

<b>Branch Name:</b>	Physics
<b>Program Code:</b>	SC105
<b>Course Name:</b>	Physics 502
<b>Course Code:</b>	<b>2SC1050502</b>
<b>Pre-requisite Course:</b>	Basic knowledge of statistical, solid state and plasma physics

### Course Objectives:

1. To develop an actual understanding of the Statistical Mechanics.
2. To know the concept of solid state physics.
3. To understand the behaviour of plasma.

### Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				Total (Marks)
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	--	--	3	70	30	--	--	100

### Subject Contents:

Sr. No	Topic	Total Hours	Weight (%)
1	<b>STATISTICAL MECHANICS</b>	15	33
	<b>(a) Macroscopic and Microscopic states</b> Macroscopic States, Microscopic States, Phase Space, $\mu$ -Space, $\tau$ -Space, Postulate of equal a priori probability. <b>(b) Statistical Ensembles</b> Micro canonical ensemble, Canonical ensemble, Alternative method for the derivation of canonical distribution, Mean value and Fluctuations, Grand Canonical Ensemble, Alternative derivation of Grand Canonical Distribution, Fluctuations in the number of particle of a system in a grand canonical ensemble, Reduction of a Gibb's distribution to Maxwell's and Boltzmann distribution, Barometric formula, Experimental verification of the Boltzmann's distribution.		
2	<b>SOLID STATE PHYSICS</b>	15	33
	<b>Elements of crystallography:</b> Symmetry elements, Classification of crystals, Zone and forms, Miller indices, Lattice types, Effect of symmetry, Atomic packing: packing of equal spheres in two and three dimension, hexagonal lattice, fcc lattice, bcc and Simple Cubic lattice, classification of closed packing, voids, voids in closed packing, Pauling's rule and its applications, Common Crystal structures: simplest crystals CsCl, NaCl, alkali metals, Diamond and hexagonal, Transformation theory.		
3	<b>PLASMA PHYSICS</b>	15	34
	<b>(a) Characteristics of a Plasma in a Magnetic field</b> Description of plasma as a gas mixture, Properties of plasma in magnetic field, Force on plasma in magnetic field, Current in		

	<p>Magnetised Plasma, Diffusion in a Magnetic field, Collisions in fully ionized magneto-plasma, Pinch Effect, Oscillations and waves in the plasma, Plasma frequency, Maxwell's equation in a homogenous plasma, Electromagnetic or Transverse Oscillations, Electrostatic or Longitudinal oscillations, Oscillations of the plasma, Hydromagnetic waves, Resonances and cut-offs or reflection points.</p> <p><b>(b) Applications of Plasma</b>  Controlled Thermonuclear Reactions, Lawson criterion, The Coulomb Barrier, Heating and Confinement of the Plasma, Radiation loss of energy, Magnetohydrodynamic conversion of energy, Plasma propulsion, Other plasma devices.</p>		
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**Text Books:**

1. Physics paper -7, semester-5, Nirav Prakashan

**Reference Books:**

1. Fundamentals of Statistical Mechanics by B. B. Laud. New Age International Publisher
2. Elements of Solid State Physics by J.P. Srivastava, PHI New Delhi 2003
3. Elements of Plasma Physics by S. N. Goswami New Central Book Agency (P). Ltd. Calcutta.
4. Statistical Mechanics and Properties of Matter by E.S.R.Gopa
5. Solid State Physics by A. J. Dekker.
6. Introduction to Solid State Physics by C. Kittel. 7th Edition, John Willy and Sons
7. Introduction to Plasma Physics by F.F.Chen. Plenum Press.
8. Plasma Physics by S. N. Sen., Pragati Prakashan, Meerut.

**List of Open Source Software/learning website:**

1. <https://www.youtube.com/watch?v=D1RzvXDXyqA>
2. <https://www.youtube.com/watch?v=vnZvNgpNOSo&list=PLd9hKAUC3AZuo7is-aN45pmfDwJHOqKAj>
3. [https://www.youtube.com/watch?v=Qu25\\_14l044](https://www.youtube.com/watch?v=Qu25_14l044)

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the Macroscopic and Microscopic states.	1 Remembering
CLO2	Discuss the Statistical Ensembles.	2 Understanding
CLO3	Applications of Plasma in various fields.	3 Applying
CLO4	Explain Elements of crystallography.	4 Analyzing
CLO5	Justify the Characteristics of Plasma in a Magnetic field.	5 Evaluating
CLO6	Design a various crystal structure.	6 creating

## Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)									Programme Specific Outcome (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CLO1									L		
CLO2			M							L	
CLO3					M						
CLO4		M									
CLO5								H		M	
CLO6								H		H	

**H: High, M: Medium, L: Low**