ENGINEERING PHYSICS

Course Code: BECSE1C029

Course Title: Engineering Physics - I

Semester: II

Credits: 04 (03 Theory and 01 Lab)

Rationale

Applied Physics includes the study of a large number of diverse topics all related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects will behave. Concrete uses of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

Course Outlines

Contents	No of Lectures
Unit-I Wave Optics and Modern Physics: Interference: Concept of Interference of Light-Division of Amplitude and Wave front with examples- Michelson and Fabry perot Interferometers- Applications Diffraction: Fraunhofer's Class of Diffraction at Single, Double and Multiple Slits-Gratings and Applications Polarization: Production and Detection of Polarised Light—Wave Plates- Optical Activity-Laurent's. half shade polarimeter.	**10**
Unit-II Lasers: Interaction of Radiation with Matter-Spontaneous and Stimulated Emissions-Basic requirements for the construction of Lasers-Construction and working of He-Ne, CO2, Nd-YAG and Semiconductor Lasers, Holography and HNDT Optical Fibers: Principle and working of optical Fiber, structure, Classification and advantages of optical fiber, Light guiding mechanism in Optical Fibers -Numerical Aperture, Signal Degradation, Attenuation, Absorption, Inter and intra modal Dispersions. Fiber optics sensors and optical fiber communications.	**10**
Unit-III Quantum Physics: Quantum Mechanics - Introduction to quantum theory, concepts and experiments led to the discovery, wave particle duality-Davisson-Germer experiment, Heisenberg uncertainty principle, Schrodinger time independent wave equation, the free particle problem - particle in an infinite and finite potential well, quantum mechanical tunnelling – applications; Hydrogen Atom Wave Functions, Angular Momentum Operators, Identical Particles, Quantum Optics - Introduction to quantum optics and Quantum Imaging.	**10**
Unit-IV Engineering Materials: Magnetic Materials: Weiss Theory of Ferromagnetism –Properties – Domains – Curie Transition - Hard and soft magnetic materials – Ferrites – Structure,	**10**

Classification, Applications in Computers. Superconductors: Introduction to superconductivity, Meissner effect - Type-I and Type-II Superconductors – Applications in Computers. Semiconductor Materials and Devices: Types of semiconductor materials, temperature and concentration effects on band gap, Hall effect, PN junction diode, photodiode, LED, junction transistor, phototransistor. Nano-materials – Introduction to Nano-materials and Nano-technology.	
Unit-V **Computers Sensors and Sensing Technologies:** Introduction, The Human Body as a Sensor System, Passive and Active sensors, the sensor as part of a measurement system, sensor properties, Classification of Sensors – Infrared Sensor, Bio Sensors, Piezoelectric Sensors, Thermal Sensors, Quantum Sensors and Applications in Computer Science and Engineering.	**10**

List of Experiments

1. Determination of Wavelength of Sodium light using Newton's Rings.
2. Determination of Wavelength of He-Ne laser – Metal Scale.
3. Measurement of Width of a narrow slit using He- Ne Laser.
4. Determination of Specific rotation of Cane sugar by Laurent Half-shade Polarimeter.
5. Determination of capacitance by using R-C circuit.
6. Determination of resonating frequency and bandwidth by LCR circuit.
7. Measurement of half-life of radioactive source using GM Counter.
8. Diffraction grating by normal incidence method.
9. Measurement of numerical aperture of optical fiber.

Course Outcomes

At the end of the course, the student will be able to

- Apply the concepts of wave and particle nature of matter and energy for solving problems
- Understand the applications of Interference, diffraction, optical fibers, holography and lasers in engineering
- Understand the basics of semiconductors, magnetism, super conductivity, nano materials and their applications in engineering.
- Comprehend sensing technologies and their applications in computer science and engineering

Text Books

1. Ajoy K.Ghatak, "*Optics*", Tata McGraw Hill, Sixth Edition, 2017.
2. Gerd Keiser, "*Optical Fibre communications*", McGraw Hill, 4th Edition

Reference Books

1. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "*Concepts of Modern Physics*", McGraw Hill Publications, Sixth edition,2009
2. M.N. Avadhanulu, P.G. Khirsagar, "*A Text Book of Engineering Physics*", 9th edition,2011
3. John Vetelino and Aravind Reghu, "*Introduction to Sensors*", CRC Press, 1st Edition, 2010.

4. Narciso Garcia, Arthur Damask and Steven Schwarz, "*Physics for Computer Science Students*", Springer, 2012, 2nd Edition.
5. Jeff Hecht, "*Understanding Lasers An Entry-Level Guide*", Wiley Publications, Fourth edition, 2018.