M.C.E. Society's

Abeda Inamdar Senior College of Arts, Science & Commerce, Pune

(Autonomous)

Department of Physics

Syllabus

as per

National Education Policy-2020

For

T.Y.B.Sc. (SEM V)

To be implemented from Academic Year:
(2025-2026)

(Under the faculty of Science and Technology)

Department of Physics

Structure of Courses: Physics as Minor

As per NEP (2020)

Credit Distribution and Titles of the Courses

Semester	Minor		VSC(P)
	Theory	Practical	
No of → Credits	2	2	2
V	**Optics (23SBPH51MN)**	**Physics Practical-III (23SBPH52MN)**	**Introduction to Fiber Optics & Laser (23SBPH51VS)**

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Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to Savitribai Phule Pune University

NAAC accredited 'A' Grade

Course Offered as	**Minor**
Course/ Paper Title	**Optics**
Course Code	**23SBPH51MN**
Semester	**V**
No. of Credits	**2**
No of Hours	**30**

Sr. No.	Learning Outcomes
1	Acquire the basic concept of wave optics.
2	Explain why a light beam spread out after passing through an aperture
3	Summarize the polarization characteristics of electromagnetic wave
4	Understand the operation of many modern optical devices that utilize wave optics
5	Understand optical phenomenon such polarization, diffraction and interference in terms of the wave model
6	Analyze simple examples of interference and diffraction.

1. Geometrical Optics (6L)

1.1. Introduction to lenses and sign conventions.
1.2. Thin lenses: lens equation for convex lens
1.3. Lens maker equation
1.4. Concept of magnification, deviation and power of thin lens
1.5. Equivalent focal length of two thin lenses
1.6. Problems

2. Lens Aberrations (8L)

2.1. Introduction
2.2. Types of aberration: Monochromatic and chromatic
2.3. Types of monochromatic aberrations and their reductions
2.4. Types of chromatic aberrations
2.5. Achromatism: lenses in contact and separated by finite distance
2.6. Problems

3. Optical Instruments (6L)

3.1. Introduction
3.2. Simple Microscope
3.3. Compound Microscope
3.4. Ramsden's eye piece
3.5. Huygens eye piece
3.6. Problems

4. Interference and Diffraction (6L)

4.1. Introduction
4.2. Phase change on reflection. (Stokes treatment)

4.3. Interference due to wedge shaped thin film
4.4. Newton's ring
4.5. Diffraction types: Fresnel's diffraction and Fraunhofer's diffraction
4.6. Plane diffraction grating without derivation, Rayleigh criterion for resolution
4.7. Problems

5. Polarization (4L)
5.1. Introduction
5.2. Brewster's law
5.3. Law of Malus
5.4. Polarization by double refraction.
5.5. Problem

Reference Books:

1. Optics by A. R. Ganesan, IVth edition, Pearson Education, E. Hetch.
2. A Textbook of Optics by N Subhramanyam, Brijlal, M. N. Avadhanulu, S. Chand Publication
3. Physical Optics by A.K. Ghatak, McMillan, New Delhi
4. Fundamental of Optics by F. A.Jenkins, H. E.White Mc Graw-Hilll International edition
5. Principles of Optics, by D. S. Mathur, Gopal Press, Kanpur.

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Course Offered as	**Physics Practical - III**
Course Code	**23SBPH52MN**
Semester	**V**
No. of Credits	**2**
No of Hours	**60**

Sr. No.	Learning Outcomes
1	Use various instruments and equipment.

2	Design experiments to test a hypothesis and/or determine the value of an unknown quantity.
3	Investigate the theoretical background of an experiment.
4	Setup experimental equipment to implement an experimental approach
5	Analyze the data, plot appropriate graphs and reach conclusions from data analysis.
6	Work in a group to plan, implement and report on a project/experiment.
7	Keep a well-maintained and instructive laboratory logbook.

