

Faculty of Science and Humanities

M.Sc.(Chemistry)Semester-I

Effective from Academic Year 2026-27

Branch Name:	M.Sc. Chemistry
Program Code:	SC203
Course Name:	Selected Topics in Physical Chemistry-I
Course Code:	2SC2030103
Pre-requisite Course:	Basics Physical chemistry up to B.Sc.

Course Objectives:

- Student can understand the basics of polymer chemistry and polymerization mechanisms.
- Student can learn the principles of electrochemistry and electrical double layer.
- Student can study reaction kinetics and photochemical reactions.
- Student can understand bonding, defects, and conductivity in solids.
- Student can develop problem-solving skills in physical chemistry topics.

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	Chemistry of Macromolecules Classification and Nomenclature of polymers, Isomerism of polymers, Chain growth polymerization – Introduction, Mechanism of free-radical, Cationic and Anionic polymerization, Kinetics of free radical, Cationic and Anionic polymerization, Mechanism and Kinetics poly condensation.	12	25%
2	Physical Electrochemistry Anomaly of strong electrolytes, Debye-Huckel Theory (Mathematical derivation), Wien effect, Structure of electrified interfaces, Thermodynamics of electrified interfaces-Lippmann's equation, Electrical double layer, Theory of structure of electrical double layer and its limitations (Gouy-Chapman theory).Overvoltage: Introduction, types, measurements, factor affecting overvoltage & importance.	12	25%
3	Kinetics of Chemical reactions and Photochemistry Introduction, Reaction velocity, Arrhenius equation, Kinetic salt effects: Primary salt effect & Secondary salt effect, Collision theory of bimolecular reactions, Collision theory of unimolecular reactions, Lindemann's Theory. Reaction Kinetics of photochemical Hydrogen-bromine reaction, photochemical Hydrogen-chlorine reaction, Decomposition of Ethane, Pyrolysis of Acetaldehyde.	12	25%

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4	Solid State Chemistry Bonding in solids and electronic structure in solids, bond theory-metals, semiconductors and insulators, defects in crystals, calculation of schottly and Frenkel defects using statistical method, non stoichiometry, solid electrolytes, diffusion in solids, electrical conductivity in solids, super conductivity, perovskites.	12	25%
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Text Books:

1. A Text Book of Physical Chemistry; A.S. Negi, S.C. Anand; New Age International (P) Limited, New Delhi, 2002.
2. Physical Chemistry, Dr. R. L. Madan & G. D. Tuli, S. Chand publication.

Reference Books:

1. Advanced Physical Chemistry, Gurtu-Gurtu, A Pragati Edition.
2. Advanced Physical Chemistry, D.N.Bajpai, S.Chand.
3. Principles of polymers Science by P.Bahadur and N.V.Sastry.(Second Edition)

List of Open Source Software/learning website:

1. <https://www.pw.live/chapter-chemical-kinetics/collision-theory-of-reaction-rates>
2. https://www.youtube.com/watch?v=DeSo0eR5U0M&list=PLDjIJRH6sIC6v3ufynqowNIL6hlD1y_O8

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

CLO	Description	Bloom's Taxonomy Level
CLO1	To Comprehensive understanding of polymer chemistry	1-Remembering 2 Understanding
CLO2	To analysis of polymerization kinetics and mechanisms	2-Understanding 4-Analyzing
CLO3	To learn & understand theories in electrochemistry like Debye-Huckel Theory, Gouy-Chapman theory etc.	2 Understanding
CLO4	To learn kinetic theories of complex reactions, kinetic salt effects and Reaction Kinetics of photochemical reactions.	1 Learning 2 Understanding 3 Applying
CLO5	To Understanding the crystalline structure of the molecules and defects of the crystalline structures of molecules	1-Remembering 2-Understanding
CLO6	Apply physico-chemical techniques to determine and analyze important chemical properties through laboratory experiments.	4-Analyzing

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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								2	1
CLO2					1												1	1
CLO3																	2	2
CLO4		1															3	3
CLO5	1	2		2			1										2	3
CLO6					2													

3:High, 2:Medium, 1:Low