

## ALLIED II - Course title: Allied Physics for Chemistry - I

Course Code*				
Credits	2	3		
Hours / Cycle	4			
Category	Part III B Allied - Theory			
Semester	III			
Year of Implementation	From the academic year 2024-2025 onwards			
Course Structure	Theory	Tutorial	Practical	Total Hours
	60	0	0	60
Course Objectives	To give a basic understanding of concepts of properties of matter, thermodynamics, crystal physics, laser, optical communication and analog electronics			
Course Outcome(s)			PSO Addressed	Bloom's Taxonomy Levels (K1 to K6)
CO-1: To remember and recall the basics of elasticity, viscosity, surface tension, Laws of thermodynamics, crystal physics, laser and analog electronics.			PSO 1	K1
CO-2: To Understand the behavior of solids and liquids, basic concepts of thermodynamics, X-ray diffraction by crystal, optical fiber communication and basic electronics elements.			PSO 1	K2
CO-3: To apply the concepts of elasticity to determine Young's modulus and rigidity modulus, surface tension & viscosity to measure liquids properties, thermodynamics to study the efficiencies of heat engines, transmission of light in optical fibers for communication, analog electronics to study I-V characteristics of diode and transistor			PSO 1, PSO 3, PSO 4	K3
CO-4 : To analyze and interpret the theories & equations discussed in units of properties of matter, thermodynamics, crystal physics, laser and analog electronics and apply them to solve problems			PSO 1, PSO 3, PSO 4	K4
CO-5 : To evaluate the concepts of elasticity, surface tension, viscosity, thermodynamics, radiation, transmission of light in optical fiber and basic electronics elements by studying various experiments & theories			PSO 1, PSO 3, PSO 4, PSO5	K5

### SYLLABUS: Allied Physics for Chemistry - I

UNIT	CONTENT	Hours	COs	Bloom's Taxonomy Level
I	<b>Properties of matter</b> Moduli of elasticity – Bending of beams –bending moment – Theory and experiment of Young's modulus by uniform bending– Twisting couple on a rod –couple per unit twist - Theory and experiment of Rigidity modulus by Torsion pendulum. Streamline and turbulent flow – critical velocity - Coefficient of viscosity -Poiseuille's equation for flow of liquid through a tube- Surface tension -Surface energy -Surface tension by drop weight method.	14	CO1 to CO5	K1 to K5
II	<b>Thermal physics</b> Thermodynamics: First law - Internal Energy - Otto and Diesel engines - Expressions for efficiency - Second law –Concept of Entropy Coefficient of Thermal Conductivity – Determination of Thermal Conductivity of a bad Conductor by Lee's disc method with theory. Black body radiation-Wien's displacement law – Rayleigh – Jean's law – Planck's radiation law and its derivation.	1	CO1 to CO5	K1 to K5

<b>III</b>	<b>Crystal Physics</b> Lattice-basis-unit cell-lattice parameters-Crystal systems and Bravais lattices-Structure and packing fractions of simple cubic, body centered cubic, and face centered cubic structures-Crystal planes, directions and Miller indices- Diffraction of X-rays by crystal planes and derivation of Bragg's law	12	CO1 to CO5	K1 to K5
<b>IV</b>	<b>Laser and Fiber optics</b> Laser-Spontaneous and stimulated emission-Einstein's coefficients- Population inversion-Methods of pumping– Three level Laser-Ruby laser - Four level Laser-Helium-Neon laser Fiber optics communication – Total internal reflection-Acceptance angle expression and Acceptance cone- Numerical aperture – Classification of optical fibers based on material, refractive index and mode – transmission of signal in them - Attenuation in optical fibers - Optical fiber in communication	12	CO1 to CO5	K1 to K5
<b>V</b>	<b>Analog Electronics</b> Intrinsic and extrinsic semiconductor – PN Junction diode – V-I characteristics of junction diode – Rectifiers –bridge rectifiers –Zener diode – Characteristics of Zener diode – Zener regulator - Transistor – Characteristics of transistor – CE mode – Transistors as an amplifier - Field Effect Transistor - Structure and characteristics of an N-channel FET	12	CO1 to CO5	K1 to K5

<b>Text Books</b> 1. DS Mathur , <i>Elements of Properties of Matter</i> , S. Chand Publishing 2. M N Avadhanulu and P G Kshirsagar, <i>A Textbook of Engineering Physics</i> , S. Chand Publishing 3. V. K. Mehta, Rohit. <i>Principles of Electronics</i> . India: S Chand & Company Limited, 2022. 4. S. Mani Naidu, <i>Applied Physics</i> , Pearson Education India, 2010 5. Brij Lal, N Subrahmanyam, PS Hemne , <i>Heat, Thermodynamics and Statistical Physics</i> , S Chand Publishing
<b>Reference books</b> 1. R Murugesan, <i>Allied Physics Paper I &amp; II</i> , S Chand Publishing, 2005 2. Nicholas Giordano, <i>College Physics: Reasoning and Relationships</i> , Cengage Learning 3. D Chattopadhyay, <i>Electronics: Fundamentals and Applications</i> , New Age International Private Limited 4. Satyendra Nath Maiti, <i>Classical Mechanics and General Properties of Matter</i> , New Age International (P) Limited
<b>Suggested reading</b> 1. Jerry D. Wilson, Anthony J. Buffa, Bo Lou, <i>College Physics</i> , 7th ed., Pearson Education. 2. Paul M. Fishbane, Stephen G. Gasiorowicz, Stephen T. Thornton, <i>Physics for Scientists and Engineers with Modern Physics</i> [3rd edition], Pearson Education. Inc.
<b>Web Resources</b> 1. <a href="https://archive.nptel.ac.in/courses/122/107/122107035/">https://archive.nptel.ac.in/courses/122/107/122107035/</a> 2. <a href="https://ocw.mit.edu/search/?d=Physics&amp;s=department_course_numbers.sort_coursenum">https://ocw.mit.edu/search/?d=Physics&amp;s=department_course_numbers.sort_coursenum</a>