Galen W. Ewing
2. Advanced Physical Chemistry, Gurtu-Gurtu, A Pragati Edition
3. Advanced Physical Chemistry, D.N.Bajpai, S.Chand

List of Open Source Software/learning website:

1. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000002BI/P001357/M021488/ET/1501754984GelElectrophoresis.pdf
2. https://www.youtube.com/playlist?list=PLYXnZUqtB3K_PcIXhig6ymq4YRMchvYcw

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Learn and understand the fundamental laws of thermodynamics and their significance in chemical systems.	2 understanding
CLO2	Learn the concepts of spontaneity, reversibility, entropy, and energy changes in reactions.	2 understanding 3 Applying
CLO3	Gain knowledge of pH measurement, conductometry, and potentiometry and their practical uses.	3Applying 4 Analyze
CLO4	Interpret conductometric and potentiometric titration data and analyze electrochemical measurements for quantitative determination.	2 understanding 4 Analyze
CLO5	Apply the principles of statistical thermodynamics including probability, thermodynamic probability, Stirling's theorem, and partition functions to derive thermodynamic properties.	3Applying 4 Analyze
CLO6	Know about the principles, instrumentation, and applications of electrophoresis techniques including PAGE, capillary electrophoresis, micellar electrokinetic chromatography, and isoelectric focusing.	2 understanding 3 Applying

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)																PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CLO1	1	2	1		1	1											3	1
CLO2	1		1			1											1	2
CLO3	2	1	3	1	2	2											2	1
CLO4	1	2	2		2	3											1	2
CLO5	2	2	1	1	1	2											2	1
CLO6	1	2	1	1		1											3	1

3:High, 2:Medium, 1:Low