SCHEME OF COURSE WORK
Subject- APPLIED PHYSICS
Academic Year-2021-2022

DEPARTMENT OF PHYSICS

Course Details:

Course Title	***Applied Physics***				
Course Code	***22BP1101***	**L**	**T P C**	**003**	**1.5**
Program:	**B.Tech.**				
Specialization:	**ECE**				
Semester	**I**				
Prerequisites	**Basics of Physics up to +2 level**				
Courses to which it is a prerequisite					

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	Teaching-Learning Strategy	Assessment Method & Schedule
1	Introduction, Interference of light-Principle of Superposition. Interference in thin films (reflected light) Newton's rings-Determination of Wavelength Applications of Interference, Problem solving	**CO1**	(1) What is interference (2) What are the conditions for the sustained interference (3) Derive the conditions for bright and dark in the case of interference in thin films (4) Derive the conditions for bright and dark in the case of Newton's rings	Lecture / Discussion & Problem solving	Assignment I (Week 6 - 7) / Quiz-I (Week -7)/ Cycle-Test I (Week 8)
2	Diffraction-Types of diffraction Fraunhofer Diffraction-Single slit Diffraction Diffraction Grating – Grating Spectrum Applications of diffraction, Numerical on diffraction	**CO1**	(1) What is diffraction (2) What is difference between diffraction and interference (3) Discuss the intensity pattern on the screen due to the diffraction of light at the single slit.	Lecture / Discussion & Problem solving	Assignment I (Week 6 - 7) / Quiz-I (Week -7)/ Cycle-Test I (Week 8)
3	Polarization-Polarizationby reflection, refraction and double refraction, Nicol's Prism Half wave and Quarter wave plate Applications of Polarization, Numerical on Polarization.	**CO1**	(1) What is polarization and double refraction? (2) How do you produce polarized light? (3) Explain Nicol's prism. (4) What are quarter and half wave plates?	Lecture / Discussion & Problem solving	Assignment I (Week 6 - 7) / Quiz-I (Week -7)/ Cycle-Test I (Week 8)
4	**Unit-2**.Introduction to Dielectrics-Electric polarization-Dielectric polarizability,Susceptibility and Dielectric constant, Types of	**CO2**	(1) Define Electric polarizbility an Electric susceptibility. (2) Establish a relation	Lecture / Discussion & Problem solving/PPT	Assignment I (Week 6 - 7) / Quiz-I (Week -7)/

	polarizations mathematical derivation for electronic polarizability Frequency dependence of polarization Lorentz(internal) field, Claussius - Mossotti equation		between susceptibility and dielectric constant Explain various kinds of polarization. (2) Derive the expression for electronic polarizability. (3) Derive internal field in a solid dielectric. (4) Derive ClaussiusMossotti equation		Cycle-Test I (Week 8)
5	Applications of Dielectrics, Numerical on Dielectrics Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment -Classification of Magnetic materials Weiss theory of ferromagnetism (qualitative)	**CO2**	(1) Define magnetic permeability and magnetic susceptibility. (2) Distinguish between various magnetic materials. (2) Explain Weiss theory of Ferromagnetism.	Lecture / Discussion & Problem solving/PPT	Assignment I (Week 6 - 7) / Quiz-I (Week -7)/ Cycle-Test I (Week 8)
6	Hysteresis-soft and hard magnetic materials-Ferrites- Magnetic device applications (transformer core and hard disc) Numerical on Magnetics **Unit-3.**Divergence and Curl of Electric and Magnetic Fields	**CO2** **CO3**	(1) Distinguish between hard and soft magnetic materials. (2) Write a short note on ferrites. (3) Explain the role of magnetic materials in working of transformer core. (4) What is meant by divergence and curl of a vector fields	Lecture / Discussion & Problem solving/PPT	Assignment I (Week 6 - 7) / Quiz-I (Week -7)/ Cycle-Test I (Week 8)
7	Numerical on divergence and curl Maxwell's Equations and their significance Electromagnetic wave propagation in free space- Poynting's Theorem Introduction to Optical Fibers-Total Internal Reflection	**CO3**	(1) What is the significance of Maxwell's 4^{th} Equation (2) What is displacement current? (3) Where do we use Maxwell's equations? (4) What information we get from the Poynting's theorem?	Lecture / Discussion & Problem solving/PPT	Assignment I (Week 6 - 7) / Quiz-I (Week -7)/ Cycle-Test I (Week 8)
8	Propagation of electromagnetic waves through optical fiber-Critical angle of propagation Acceptance angle -Numerical Aperture- derivation. Classification of fibers based on Refractive index profile, modes importance of V number, Medical Application (endoscopy)	**CO3**	(1) How do the waves propagate through different types of fibers (2) Define critical and acceptance angle (3) Derive acceptance angle and numerical aperture (4) Classify fibers based on modes and index profile (5) What is the medical	Lecture / Discussion & Problem solving/PPT	Cycle-Test I (Week 8)

