20SC102					Engineering Physics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	Viva	
3	0	2	0	4	25	50	25	--	--	100

COURSE OBJECTIVES

- ⮚ To understand basic concepts of quantum mechanics and solve the Schrödinger equation for various cases.
- ⮚ To understand basics concepts of electric and magnetic properties of solids.
- ⮚ To develop the fundamental understanding of optoelectronic devices.
- ⮚ To understand the heat transfer mechanism in solids and fluids.

UNIT 1 Introduction to Quantum Mechanics	12 Hrs.
Inadequacies in Classical Physics, Wave Nature of Matter, Heisenberg's Uncertainty Principle and its applications, zero point energy, Basic Postulates and Formalism of QM: Energy, Momentum and Hamiltonian Operators. Time-independent Schrodinger Wave Equation for Stationary States. Properties and interpretation of Wave Function. Probability Density and Probability. Conditions for Physical Acceptability of Wave Functions, Application of time-independent Schrödinger equation for various potentials.	

UNIT 2 Electronic theory of Solids	10 Hrs.
Elements of crystallography; lattice vibrations of solids; Bloch Theorem and Origin of energy bands, band structure of conductors, type of semiconductors, Free Electron Theory of metals, Wiede-mann Franz Law, Kronig-Penny model, Hall effect. Magnetism and its origin, magnetization and susceptibility, dia-para-ferro-magnetism. Ferromagnetism, Nano magnets and magneto resistance, hard disk drive storage technology. Phenomenology of Superconductors, Meissner effect, BCS theory - high temperature superconductors.	

UNIT 3 OPTICS, LASER AND OPTO-ELECTRONICS	08 Hrs.
Optics: Introduction, division of amplitude, thin film interference, Applications of interference, Laser: The Einstein coefficients, Spontaneous and stimulated emission, Optical amplification and population inversion, meta stable state, optical resonator, the principle of pumping scheme, laser beam characteristics. Types of LASER, Injection Laser Diode (ILD). Quantum Cascade Laser, Comparison between ILD and QCL. Applications of lasers.	

UNIT 4 THERMAL PHYSICS	10 Hrs.
Laws of thermodynamics-basic concepts, closed and open systems-first law. Heat transfer-thermal expansion of solids and liquids –Conduction in solids – thermal conductivity- Forbe's method, Lees' disc method, conduction through compound media, formation of ice on ponds, thermal insulation and its applications. Thermal Convection - properties of radiant heat, sea and land breeze. Thermal Radiation – emission and absorption radiation, emissive power, black body radiation – Kirchoff's, Stefan's laws, wien's law, Newton's law of cooling.	
	Max. 40 Hrs.

COURSE OUTCOMES

CO1 – identify and understand the experimental results which require conceptualization of quantum theory.

CO2 – Interpret the solution of Schrödinger equation to obtain physical information about the system.

CO3 - Identify basic concepts in semiconductors, superconductors and magnetism and apply it in engineering
 applications.

CO4 - To understand concepts of optical interference and LASER, analyse the lasing characteristics to apply in different
 laser diodes and other applications

CO5 - To understand concepts of thermal physics in terms of laws and modes of heat transfer.

CO6 - To apply knowledge of concepts of engineering physics to solve real world problems.

TEXT/REFERENCE BOOKS

1. N. Zettili, Quantum Mechanics: Concepts and applications, Willey Publications
2. Kittel, Charles. Introduction to Solid State Physics. John Wiley and Sons.
3. W.D. Callister and David Rethwisch, Materials Science & Engineering -An Introduction, 9th edn.,
4. Heat and Thermodynamics BrijLal, N. Subrahmanyam, S. Chand, Limited, 2001.
5. Optics by Ajay Ghatak, Tata macgraw hill publishing.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100   **Exam Duration: 3 Hrs**

Part A/Question: 3 Questions from each unit, each carrying 3 marks   36 Marks
Part B/Question: 2 Questions from each unit, each carrying 8 marks   64 Marks