Course Title: Chemistry Core-3: General Physical Chemistry *w.e.f. the session 2022-23 and onwards*	
Class: M.Sc. Pt.-I / Semester-I	**Course code: MCH-C103**
Lectures: 60	Credits : 04
MM: 70	Exam Hours: 03

NOTE: The question paper shall consist of Two sections (Sec.-A and Sec.-B). Sec.-A shall contain 10 short answer (about 150 words) type questions of SIX marks each and student shall be required to attempt any five questions. Sec.-B shall contain 08 descriptive type questions of TEN marks each and student shall be required to attempt any four questions. Both sections shall have questions from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

COURSE CONTENTS:

Unit - I

Chemical Kinetics - I: Derivation of IIIrd order kinetic equation, collision theory for uni, bi and termolecular reactions, Steric factor, Theory of absolute reaction rates, Entropy of activation. Experimental techniques for the study of kinetics of slow and fast reactions. Potential energy surfaces (two-dimentional and 3-dimentional diagrams), P.E. surface for $H + H_2$ reaction, Concept of COL and Contour diagram.

Unit - II

Chemical Kinetics - II: Opposing, Consecutive, Side and Induced reactions, Induction period. Chain reactions and explosion limits. Reactions in solution, Factors affecting the rates in solutions, effect of solvation and Internal pressures, Double and Single sphere models, Effect of ionic strength, Bronsted-Bjerrum equation, Numerical Problems.

Unit - III

Linear Free energy Relationships: Effect of substituents on reaction rates, Basic idea of linear free energy relationships particularly Hammett, Taft, Brown and Okamoto, Sekigawa and Van - Bakkum plots (Introductory treatment only).

Unit - IV

Catalysis: Acid- Base catalysis, Acidity function, Enzyme -catalysis, Michaelis-Menten equation.

Photochemistry: Jabolinskii diagram, fluorescence, phosphorescence, chemiluminiscence and photosensitization, photophysical kinetics of unimolecular process.

Unit - V

Macromolecules : Explaining the terms Isotactic, Atactic, Syndiotactic, Copolymers, Block copolymers, Linear, Branched and Cross linked polymers, Addition and condensation polymerisation. Degree of polymerisation and length of polymer chains. Requirement of purity for synthesis. Molecular weights and their distribution. Polydispersity. Determination of molecular weight by Osmotic pressure, Viscosity, light scattering and sedimentation equilibrium methods.

Suggested Readings :

1. Chemical Kinetics by: K.J. Laidler
2. Enzyme Kinetics by: D.V. Roberts
3. Text book of Physical Chemistry by: S. Glasstone
4. Chemical Kinetics by: Ralphe Jr. Westron and A.S. Harold
5. Physical Chemistry by: G.M. Barrow
6. Physical Chemistry by: G.W. Castellan

7. Introductory Polymer Chemistry by: G.S. Misra
8. Physical Organic Chemistry by: N.S. Issacs

COURSE OBJECTIVES:

1. Third order reactions, Theories of reaction rates, 3-d Potential energy surface diagrams, Col, Contour diagrams
2. Complex reactions, salt effect and solvent effect in Reactions
3. Linear Free Energy Relationships
4. Catalysis and Photochemistry
5. Macromolecules

COURSE OUTCOMES:

On completion of this course, student shall be able to:

CO1: Discuss kinetics of 3rd order reactions, collision and activated state theory for reaction rates and potential energy surfaces for a reaction.
CO2: Explain the effect of different parameters on reaction rates as ionic strength, solvent, catalyst and temperature on reaction rates.
CO3: Deduce a linear relationship between substituents and change in free energy of a reaction series.
CO 4:Familiarize with the processes such as fluorescence, phosphorescence and photochemical reactions etc.
CO5:Gain knowledge of macromolecules about their types, polymerization and methods to determine their molecular weight, polydispersity etc.

Mapping of Course outcomes (Cos) with Programme outcomes (POs)

Course outcomes/ Programme outcomes	1	2	3	4	5	6	7	8
CO 1	X				X	X		X
CO 2	X				X	X		X
CO 3	X							X
CO 4	X		X					X
CO 5	X		X		X			X