

Course Title	SOLID STATE ELECTRONICS
Course Code	NPHY-140
Credit Hours	CH3
Pre- requisites	
Learning outcomes	To teach fundamental concepts of solid state Physics, Quantum mechanics and quantum effects. To impart the knowledge of semiconductor materials and their devices. To understand the electrical behavior of semiconductor devices under varying excitation conditions.
Contents	<p>Fundamental Solid-State Principles: Atomic theory, Metals, insulators and semiconductors, Conduction in Silicon and Germanium, doping, The forbidden energy gap, n and p type semiconductors. The Semiconductor Diode, Semiconductor crystal lattices, planes and directions.</p> <p>Introduction to Quantum Mechanics: Schrodinger's wave equation, electron in free space, infinite and step potential function, extensions of wave theory to atoms. Allowed and forbidden energy bands, electrical conduction in solids, effective mass theorem, Boltzmann transport theory and distribution function, space lattices, atomic bonding, impurities and imperfection in solids, energy band structure. generation, recombination and carrier lifetimes</p> <p>Carrier transport phenomena: high field transport, impact ionization, Carrier diffusion, drift and high field effect, mobility and conductivity, velocity saturation, Hall effect with applications to electronic devices, graded impurity distribution,</p> <p>Homo-junction and hetero-junctions: homo-junction and hetero-junction properties of semiconductor devices and theories underlying the static/dynamic characteristics of semiconductor devices.</p> <p>Optical properties and devices: optical absorption, luminescence, photoconductivity, direct and indirect recombination, photoconductive devices, quasi Fermi level, Haynes-Schokley experiment.</p>
Teaching-learning Strategies	Class room teaching/lecturering
Assignments- Types and Number	Problem sheet: 3-4
Assessment and Examinations	<p>Mid-Term Assessment: 35%</p> <p>Formative Assessment: (25%): It includes classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.</p> <p>Final Term Assessment: 40%</p>
Text Books	<ol style="list-style-type: none"> 1. Solid State Electronic Devices, 7th Edition, by Ben Streetman and Sanjay Banerjee, Pearson; (March 19, 2014) 2. Physics of Semiconductor Devices, by Simon M. Sze, Kwok K. Ng, Wiley Interscience; 3 edition (October 27, 2006). 3. Introductory Electronic Devices and Circuits, by R. T. Paynter, Prentice Hall, 7th edition, (2005). 4. Introductory Electric Circuits, by R. T. Paynter, Prentice Hall, (1998). 5. Electronic Devices, by T. L. Floyd, Pearson, 10th Edition, (2017)

