ENGINEERING PHYSICS

Course Code : 18PH1ICPHY/18PH2ICPHY **Credits : 4**

L:P:T:S : 3:0:2:0 **CIE Marks : 50**

Exam Hours : 3 **SEE Marks : 50**

Course Objectives:

1. To distinguish the principles of Classical Physics and Modern Physics.
2. To analyze different materials for various scientific applications.
3. To apply the acquired knowledge in Physics and Nanoscience for future applications.

Course Outcomes: At the end of the course, students will be able to:

CO1	Distinguish the principles of Classical Physics and Modern Physics.
CO2	Analyze different materials for various scientific applications.
CO3	Apply the acquired knowledge in Physics and Nanoscience for future applications.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-

Unit	Course content	Hours	COs
1	**Modern Physics:** Black body radiation spectrum, Weins law, Rayleigh Jeans law, Planck's Law, Derivation of Weins law and Rayleigh Jeans law from Planck's law, Wave Particle dualism, de-Broglie hypothesis, Compton effect and its Physical significance. Matter waves and their characteristic properties. Problems. **Quantum Mechanics:** Heisenberg's uncertainty principle and its physical significance and proof of non-existence of electrons in the nucleus. Wave function, properties and physical significance of wave function, Probability density and Normalization of wave function. Setting up of one dimensional time independent Schrodinger wave equation. Eigen values and Eigen functions. Application of Schrodinger wave equation: Energy Eigen values for a particle in a potential well of infinite depth. Problems.	**10 (8L + 2T)**	**CO1**
2	**LASERS:** Interaction of radiation with matter, Einstein's coefficients; expression for energy density (derivation). Requisites of a Laser system. Conditions for laser action. Principle, construction and working of CO_2 Laser and explanation based on energy level diagram. Construction and working of a semiconductor Laser. Industrial applications of Laser: Laser welding, cutting and drilling. Problems. **Optical Fibers:** Propagation mechanism in optical fibers. Angle of acceptance and Numerical aperture (derivation), Types of optical fibers and modes of propagation, Absorption coefficient (qualitative), Application of optical fiber: Block diagram and explanation of point to point communication. 3 advantages of optical fibre communication, Problems.	**10 (8L + 2T)**	**CO1 CO2**
3	**Mechanics:** Stress and strain, Hook's law and stress-strain diagram, Young's modulus(Y) Bulk modulus (K), Rigidity modulus (n),Poisson Ration(σ),Relation between elastic constants, Relation between shearing strain,Enlongated strain and compression strain, Relation between Y,n and σ, Relation between K, Y and σ, Relation between K, n and Y Relation between K, n and σ, limiting values of σ, work done per unit volume in elongation strain. Bending of beams, Neutral surface and neutral axis, bending moment of a beam: rectangular cross section, Problems. **Oscillation and waves:** Terminologies: Amplitude, displacement, Frequency, Angular frequency, Period, Simple Harmonic Motion, Relation between γ and T,ω and T, Equation of SHM, Restoring force and force constant, Natural frequency of free vibration (Derivation),analytical treatment of free vibrations, Problems.	**10 (8L + 2T)**	**CO1**

4	**Electromagnetic Theory:** Charge density, Linear, surface and volume, Divergence, Curl, Gradient, Gauss divergence Theorem, Stoke's theorem, Electric field and Potential, Superposition principle, Poisson's and Laplace equation, Gauss theorem differential form, ampere's circuital Law, Scalar and Vector potentials, Continuity equation (derivation), Maxwell's equations differential forms, derivation of first equation, second, third and fourth equation. Maxwell's equation in integral form, significance of Maxwell's equation. Maxwell's equation in isotropic dielectric medium (derivation), Problems. **Semiconductors:** Conductivity of semi conducting materials, Concentration of electrons and holes in intrinsic semiconductors (derivations). Fermi level in an intrinsic Semiconductor, Proof of $E_F = Eg/2$, Hall effect, Hall coefficient derivation, Problems.	**10 (8L + 2T)**	**CO1 CO2**
5	**Thin films and devices:** Thin films, Stages of thin film growth: nucleation, agglomeration and continuous film with diagrams. Thin film deposition process using vacuum evaporation. Schematic of thin film unit. **Nanoscience:** Introduction to Nanoscience, Mesoscopic state, Density of states in 0D, 1D, 2D and 3D structures. Synthesis: Top–down and Bottom–up approach examples: Ball Milling and Sol–Gel methods explanations with diagrams. Carbon nano tubes: Types, properties and applications.	**10 (8L + 2T)**	**CO1 CO3**

Self Study Component:

NOTE: 1. Questions for CIE and SEE not to be set from Self Study Component.

2. Assignment Questions should be only from Self Study Component.

UNIT 1: Self study component: Davisson Germer Experiment, Group velocity and phase velocity.

UNIT 2: Self study component: Other applications of LASER: atmospheric pollutant analysis, Types of attenuation.

UNIT 3: Self study component: Bending moment of a beam of circular cross section. Analytical treatment or general solution of damped vibrations. Three cases for $b^2 > \omega^2$,$b^2 = \omega^2$ and $b^2 < \omega^2$. Analytical treatment or general solution of forced vibrations. Resonance, sharpness of resonance, applications of resonance: acoustic cavity, LCR and LASER.

UNIT 4: Self study component: Electrostatic boundary conditions, Maxwell's displacement current, Electromagnetic energy density.

UNIT 5: Self study component: Synthesis of Carbon nano tubes, Applications of thin films: solar cells and LEDs.

