

Programme	Bachelor of Science in Solid State Physics (BS SS Physics)	Course Code	GNS-201	Credit Hours	3 (2-1)
Course Title	Fundamentals of Physical Chemistry				
Course Introduction					
Fundamentals of physical chemistry is the study of macroscopic and microscopic phenomena in chemical systems in terms of the principles, practices, and concepts of physics such as motion, energy, force, time, thermodynamics, quantum chemistry, statistical mechanics, analytical dynamics and chemical equilibria.					
Learning Outcomes					
By the end of this course, students will be able to:					
<ol style="list-style-type: none"> 1. Explain and apply the concepts of thermodynamics, kinetics, quantum mechanics, and spectroscopy to chemical, physical, and biochemical systems. 2. Derive essential mathematical relationships in thermodynamics, kinetics, quantum mechanics, and spectroscopy. 3. Students will apply essential mathematical relationships to chemical, physical, and biochemical problems, including chemical and biochemical reactions and phase equilibria. 4. Students will evaluate physical and chemical systems to determine how to control these systems. 					
Course Content					Assignments/Readings
Week 1	Unit-I 1.1 Introduction 1.1.1 Ideal and real gases, equations of state, critical phenomenon and critical constants, molecules in motion, collision diameter and mean free path				Difference between ideal and real gas
Week 2	Unit-II 2.1 Physical properties of liquids 2.1.1 Surface tension, viscosity, refractive index etc. and their applications, brief account of interactions among the molecules in liquids				Examples of viscous materials
Week 3	Unit-III 3.1 Packing of atoms 3.1.1 Unit cells and crystal systems, methods of crystal structure analysis, brief account of polymers and composite				What is a unit cell

	materials with special emphasis on superconductors, semi-conductors etc.	
Week 4	Unit-IV 4.1 Introduction to plasma	What is plasma
Week 5	Unit-V 5.1 Chemical Thermodynamics 5.1.1 Laws of thermodynamics and their applications, thermodynamic functions	Exercise
Week 6	Unit-VI 6.1 Internal energy 6.1.1 enthalpy, entropy and free energy, relations between thermodynamic functions	Define enthalpy and entropy
Week 7	Unit-VII 7.1 Heat capacity 7.1.1 Concept of entropy & probabilities	Practice
Week 8	Mid Term Exams	
Week 9	Unit-VIII 8.1 Chemical Kinetics 8.1.1 Rate of reaction, rate law, order and molecularity of the reactions, zero, first and second order reactions	Examples first and second order reactions
Week 10	Unit-IX 9.1 Reaction Order 9.1.1 determination of reaction order and its rate constant, effect of temperature on the reaction rate, concepts of chemical equilibrium, law of mass action, equilibrium constant	What is law of mass action
Week 11	Unit-X 10.1 Le-Chatellier's principle and its applications 10.1.1 elementary concepts underlying complex and fast reactions, theories of elementary reactions, collision theory, transition state theory	Collision theory
Week 12	Unit-XI 11.1 Solution Chemistry 11.1.1 Ideal and non-ideal solutions, Rault's law and its applications, molecular interactions in solutions, colligative properties	

Week 13	Unit-XII 12.1 Azeotropic mixture 12.1.1 Distillation and concept of azeotropic mixture, phase rule and its applications.	Exercise
Week 14	Unit-XIII 13.1 Electrochemistry 13.1.1 Electrolytes, electrolyses, Faradays laws of electrolyses	Discussion
Week 15	Unit-XIV 14.1 Conductance 14.1.1 Molar conductance and equivalent conductance of solution of electrolytes, construction and working of electrochemical cells, cell potential, electrode potential.	Presentations
Week 16	Final Term Exams	

Textbooks and Reading Material

1. Atkins P.W. Physical Chemistry, 6th edition, W. H. Freeman and co. NY. (1998)
2. Adamson A. W. Understanding Physical Chemistry, 3rd Ed., Benjamin Cummings Publishing Company Inc.

Teaching Learning Strategies

1. Course Teaching
2. Presentations
3. Quiz

Assignments: Types and Number with Calendar

- 1.
- 2.
- 3.
- 4.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.

2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.