



<b>Program</b>	BACHELOR OF TECHNOLOGY (B.Tech)	<b>Semester - 2</b>
<b>Type of Course</b>	Basic Science Course	
<b>Prerequisite</b>		
<b>Rationale</b>	-	
<b>Effective From A.Y.</b>	2025-26	

Teaching Scheme (Contact Hours)				Examination Scheme				
Lecture	Tutorial	Lab	Credit	Theory Marks		Practical Marks		Total Marks
				SEE TH	IAT	SEE P	CCE	
3	-	2	4	70	30	50	50	200

SEE - Semester End Examination, IAT - Internal Assessment Test, CCE - Continues & Comprehensive Evaluation

Course Content		T - Teaching Hours   W - Weightage	
Sr.	Topics	T	W
1	<b>Basics of Semiconductors</b> Introduction of Semiconductors: Types of materials : Conductors, semiconductors and insulators, Atomic structure and bonding in semiconductors, Intrinsic and Extrinsic semiconductors Semiconductor fundamentals : Electrons and holes, Carrier transport mechanism, Drift and diffusion, mobility and conductivity, Generation and recombination of carriers Charge carriers in semiconductors: Carrier concentration and Fermi level, Temperature dependence of carrier concentration, Numerical problems	10	20
2	<b>Semiconductor Materials and Device</b> Silicon, Germanium and compound semiconductor, Crystal structure and growth techniques (Czochralski process, Float zone process) P-N Junction: Formation of P-N Junctions, Depletion region and built-in potential, current – voltage characteristics , Types of diodes (Zener, Schottky, LED), Diode characteristics and applications Solar cell (Principle, Construction and Working), Numerical problem	8	20
3	<b>NANOPHYSICS</b> Nanoscale, Surface to volume ratio, Surface effects on Nanomaterials, Quantum size effects, Electron confinement, Nanomaterials and Nanotechnology, Unusual properties of Nanomaterials, Disadvantages of Nanomaterials, Synthesis of Nanomaterials (Sol Gel, Ball Milling, PVD), Carbon Nanotubes: Introduction, Structure, Synthesis, Properties and applications, Applications of Nanomaterials	6	10
4	<b>Superconductivity</b> Introduction of Superconductivity, Properties of superconductor, Effect of magnetic field, Meissner effect, Pressure effect, Impurity effect, Isotopic mass effect, Mechanism of Superconductivity : BCS Theory, Penetration depth : Magnetic field, Josephson's junction and its application, Applications of superconductors (SQUID, MagLev Train), Numerical problems	8	20
5	<b>Dielectric and Optical Fibre</b> Dielectrics : Introduction, Polar and Non-Polar Dielectric, Types of Dielectric Materials, Dielectric Insulator, Application Optical fibre-principle [TIR] – types material, mode, refractive index- Fibre loss-Expression for acceptance angle and numerical aperture, Application-Communication, Numerical problems	5	10
6	<b>Photonics</b> Einstein's theory of matter radiation interaction and A & B coefficients, Properties of laser, Spontaneous and stimulated emission, Amplification of light by population inversion, Types of lasers: solid- state laser (Neodymium), gas lasers (CO <sub>2</sub> ).	8	20
<b>Total</b>		<b>45</b>	<b>100</b>



### Suggested Distribution Of Theory Marks Using Bloom's Taxonomy

Level	Remembrance	Understanding	Application
Weightage	30	40	30

NOTE : This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Course Outcomes

At the end of this course, students will be able to:

CO1	Develop basic theoretical and mathematical concept of semiconductors
CO2	Extend the concept of semiconductor material and various devices.
CO3	Elucidate the fundamental of Nanophysics and its Application
CO4	Outline the fundamental overview of superconductivity their relevant application
CO5	Outline the fundamental overview of Dielectric and Optical fibre-their relevant application
CO6	Develop the fundamental concept of LASERs and their relevant applications.

### CO PO Mapping

CO	CO - 1	CO - 2	CO - 3	CO - 4	CO - 5	CO - 6
PO - 1	1	1	1	1	1	1
PO - 2	1	1	1	1	1	1
PO - 3						
PO - 4						
PO - 5	1	1	1	1	1	1
PO - 6						
PO - 7						
PO - 8	1	1	1	1	1	1
PO - 9						
PO - 10						
PO - 11	1	1	1	1	1	1

### List of Practical

1.	Determine the wavelength of laser using diffraction grating
2.	Determine the divergence of laser
3.	To study the characteristics of Zener diode
4.	To study the characteristics of P-N Junction diode
5.	To study the characteristics of LED diode
6.	Study of the voltage and current of solar cells
7.	Study of the voltage and current of the Solar cells in series and parallel combination.
8.	Determination of the band gap of a Semiconductor : Germanium Chip : Four Probe Method
9.	Velocity measurement of Ultrasonic wave in given sample (liquid) using Ultrasonic Interferometer