Text books:

1. Hitendra K Malik and A K Singh, Engineering Physics, Tata McGraw Hill, India.
2. B V Narayana Rao, Engineering Physics, Wiley Eastern Ltd., India

Reference books:

1. S P Basavaraju, Engineering Physics, Subhas Publications, India.
2. K.L. Chopra, Thin film Phenomena, Mc Graw Hill, New York.

Assessment Pattern

CIE –Continuous Internal Evaluation Theory

Bloom's Category	**Tests**	**Assignments**	***AAT1**	**AAT2**
Marks	**30**	**10**	**05**	**05**
Remember	10			01
Understand	10	05	02	02
Apply	10	05	03	02

***AAT** – Alternate Assessment Tool

SEE –Semester End Examination (Theory)

Bloom's Category	**Marks**
Marks	**50**
Remember	15
Understand	15
Apply	10
Analyze	10

***AAT 1– Alternate Assessment Tool 1: Quiz**

AAT 2 - **Alternate Assessment Tool 2:** Project based learning/ E-course certification/Model making/Group discussion/Case study/ Seminar/Paper presentation/projects/Review on invited talks/Simulations/MOOC.

ENGINEERING PHYSICS LAB

Course Code : 18PH1ILPHY/18PH2ILPHY **Credits : 1**

L:P:I:S : 0:2:0:0 **CIE Marks : 50**

Exam Hours : 3 **SEE Marks : 50**

Course objectives:

1. To acquire hands on experience on optics, electrical, electronics and Modern Physics experiments.
2. To utilize basic Physics concepts for practical applications such as working components like capacitors, diodes and transistors.
3. To develop the ability to use various measuring instruments like ammeters, voltmeters and signal generators.

Course Outcomes: After completion of the course, the graduates will be able to

CO1	Acquire hands on experience on optics, electrical, electronics and Modern Physics experiments.
CO2	Utilize basic Physics concepts for practical applications such as working components like capacitors, diodes and transistors.
CO3	Develop the ability to use various measuring instruments like ammeters, voltmeters and signal generators.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-

No	Course content	Hours	COs
1	**List of Experiments:** 1. Determination of Planck's constant using LEDs. 2. Newton's Rings (Determination of radius of curvature of plano convex lens).	**4**	**CO1** **CO2**
2	**List of Experiments:** 3. Characteristics of a Transistor (Study of Input and Output characteristics and calculation of input resistance, output resistance and amplification factor). 4. Determination of resistivity of a semiconductor using a four probe technique. 5. Photo Diode Characteristics (Study of I–V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage and intensity). 6. I–V Characteristics of a Zener Diode. (Determination of knee voltage and Zener voltage). 7. Uniform bending.	**10**	**CO2** **CO3**
3	**List of Experiments:** 8. Diffraction grating (Measurement of wavelength of laser source using diffraction grating).	**2**	**CO1**
4	**List of Experiments:** 9. Dielectric constant (Measurement of dielectric constant using charging and discharging of a capacitor). 10. Series and parallel LCR Circuits (Determination of resonant frequency and quality factor).	**4**	**CO2** **CO3**
5	**List of Experiments:** 11. Determination of Fermi energy. (Measurement of Fermi energy in copper).	**2**	**CO1**

*Note: Ten experiments compulsory (Expt. Nos. 1-10).

Reference books

1. **Lab Manual**, Department of Physics, DSCE.
2. **Engineering Physics**, N.H. Ayachit and P.K. Mittal, IK International Publishing house Pvt. Ltd.

CIE –Continuous Internal Evaluation Lab (50 Marks)

Bloom's Category	**Performance (Continuous evaluation)**	**CIE (Internal)**
Marks	**25**	**25**
Remember	05	05
Understand	05	05
Apply	05	05
Analyze	05	05
Evaluate	05	05
Create		

SEE –Semester End Examination Lab (50 Marks)

Bloom's Category	**Marks**
Marks	**50**
Remember	15
Understand	15
Apply	10
Analyze	10
Evaluate	
Create	

Scheme of evaluation

<table>
<tr><th colspan="6">CIE in Theory (50 marks)</th></tr>
<tr><td rowspan="2"></td><td rowspan="2">Internal Assessment Test</td><td colspan="4">Marks</td></tr>
<tr><td>Marks</td><td>Average Marks</td><td>Total final CIE marks</td><td>Final CIE Marks</td></tr>
<tr><td>CIE-1</td><td>Test-1</td><td>50</td><td rowspan="3">50+50+50/3 = 150/3 = 50 marks reduced to 30 max. marks</td><td rowspan="3">30 + 10 (1 assignment) + 10 marks for AAT1 + AAT2 (5 marks each) = 50 marks maximum</td><td rowspan="3">50 marks Max.</td></tr>
<tr><td>CIE-2</td><td>Test-2</td><td>50</td></tr>
<tr><td>CIE-3
All 3 tests are compulsory.</td><td>Test-3</td><td>50</td></tr>
<tr><th colspan="6">CIE in Laboratory (50 marks)</th></tr>
<tr><td colspan="4">Write up for 2 experiments</td><td>05</td><td rowspan="6">50 marks Max.</td></tr>
<tr><td colspan="4">Viva</td><td>03</td></tr>
<tr><td colspan="4">Performance of one experiment
(For SEE, perform two experiments compulsorily)</td><td>12</td></tr>
<tr><td colspan="4">Calculation and results</td><td>05</td></tr>
<tr><td colspan="4">Record and viva by continuous evaluation</td><td>25</td></tr>
<tr><td colspan="4">Total</td><td>50</td></tr>
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