FOUR YEARS UNDERGRADUATE PROGRAM (2024-28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION

Program: Bachelor in Science (Diploma/ Degree/ Honors)		Semester: IV	Session: 2024-25
1	Course Code	PHSC-04T	
2	Course Title	Waves and Optics	
3	Course Type	Discipline Specific Course	
4	Pre-requisite (if any)	As per Program	
5	Course Learning Outcomes (CLO)	After going through the course, the student should be able to: ➤ Analyze the behavior of waves propagating through different mediums and predict how factors such as density, elasticity, and temperature affect wave propagation. ➤ Demonstrate an understanding of interference phenomena, including constructive and destructive interference, and apply this knowledge to solve problems involving wave superposition. ➤ Explain the concept of diffraction and its implications for wave propagation, including how waves bend around obstacles and spread out after passing through narrow openings. ➤ Describe the polarization of waves, including linear, circular, and elliptical polarization, and apply polarization concepts to analyze and manipulate electromagnetic waves.	
6	Credit Value	03 Credits	1 Credit= 15 Hours - Learning &Observation
7	Total Marks	Maximum Marks: 100	Minimum Pass Marks: 40

PART – B: CONTENT OF THE COURSE

TotalNo.of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	**Contribution of C. V. Raman:** Brief biography of C. V. Raman with his contribution in field of acoustics and optics. **Waves in Medium:** Speed of transverse waves on uniform string, Speed of longitudinal waves in a fluid, Energy density and energy transmission in waves. Group velocity and phase velocity and relationship between them. **Reflection, refraction and diffraction of sound:** Acoustic impedance of a medium, percentage reflection & refraction at a boundary, diffraction of sound, principle of a sonar system.	11
II	**Interference:** Principle of superposition, Division of wavefront and division of amplitude, Young's Double Slit experiment. Fresnel's Biprism, Phase change on reflection, Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings, measurement of wavelength and refractive index. Michelson's Interferometer, Formation of fringes, Determination of wavelength, Wavelength difference.	12
III	**Diffraction:** Fresnel Diffraction; Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. Fraunhofer diffraction; Single slit, Double slit. Multiple slits & Plane Diffraction Grating, Resolving Power of Grating.	11
IV	**Polarization:** Polarized light and its mathematical representation, Electromagnetic theory of double refraction, Nicol Prism, Double image prism, Polaroid, Phase retardation plates, Circular and elliptical polarization. Polarization by double refraction and Huygens's theory, Rotation of plane of polarization, Biquartz polarimeter.	11
Keywords:	*Longitudinal and transverse waves, principle of superposition, Haidinger Fringes, Fresnel Diffraction, Fraunhofer diffraction, Polarization*	

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PART – C: LEARNING RESOURCES

Text Book, Reference Book and Others

Text Books Recommended-

1. Berkely Physics Course: Vol.-III, 'Waves and Oscillations'
2. Principles of Optics, B.K. Mathur, 1995, Gopal Printing
3. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, S. Chand Publication
4. Physical Optics, A.K. Ghatak
5. Unified Physics- II, R. P. Goyal, Shivlal Agrawal Publications
6. Unified Physics- II, Navbodh Publications

Reference Books Recommended

1. Concepts of Physics by H.C. Verma
2. Fundamentals of Physics by R. Shankar
3. Optics by Ajoy

Online Resources (e-books/ learning portals/ other e-resources)

1. Wave an introduction https://youtu.be/SuQE7eUEriU
2. Interference https://youtu.be/hvpYKPyT-vc
3. Diffraction https://youtu.be/3RZZQvEVrEA
4. Polarization https://youtu.be/nELYaf_N528
5. Waves and Oscillations- https://archive.nptel.ac.in/courses/115/106/115106119/
6. Optics- https://archive.nptel.ac.in/courses/115/107/115107131/

PART – D: ASSESSMENT AND EVALUATION

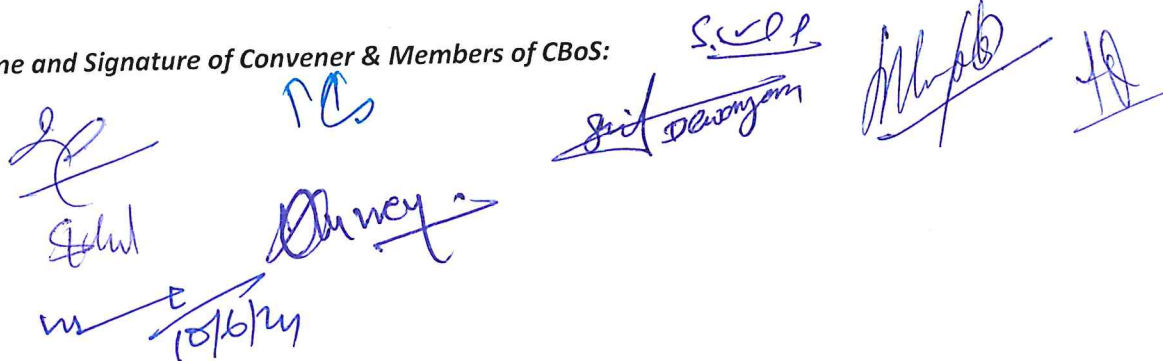**Suggested Continuous Evaluation Methods:**

