IT112	ENGINEERING PHYSICS	L	T	P	C	Int	Ext
	(Common to branches IT/CSE/CSD/CSO)	3	-	-	3.0	30	70

Semester I [First Year]

COURSE OBJECTIVES:

1. To understand the concept of wave and particle nature of matter and the basics of semiconductors.
2. Enlightening the modern optics such as lasers and optical fibers.
3. Identifying optoelectronic devices and low dimensional structures for various applications.
4. Explain the novel concepts of Sensors and its applications.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. familiarize the Quantum Mechanical concepts, semiconductors and their uses.
2. Identify and illustrate types of lasers, optical fibers and thier applications.
3. demonstrate various optoelectronic devices, importance of low dimensional structures, their resistivity measurements.
4. summarize various sensing technologies and their applications in computer science.

UNIT I *Text Book - 1* [CO:1] **(12)**

Quantum Physics: Wave particle duality, debroglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle, experimental verification (diffraction- single slit), Schrodinger's time independent wave equation, Physical significance of , particle in a one dimensional infinite potential well.

Semiconductors: Types of semiconductors: intrinsic and extrinsic semiconductors, temperature and concentration effects on fermi level (qualitative), Drift and diffusion currents, Formation of PN junction, Hall effect and its applications.

UNIT II *Text Book - 1* [CO:2] **(12)**

Lasers : Interaction of radiation with matter, spontaneous and stimulated emissions, characteristics of lasers, basic requirements for the construction of lasers (Pumping, population inversion and optical resonant cavity), construction and working of He-Ne, Nd: YAG and semiconductor (GaAs) laser (Homo junction), applications of lasers.

Fiber optics : principle, basic structure, Numerical aperture & acceptance angle, classification (propagation of light in various fibers based on refractive index), Light wave communication through optical fibers, applications of optical fibers.

UNIT III *Text Book - 1* [CO:3] **(12)**

Optoelectronic devices: Direct & Indirect band gap Semiconductors, Photo diode, Light Emitting diode (LED) (construction & working), applications of LED, Solar cell (working principle and characteristics).

Low dimensional structures: Surface to volume ratio, Physical properties, classification of low dimension structures (quantum well, quantum wire and quantum dot), resistivity and its measurements by four point probe and vander pauv methods, hot-point probe method.

UNIT IV *Text Book - 2* [CO:4] **(12)**

Introduction to Sensors and Sensing Technologies : Introduction, Human Body as a Sensor System, Passive and Active sensors, the sensor as part of a measurement system, sensor properties, Classification of Sensors: Piezoelectric Sensors (principle, mechanical force & pressure sensors), Thermal Sensors (metal & semiconductor based thermometers), Quantum Sensors (difference between classical & quantum sensors, over view of common types & applications).

LEARNING RESOURCES:

TEXT BOOK(s):

1. A Text book of Engineering Physics, M. N. Avadhanulu & TVS Arun Murthy, S. Chand Publications, 1st Edition 2024.
2. John Vetelino and Aravind Reghu, Introduction to Sensors, CRC Press, 1st Edition, 2010.

REFERENCE BOOK(s):

1. Engineering Physics, D.K.Bhattacharya & Poonam Tandon, Oxford University Press, 2015.
2. B.K.Pandey, S.Chaturvedi, Engineering Physics - Cengage Publications, 2012.
3. J.Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc., 1995.
4. Hand book of Modern Sensors, Jacob Fraden, 4th edition, Springer, 2010.

WEB RESOURCES:

1. Online course: Semiconductor Opto electronics by M R Shenoy on NPTEL.
2. Online course: Optoelectronic Materials and Devices by Monica Katiyar and Deepak Gupta on NPTEL.
3. http://nptel.iitm.ac.in/courses/
4. Course relevant website : www.rvrjcce.ac.in/moodle