Total Experiments to be performed by a student must include at least six experiments from Section I and two experiments from Section II so as to complete:
(A) **10 Experiments OR**
(B) **8 Experiments + Two Activities**

Sr. No.	Section I: Electronics (21SBPH233)
1	Circuit Theorems (Thevenin's, Norton's and Maximum Power Transfer Theorems)
2	Study of Encoder / Decoder
3	Single Stage Transistor Amplifier
4	Study of RS/J-K Flip Flop
5	Zener diode as a Regulator (Line and Load Regulation)
6	Op-amp as inverting and non-inverting amplifier
7	Study of Wein Bridge / Phase Shift Oscillator using IC741
8	Op-amp as an adder and subtractor
9	Study of Half Adder/ Full Adder
10	Study of Mux / Demux

Sr. No.	Section II: Use of Computer

1	Plotting of various trigonometric functions: sin(x), cos(x), tan(x), ex, e-x, log(x), ln(x), xn etc. using spread sheet/any graphic software viz. Microsoft Excel or Origin.
2	Plotting of conic sections: circle, ellipse, parabola, hyperbola using spreadsheet /any graphic software viz. Microsoft Excel or Origin.
3	Finding Inverse, determinant of matrix, solution of linear equations using Microsoft Excel or Origin software.

Sr. No.	**Additional Activities (any two)**
1	Plotting of any two graphs using spreadsheets (of data obtained from various experiments performed by the student)
2	Any two computer aided demonstrations (Using computer simulations or animations)
3	Demonstrations-Any two demonstrations
4	Study tour with report
5	Mini project

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Course Offered as	**VSC**
Course/ Paper Title	**Introduction to Fiber Optics & Laser**
Course Code	**23SBPH51VS**
Semester	**V**
No. of Credits	**2**
No of Hours	**60**

Sr. No.	**Learning Outcomes**

1	To study the basic concepts of Optical Fiber and their Properties.
2	To provide the adequate knowledge about the Industrial Applications of Optic Fibers.
3	Introduction to Laser Fundamentals.
4	Explore the Industrial Application of Lasers.
5	Study Holography and Medical Applications of Lasers.

Sr. No.	**Experiments**
1	To study Characteristic of Laser Lights
2	To determine the diameter of a circular aperture by studying Fraunhofer diffraction pattern
3	Measurement of wavelength of laser beam by forming a diffraction pattern due to a thin wire/straight edge
4	To measure the wavelength of laser with a Vernier Caliper
5	To study total internal reflection by Laser.
6	To determine the wavelength of the given laser source using diffraction grating
7	To determine the number of ruling per metre in a diffraction grating using laser source
8	To measure the focal length of a given convex lens using grating
9	To explore Polarization with Lens
10	To demonstrate diffraction of light using optical fibre and laser
11	To study Interference of light using bi-prism and laser
12	To demonstrate the spatial coherence of the laser beam
13	To demonstrate the temporal coherence of the laser beam
14	To study the interferences fringes using glass plate of constant thickness
15	To study the formation of different interference fringes using flat surface/wedge plate/prism/lens
16	To study temperature and refractive index experiment
17	To study polarization of light using He-Ne laser
18	To produce different form of polarization

19	Measurement of the diameter of Human Hair
20	Study on Spectral Response of a Photo Diode used in a Fibre Optic Link
21	To study the Resolving Power of a Pane Diffraction Grating using Laser Light
22	To study the Resolving Power of a Prism using Laser Light

A student is expected to perform 15 experiments.

References Book :

1. G. Keiser,' Optical Fibre Communication ', McGraw Hill , 1995 .

2. Monte Ross, ' Laser Application', McGraw Hill, 1968.

3.John and Harry , " Industrial lasers and their application", McGraw Hill, 2002.

4 .G. Keiser , " Optical Fibre Communication " , McGraw- Hill, 3rd Edition , 2000.
http://nptel.ac.in/courses/117101002/