Maximum Marks: 100Marks

Continuous Internal Assessment (CIA):30 Marks

End Semester Examination (ESE): 70 Marks

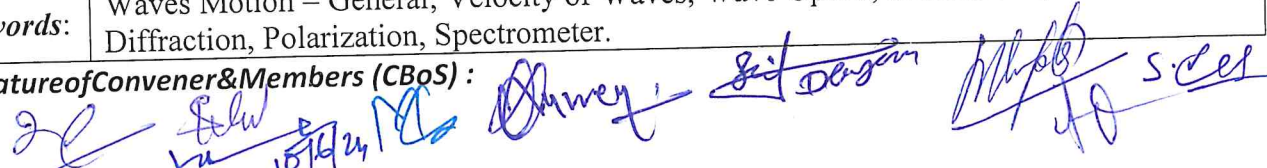| Continuous Internal Assessment (CIA): (By course teacher)	Internal Test/ Quiz (2): 20+20 Assignment/ Seminar (1): 10 Total Marks: 30	Better marks out of the two Test / Quiz + marks obtained in Assignment shall be considered against 30 Marks
End Semester Examination (ESE):	Two section – A & B Section A: **Q1.** Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 =20Marks** Section B: Descriptive answer type,**1out of 2** from each unit-**4x10=40 Marks**	

Name and Signature of Convener & Members of CBoS:

10/6/24

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DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART – A: INTRODUCTION

	Program:Bachelor in Science (Diploma/ Degree/ Honors)	Semester: IV	Session: 2024-25
1	Course Code		PHSC- 04P
2	Course Title		Waves and Optics
3	Course Type		Discipline Specific Course
4	Pre-requisite (if any)		As per program
5	Course Learning Outcomes (CLO)		After the completion of the course, Students are expected to understand laws and principles behind various optical phenomena, specially related to wave nature of light. The students will also be able to - Gain proficiency in operating laboratory equipment such as light source i.e. mercury, sodium and Laser, spectrometers, polarimeter, demonstrating competence in setting up experiments, calibrating instruments, and collecting accurate data. - Develop a deep understanding of optical principles such as refraction, diffraction, dispersion, and interference, as well as their applications in various scientific disciplines - Analyze recorded data and formulate it to get desired results.
6	Credit Value	01 Credit	1 Credit = 30 HoursLaboratory Work
7	Total Marks	Maximum Marks: 50	Minimum Pass Marks: 20

PART – B: CONTENT OF THE COURSE

TotalNo.of learning-Training/performance Periods -30 Periods (30 Hours)

Sr. No.	Objects (At least 10 of the following or related Experiments)	No. of Period
1	To determine the Frequency of AC mains with the help of Sonometer.	30
2	Determination of angle of prism using spectrometer.	
3	To determine the Refractive Index of the Material of a given Prism using Spectrometer.	
4	To determine Dispersive Power of the Material of a given Prism using Spectrometer	
5	To determine the value of Cauchy Constants of a material of a prism.	
6	To determine the Resolving Power of a Prism.	
7	To determine wavelength of sodium light using Fresnel Biprism.	
8	To determine wavelength of sodium light using Newton's Rings Method.	
9	To determine the wavelength of Laser light using Single Slit Diffraction.	
10	To determine wavelength of Sodium light by laser diffraction.	
11	To determine wavelength of spectrum of Mercury light using plane diffraction Grating and Spectrometer.	
12	To determine the Resolving Power of a Plane Diffraction Grating.	
13	To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.	
14	Determination of resolving power telescope.	
15	Study of polarization of sugar solution using polarimeter.	
Keywords:	Waves Motion – General, Velocity of Waves, Wave Optics, Interference, Interferometer, Diffraction, Polarization, Spectrometer.	

SignatureofConvener&Members (CBoS) :

PART – C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
4. A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.
5. Practical Physics B.Sc II : R P Goyal, Shivlal Publications

ReferenceBooks Recommended

1. Practical Physics by S.L. Gupta and V. Kumar
2. Advanced Practical Physics for Students by B.L. Worsnop and H.T. Flint
3. B.Sc. Practical Physics by C.L. Arora
4. Experimental Physics: Modern Methods by R.A. Dunlap

Online Resources (e-books/ learning portals/ other e-resources)

1. Link for e-Books for Physics:Physics Practical: https://egyankosh.ac.in/handle/123456789/82374; https://www.lightandmatter.com/lab_223.pdf;
2. Virtual Lab : https://vlab.amrita.edu/index.php?sub=1&brch=281
3. https://www.compadre.org/books/?ID=70&FID=63273
4. https://www.edutech.com/category/higher-education/engineering-labs/virtual-labs-1
5. https://phet.colorado.edu/en/simulations/wave-interference
6. https://egyankosh.ac.in/handle/123456789/82374

PART – D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 Marks
Continuous Internal Assessment(CIA):15 Marks
EndSemester Exam(ESE):35 Marks

Continuous InternalAssessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2): **10 & 10** Assignment/Seminar +Attendance –**05** Total Marks - 15	Better marks out of the two Test / Quiz **+Marks** obtained in Assignment shall be considered against **15** Marks
End Semester Exam (ESE):	Laboratory Performance: On spot Assessment Performed the Task based on lab. work - 20 Marks Spotting based on tools & technology (written) – 10 Marks Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:

10/6/24