22PYB01 - SEMICONDUCTOR PHYSICS (Common to CSE, CSE (CS), CSE (IoT), IT & AI&DS)				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PRE-REQUISITE : NIL

Course Objective:	• To expose the concepts of conducting materials and electrical properties of semiconductors. • To expand familiarity in the field of photo detectors and new engineering materials

Course Outcomes The student will be able to		**Cognitive Level**	**Weightage of COs in End Semester Examination**
CO1	Apply the properties of intrinsic semiconductor in photovoltaic cells.	Ap	20%
CO2	Compare various types of semiconducting materials to fabricate laptop circuits	An	20%
CO3	Implement the principles of laser in engineering and medical applications.	Ap	20%
CO4	Analyze proficient in photo doctors in device fabrications.	An	20%
CO5	Examine new engineering materials to assess their performance in electronic applications.	Ev	20%

UNIT I -INTRODUCTION TO CONDUCTING MATERIALS	(9)
Classical free electron theory – Expression for electrical conductivity – Thermal conductivity, expression – Wiedemann – Franz law- Success and failure – electrons in metals - Fermi- Dirac statistics – Density of energy states- - Particle in a three-dimensional box- degenerate states -Energy bands in solids- - Electron effective mass- concept of hole.	
UNIT II -ELECTRICAL PROPERTIES OF SEMICONDUCTORS	(9)
Elemental and compound semiconductors - Intrinsic semiconductor – carrier concentration derivation – variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors (qualitative) – variation of Fermi level with temperature and impurity concentration – Hall effect –determination of Hall coefficient – Applications	
UNIT III -SEMICONDUCTOR LASER	(9)
Population of energy levels – Einstein's A and B coefficients derivation -Resonant cavity – Types of Semiconductor lasers: homo junction and hetero junction- Determination of particle size using laser - Holography – construction – reconstruction – Engineering applications of lasers -Medical field (Surgery).	
UNIT IV -PHOTO DETECTORS	(9)
Classification of optical materials- Carrier generation and recombination processes- Absorption, emission and scattering of light in metals, insulators and semiconductors (concept only)- Formation of P-N junction - Barrier potential and depletion layer – P-N junction diode-Solar cell–LED–organic LED- Laser diode – optical data storage technique.	

UNIT V -ADVANCED NEW ENGINEERING MATERIALS	(9)
Metallic glasses: preparation, properties and applications. Shape Memory Alloys (SMA): Characteristics, properties of NiTi alloy, application. Nano materials: Properties - Preparation – Pulsed laser deposition – chemical vapour deposition of nano particles and applications. Carbon nano tubes: fabrication – arc method – pulsed laser deposition –structure – properties and application.	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. R. A. Serway and J.W. Jewett, "Physics for Scientists and Engineers", Ninth Edition. Cengage Learning, 2018.
2. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2017.
3. V.Rajendran, — Engineering Physicsll, Tata McGraw-Hill. New Delhi.2019

REFERENCES:

1. Raghavan V, "Materials and Engineering", Prentice-Hall of India, New Delhi, 2013.
2. Dattuprasad and Ramanlal Joshi, "Engineering Physics" Tata McGraw hill education, 2016.

B. Rogers, J.Adams and S.Pennathur, "Nanotechnology: Understanding Small System" CRC Press, 2014.

WEB LINKS

1. https://physicaeducator.files.wordpress.com/2017/11/electricity_and_magnetism-by-purcell-3ed-ed.pdf.
2. https://rajeshvcet.home.blog/regulation-2021/ph3151-engineering-physics-study-materials/
3. https://zenodo.org/record/243407#.ZEgPZXZBzIU
4. https://web.pdx.edu/~pmoeck/phy381/workbook%20nanoscience.pdf.

Mapping of COs with POs / PSOs

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2												
2	3	2												
3	3		2											
4	3													
5	3					2	2					2		
CO (W.A)	**3**	**2**	**2**			**2**	**2**					**2**