C. U. SHAH UNIVERSITY, WADHWAN CITY.

Faculty of: **Science & Life Sciences**
Course: **Bachelor of Science (Physics)**
Semester**: II**
Subject Code**: PHM204-1C**
Subject Name: **Waves and Optics**

Sr. No	Category	Subject Code	Subject Name	Teaching hours/ Week			Credit hours	Credit Points	Evaluation Scheme/ Semester								
									Theory				Tutorial / Practical				Total
									Continuous and Comprehensive Evaluation		End Semester Exams		Internal Assessment		End Semester Exams		
				Th	Tu	Pr			Marks		Marks	Duration	Marks	Duration	Marks	Duration	
2	MAJOR - 2	PHM204-1C	Waves and Optics	3	-	2	5	4	10 10 05	Assignment MCQ Attendance	50	2	25	1	-	-	100

AIM :

- Aware students of the basics of optics and its scope.
- Acquaint the basic concept of Physics as a subject.
- Basic concepts related Waves and Optics.
- Learn laboratory skills for handling instruments.

COURSE CONTENTS

Course Outline for Theory

UNIT	COURSE CONTENT	TEACHING HOURS
I	**Superposition of Two Collinear Harmonic oscillations:** Linearity and Superposition Principle, (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). **Superposition of Two Perpendicular Harmonic Oscillations:** Graphical and Analytical Methods, Lissajous Figures with equal an unequal frequency and their uses. **Sound:** Simple harmonic motion, forced vibrations and resonance, Fourier's Theorem, Application to saw tooth wave and square wave, Intensity and loudness of sound, Decibels, Intensity levels, musical notes, musical scale. Acoustics of buildings: Reverberation and time of reverberation, Absorption coefficient, Sabine's formula, measurement of reverberation time, Acoustic aspects of halls and auditoria.	**15**
II	**Diffraction:** Fraunhofer diffraction: Single slit, Double Slit, Multiple slits & Diffractiongrating, Fresnel Diffraction: Half-period zones. Zone plate, Fresnel Diffraction patternof a straight edge, a slit and a wire using half-period zone	**15**

	analysis. **Polarization:** Transverse nature of light waves. Plane polarized light, production andanalysis. Circular and elliptical polarization.	
III	**Wave Optics:** Electromagnetic nature of light, Definition and Properties of wave front, Huygens Principle. **Interference:** Interference: Division of amplitude and division of wavefront, Young's Double Slit experiment, Lloyd's Mirror and 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.	**15**

Course Outline for Practical

Sr. No.	Course Contents
1	Refractive Index of the Material of a Prism using a Spectrometer
2	Investigations with Polarised Light using a Polarimeter
3	Cauchy's Constants of the Material of a Prism
4	Wavelength of Sodium Light using Newton's Rings
5	Wavelength of Sodium / Mercury Light using a Plane Diffraction Grating
6	Dispersive Power of a Prism
7	Wavelength of Sodium Light using Fresnel's Biprism
8	Resolving Power of a Prism
9	Diffraction from a Wire
10	Study of Single Slit Diffraction of a Laser using Photo Sensor
	Total Hours - 30

TEACHING METHODOLOGY:

- Conventional method (classroom blackboard teaching)
- ICT Techniques
- Teaching through the classroom, laboratory work
- Variety of learning styles and tools (PowerPoint presentations, audio-visual resources, e-resources, seminars, workshops, models)
- Teaching through laboratory work

Learning Outcomes:-After successful completion of this course, students have:

- Knowledge of Practical related to theory of Physics and its application in various fields.

Arrangement of lectures duration and practical session as per defined credit numbers:

Units	Lecture Duration (In Hrs.)		Calculation of Credits (In Numbers)		Total Lecture Duration	Credit Calculation
	Theory	Practical	Theory	Practical	Theory+ Practical	Theory+ Practical
Unit – 1	15	30	3	1	45 + 30	4
Unit – 2	15					
Unit – 3	15					
TOTAL	45	30	3	1	75	4

Evaluation

Theory Marks	Practical Marks	Total Marks
75	**25**	**100**

REFERENCE BOOKS:

1. 'A textbook of Optics', **N. Subrahmanyam, Brij Lal and M. N. Avadhanulu**, *S. Chand and Company Ltd*.
2. 'Fundamentals of Optics', **Francis Arthur Jenkins and Harvey Elliott White**, *McGraw Hill*.
3. 'Optics', **Ajoy Ghatak**, *Tata McGraw Hill*.
4. 'Fundamental of Optics', **D. R. Khanna and H. R. Gulati**, *S. Chand and Company Ltd.*
5. 'Elements of Spectroscopy', **Gupta, Kumar and Sharma**, *Pragati Prakashan*.
6. 'Atomic Physics', **J. B. Rajam,** *S. Chand and Company Ltd.*
7. 'Optics and Spectroscopy', **R. Murugeshan and K. Sivaprashatha,** *S. Chand and Company Ltd.*
8. 'Handbook of Optics-Vol. I to IV', **Michael Bass,** *McGraw Hill.*
9. 'LASERS: Fundamentals and Applications', **K. Thyagrajan and A. K. Ghatak**, *Tata McGraw Hill.*
10. 'Fibre Optics through Experiments', **M. R. Shenoy, S. K. Khijwania *et.al.***, *Viva Books*.
11. 'Nonlinear Optics',**Robert W. Boyd**, (Chapter-I), *Elsevier* (2008).
12. 'OpticsLearning by Computing with Model Examples', **Karl Dieter Moller**, *Springer* (2007).
13. 'Optical Systems and Processes', **Joseph Shamir**, *PHI Learning Pvt. Ltd.*
14. 'Optoelectronic Devices and Systems', **S.C. Gupta**, *PHI Learning Pvt. Ltd.*
15. 'Optical Physics', **A.Lipson, S.G.Lipson and H.Lipson**, 4thEd., *Cambridge Univ. Press*.