Course: BTech **Semester:** 1

Prerequisite: Knowledge of Physics and some basic concepts in Mathematics like differentiation, integration, limit, differential equation, vector calculus up to 12thscience level.

Rationale: Knowledge of physics is essential for all Engineering branch because physics is the foundation subject of all the branches of engineering and it develops scientific temperament and analytical capability of engineering students. Comprehension of basic physics concepts enables the students to solve engineering problem logically and develop scientific approach.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
					Internal Marks			External Marks		
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Hrs/Week	Credit	T	CE	P	T	P	
3	-	2	-	4	60	20	30	20	20	150

SEE - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**UNIT-I: Modern Physics**Introduction about quantum Mechanics, Schrodinger's equations, Time dependent and Time Independent Wave Equation, Physical Significance of the wave Function, Application of Schrodinger equation in particle in One Dimensional Potential Box and Tunneling effects.	20	9
2	**UNIT-II: Band theory & Semiconductors**Energy bands in solids, Classification of Materials into Conductors, Semiconductors & Insulators, Density of state, E-k diagram, Kronig-Penny model (to introduce origin of band gap), Effective mass. Direct and indirect band gap. Carrier Concentration in semiconductors, Fermi Level in Intrinsic and Extrinsic Semiconductors, P-N junction diode, Ohmic and Schottky Junction.	20	9
3	**UNIT-III: Materials**Classification of materials: Magnetic materials, Nanomaterials based on semiconductors and metal oxides, Basic characteristic properties of nanomaterials, Novel Materials. Physical, Thermal, Electrical, Optical and Magnetic properties of materials.	20	9
4	**UNIT-IV: Laser and Fiber Optics**Lasers: Interaction of radiation with Matter, Absorption, Spontaneous and Stimulated emission, Characteristics of Lasers, Types of Lasers: Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers. Fiber Optics: Principle and Structure of Optical Fiber, Numerical Aperture of fiber, Types of Optical Fibers, Attenuation in Optical Fibers, Applications of Optical Fibers.	20	9
5	**UNIT-V: Devices**Optoelectronic Devices: Photoconductive cell, photovoltaic cell, Photodiode, Phototransistor, LED, IR emitters, Opto coupler, X-ray diffractometer, Quantum devices and their applications.	20	9

Reference Books

1.	**Semiconductor Optoelectronics** By J. Singh | McGraw-Hill Inc, Pub. Year 1995
2.	**Fundamentals of Photonics** By B. E. A. Saleh and M. C. Teich | John Wiley & Sons, Pub. Year 2007
3.	**Semiconductor Devices: Physics and Technology** By S. M. Sze | Wiley, Pub. Year 2008
4.	**Semiconductor Optoelectronic Devices** By P. Bhattacharya | Prentice Hall of India, Pub. Year 1997
5.	**Fundamentals of Physics** By D. Halliday, R Resnick and J. Walker | Asian Books Pvt. Ltd

Course Outcome

After Learning the Course the students shall be able to:
1. Understand the band structure and origin of band gap in semiconductors. 2. Formulate and conceptualize various theoretical aspects and the physical phenomena at atomic level. 3. Analyze the optical transition processes in semiconductors and identify the materials useful in optoelectronic devices. 4. Use different techniques of measurement of bandgap, resistivity and other parameters of interest of semiconductors. 5. Understand the fabrication and applications of low dimensional semiconductor devices.

List of Practical

1.	**I-V characteristics of light emitting diode in forward bias.**
2.	**I-V characteristics of Zener diode in reverse bias.**
3.	**Determination of Velocity of ultrasonic waves in water.**
4.	**Determination of Dielectric constants of Dielectric samples**
5.	**Measurement of Band gap of semiconductor material.**
6.	**Measurement of Hall coefficient RH and carrier concentration in a semiconductor**
7.	**Measurement of Planck's constant using LED**
8.	**Measurement of wavelength of laser light using diffraction grating.**
9.	**Measurement of Numerical aperture of an optical Fiber.**
10.	**Moment of Inertia of a flywheel.**
11.	**Measurement of power loss in an optical fibre**
12.	**B-H Curve tracing.**
13.	**Determination of Young's modulus.**
14.	**Determination of thermal conductivity. (Searle's method or Lee's method)**
15.	**To Determine acceleration due to gravity using compound pendulum.**