			application of fibers		
9	Fiber sensors, Fiber optic Sensors Block Diagram of Fiber optic Communication and its advantages Numerical on Optical fiber **Unit-4.** Classification of solids based on energy bands	**CO3** **CO4**	(1) What are the advantages of fiber optic communication system (2) Explain block diagram of fiber optic communication. (3) What is the importance of fiber optic sensor (4) Write the applications of fibers.	Lecture / Discussion & Problem solving/PPT	Assignment II (Week-14-15) Quiz -II (Week -15) Cycle-Test II (Week 16) /
10	Intrinsic semiconductors:Electrical conductivity Derivation of density of charge carriers (electron) Fermi energy, Extrinsic semiconductors - n-type &p-type and density of charge carriers (Qualitative) Dependence of Fermi energy on temperature and carrier concentration	**CO4**	(1) What is a semiconductor? (2) Name an intrinsic semiconductor. (3) What is the expression for electrical conductivity? (4) Write down an expression for electron and hole densities of Si. (5) Write about Fermi level (6) What are the major differences between n- and p-type semiconductors?	Lecture / Discussion & Problem solving	Assignment II (Week-14-15) Quiz -II (Week -15) Cycle-Test II (Week 16) /
11	Hall effect- Hall coefficient Applications of Hall effect - Applications of Semiconductors **Unit-5.**Intorduction to Superconductors, Properties: Critical temperature Critical parameters of Superconductors: Transition temperature, Critical current density and critical magnetic field	**CO4** **CO5**	(1) What is Hall effect? What is its significance? (2) What are superconductors (3) What is transition temperature (4) What are the critical parameters	Lecture / Discussion & Problem solving	Assignment II (Week-14-15) Quiz -II (Week -15) Cycle-Test II (Week 16) /
12	Meissner effect Type-I and type-II Superconductors BCS Theory Josephson effect (AC & DC)	**CO5**	(1) Define Meissner Effect and Critical Temperature? (2) What are Type- I and II superconducting material? (3) Explain BCS theory (4) Explain Josephson effect	Lecture / Discussion & Problem solving	Assignment II (Week-14-15) Quiz -II (Week -15) Cycle-Test II (Week 16)
13	High T_C Superconductors, Applications of superconductor-transformersand electrical machines, maglev trains, SQUID. Numerical on Superconductors	**CO5**	(1) What are high T_c superconductors. (2) What is a SQUID (3) Explain about maglev trains		Assignment II (Week-14-15) Quiz -II (Week -15) Cycle-Test II (Week 16)

14	Basics of Nano Materials- Top and Bottom approaches, Preparation (Sol-Gel and Ball Milling)	**CO5**	(1) What are Nano materials? Why do they exhibit different properties (2) Discuss top and bottom approaches (3) Explain sol-gel technique (4) Write about ball milling		Assignment II (Week-14-15) Quiz -II (Week -15) Cycle-Test II (Week 16)
15	Carbon Nano tubes, properties, types, applications Applications of nanomaterials (better insulating materials, elimination of pollutants, high energy density battery, nanomachines and nano devices	**CO5**	(1) What are CNT? How are they produced? (2) Discuss some applications of Nano- Materials		Assignment II (Week-14-15) Quiz -II (Week -15) Cycle-Test II (Week 16)
16	Revision Cycle Test-II				Cycle-Test II (Week 16)

Assessment Methods:	Assignments/Quiz exam/ Mid Exam / End Exam

CO-PO mapping (2021-22)

PROGRAM OUTCOMES: At the end of the semester student is able to

PO1: Graduates will be able to apply the knowledge of mathematics, science, engineering fundamentals and principles of Computer Science & Engineering to solve complex problems in different domains.

PO2: Graduates can identify, formulate, study contemporary domain literature and analyze real life problems and make effective conclusions using the basic principles of science and engineering.

PO3: Graduates will be in a position to design solutions for Engineering problems requiring in depth knowledge of Computer Science and design system components and processes as per standards with emphasis on privacy, security, public health and safety.

PO4: Graduates will be able to conduct experiments, perform analysis and interpret data as per the prevailing research methods and to provide valid conclusions.

PO5: Graduates will be able to select and apply appropriate techniques and use modern software design and development tools. They will be able to predict and model complex engineering activities with the awareness of the practical limitations.

PO6: Graduates will be able to carry out their professional practice in Computer Science & Engineering by appropriately considering and weighing the issues related to society and culture and the consequent responsibilities.

PO7: Graduates would understand the impact of the professional engineering solutions on environmental safety and legal issues
PO8: Graduates will transform into responsible citizens by adhering to professional ethics. PO8: Graduates will transform into responsible citizens by adhering to professional ethics.
PO9: Graduates will be able to function effectively in a large team of multidisciplinary streams consisting of persons of diverse cultures without forgetting the significance of each individual's contribution.
PO10: Graduates will be able to communicate effectively about complex engineering activities with the engineering community as well as the general society, and will be able to prepare reports.
PO11: Graduates will be able to demonstrate knowledge and understanding of the engineering and management principles and apply the same while managing projects in multidisciplinary environments.
PO12: Graduates will engage themselves in self and life-long learning in the context of rapid technological changes happening in Computer Science and other domains.

COURSE OUTCOMES

The student shall be able to

CO1: realize the principles of optics in designing optical devices
CO2: convert the knowledge of basic principles of dielectrics magnetism to design electrical and storage devices
CO3: apply electromagnetic wave propagation in different guided media
CO4: calculate conductivity of semiconductors
CO5: interpret the difference between normal conductor and superconductor, demonstrate the application of nanomaterials

Course Outcome versus **Program Outcomes for CSE:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	-	-	-	-	-	-	-	**2**	1	-
CO 2	**3**	**3**	-	-	-	-	-	-	-	**2**	**1**	-
CO 3	**3**	**3**	-	-	-	-	-	-	-	**2**	1	-
CO 4	3	3	-	-	-	-	-	-	-	**2**	1	-
CO 5	3	3	-	-	-	-	-	-	-	2	1	1

3 – Substantial (High), 2 – Moderate (Medium), 1- Slight (Low) '-' – No correlation