SILVER OAK UNIVERSITY

Silver Oak Institute of Science

Bachelor of Science Physics

Course Name: Fundamental Physics-II

Course Code: 2050253104

Semester: 2nd

Prerequisite:

1. Solid understanding of calculus, electromagnetism, and basic linear algebra concepts.

Course Objectives:

1. Understand optical phenomena such as Fermat's principle, interference in thin films, and the application of matrices in optics for analyzing systems involving thin lenses.
2. Explore wave optics concepts including Fresnel and Fraunhofer diffraction, resolving power of optical instruments, and comparisons between prism and grating spectra.
3. Grasp fundamentals of electrostatics, including Gauss's law, Laplace equation, and solving problems related to electric fields and potentials, alongside analyzing DC and AC circuits.

Teaching Scheme:

Teaching Scheme				
L	T	P	Contact Hours	Credit
2	0	4	6	4

Contents:

Unit	Topics	Teaching Hours	% Weightage
1	**Optics** Fermat's principle and its applications: Fermat's principle of least time, laws at reflection, laws of refraction. Interference in thin films: Thin film, Plane parallel film, Interference due to transmitted light, Haidinger fringes, variable thickness (wedge-shaped) film, Newton's ring. Matrices: Types of matrices, Inversion of a Matrix, Rank of a Matrix, Diagonalization (3X3 only). Matrix Method in Optics: Introduction, The matrix method, Unit planes, Nodal point planes, A system of two thin lenses. **Wave optics** A. Diffraction of Light (Fresnel class): Fresnel's half period zones, zone plate, difference between interference & diffraction, B. Fraunhofer class: Fraunhofer diffraction at two slits, diffraction at N slits, Plane diffraction grating, Dispersive power of grating, Grating at oblique incidence. C. Resolving power of optical Instrument: Resolving power, Rayleigh's criterion of resolution, resolving power of telescope, relation between magnifying power & the resolving power of telescope, Resolving power of a plane diffraction grating, difference between resolving power & dispersive power of grating, comparison of prism & grating spectra.	14	50

2	**Electrostatic** Differential form of Gauss law, Poison and Laplace Equation, Field between Two concentric spheres which have equal and opposite charges. A useful Theorem in electrostatics, electrostatic potential, Determination of potential Due to uniformly charged spherical shell. Determination of potential and field by a ring of charges at a point on the axis of the ring. Determination of field of a semicircular uniform distribution of line charge of linear charge density. Determination of a potential and field on the axis and rim of a uniformly charged disc. Electrostatic energy of a continuous distribution of charges, field of a dipole in plane polar coordinate, spherical polar coordinate, Cartesian coordinate System, electric dipole in a non-uniform electric field, Mutual potential Energy of two dipoles. **Electric & Electronic Circuits** DC Circuits: RL circuits (Growth and decay of current), RC circuit (Charging and discharging of capacitor) L-C-R circuit in series with DC source. AC Bridges: Condition for bridge balance, Maxwell bridge, Hay bridge, Schering bridge, Wein bridge	14	50

Course Outcomes:

Sr. No.	CO Statement	Unit
CO-1	Master principles in optics, including Fermat's principle, laws of reflection and refraction, interference in thin films, and the matrix method in optics.	1
CO-2	Explore wave optics phenomena, such as diffraction (Fresnel and Fraunhofer classes), resolving power of optical instruments, and the properties of diffraction gratings.	1
CO-3	Analyze electric and electronic circuits, including DC circuits with RL and RC components, AC bridges, and resonance phenomena.	2
CO-4	Investigate specific experiments and constants related to physics, such as Stefan's constant, LDR characteristics, radioactive decay, and electrical resonance using various circuit configurations.	2

Teaching & Learning Methodology:

1. Conceptual Learning
2. Cooperative based Learning
3. Competency based Learning
4. Problem - based Learning

List of Experiments: **Total Hours: 56**

Sr. No.	Practical Name
1	Stefan Constant
2	LDR Characteristics
3	Projection Method
4	'g' by Bar pendulum
5	Radioactive decay
6	Parallel Resonance
7	Owen's Bridge
8	C-programming III
9	C-programming IV
10	Experiment Simulations

Books Recommended: -

1. R. S. Sedha, A text book of electronic circuits S. Chand
2. Dennis Roddy and John Coolen, Electronic Communications (Fourth edition), Prentice Hall
3. of India.
4. Malvino and Leach, Digital Principles and Applications, McGraw-Hill
5. Moriss Mano, Digital Design, PHI
6. Floyd, Digital Fundamentals, Pearson
7. M. N. Avadhanulu, "An Introduction to LASERS - Theory and Applications", S. Chand & Company Ltd.
8. B. B. Laud, Electromagnetics, Wiley Eastern Limited
9. Ajay Ghatak, Optics, Tata McGraw Hill Ltd.

List of Open-Source Software/learning website:

1. http://silveroakuni.ac.in/video-lecture

CO-PO-PSO Matrix:

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO-1	2	3	2	2	2	1	2	1	1	1	1	2	2
CO-2	3	3	2	2	2	2	3	1	1	1	1	2	2
CO-3	2	3	2	2	2	2	2	1	1	1	1	2	2
CO-4	2	3	2	2	2	2	2	1	1	1	1	2	2