Course Synopses

Course Code	PHU4302		Level	4		
Course Title	Optics					
Credit value	03					
Core/Optional	Optional					
Prerequisites	**NO**					
Hourly breakdown	**Theory**		**Practical**	**Independent Learning**	**Assessment**	**Total**
	Sessions X 2 = 20 x 2hrs =40 hrs	DS hrs = 4 x 3 hrs = 12 hrs	Lab hrs = 3days x 6 hrs = 18 hrs	20 Sessions (x 3) = **60 hrs** Learning hours (Laboratory preparation for 6 practicals)= **10 hrs** Online /Audio-visual materials and other learning resources =**10 hrs**	Continuous Assessments (2 CA) = **2 hrs**	**152 hrs**

Course Aim/s.	**Students who follow this course should:** • Master a broad set of knowledge concerning the fundamentals in wave nature of light • Get the aptitude to use the knowledge in fundamental concepts in physics that can be applied in many different ways to understand and predict what nature does. • Appreciate how observation and experiment along with theory work together to continue to expand the frontiers of knowledge of the physics specially in the field of physics optics • Recognize the objective of the physics laboratory experiment and use the laboratory sessions to develop their creativity and scientific writing skills. • Be able to communicate ideas in physics with precision and clarity to both experts and non-experts.
PLOs addressed by course	**PLO1:** Knowledge - Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the BSc degree. **PLO2** Practical Knowledge and Application - Acquire competency in practical skills and the necessary knowledge to appropriately use these skills. **PLO3**: Communication - Communicate reliably, efficiently and effectively to present information, ideas and concepts to the scientific community as well as to the wider society. **PLO4:** Individual Work, Team Work and Leadership - Function effectively as an individual, and as a team member, sharing work and experiences, leading and managing assigned tasks to completion on time, demonstrating leadership to address situations in diverse and multi-disciplinary environments in day to day life. **PLO5:** Creativity and Problem Solving - Identify problems and argue out and analyze such problems using qualitative and/or quantitative practical approaches in scientific methodology to provide valid conclusions. **PLO6:** Adaptability and Flexibility - Develop appropriate strategies to adapt to changing environments. **PLO7**: Information and Communication Technology Literate: Effectively use ICT skills for numerical and statistical analysis keeping up to date with knowledge and skills. **PLO8:** Vision for Life: Identify where one wants to be and develop long term goals maintaining competency to conduct scientific investigations and proceed to undertake further studies. **PLO9:** Lifelong Learning: Foresee new trends and recognize their impact, and update knowledge and develop new skills to meet future changes and challenges.
Course Learning Outcomes (CLO)	Students following this course should be able to: **CLO-1:** Use and understanding of basic concepts and principles of the wave nature of light to effectively solve problems encountered in everyday life, further study in science, and in the professional world. (PLO1,PLO8, PLO9) **CLO-2:** Competency development by acquiring new knowledge and applying the learned concepts in various situations (PLO1)(PLO9) **CLO-3:** Apply students understanding of physics and mathematics to convert a physical situation expressed in English to a mathematical formulation and then solve technical and engineering problems, especially those related to optics.(PLO1)(PLO5)(PLO9) **CLO-4**: Students will develop to communicate well orally and in writing in a scientific context and conceptual understanding through explanations to their fellow students.(PLO1)(PLO2)(PLO3)(PLO4)

	CLO-5 : Explain the problem and its solution in both words and mathematical formulation and then analysis it quantitatively (PLO1)(PLO2)(PLO5)(PLO7) **CLO-6:** Identification of the essential part of a problem and relevant theoretical methods to approach. Achieve analytical or numerical solutions to a problem, test the accuracy the solution , interpretation of results with justification.(PLO1)(PLO4)(PLO5) **CLO-7:** Students as a group and individually will develop good experimental technique, including proper setup and care and handling of equipment, conducting experiments and analyzing results in order to observe physical phenomena, assess experimental uncertainty, and make meaningful comparisons between experiment and theory(PLO1)(PLO2)(PLO4)(PLO5)(PLO6) **CLO-8:** Students will develop, critical thinking and analytical skills, clear and concise problem solving, effective written communication skills. Preparation of well-structured laboratory reports. Skills of a high order in interpersonal understanding. Teamwork and communication (PLO1)(PLO5) **CLO-9:** Use basic laboratory data analysis techniques, including distinguishing statistical and systematic errors, propagating errors, and representing data graphically (PLO2)(PLO4)(PLO5) **CLO-10:** Communicate verbally, graphically, and in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.(PLO2)(PLO3)(PLO4)	
Content (Main topics, sub topics)	**Unit 1. Interference** (i)Wave front, wave packets, principle of superposition and Huygen's principle. (ii) Interference patterns by the method of deviation of wave front (iii) Interference patterns by the method of deviation of amplitude (iv) Industrial applications of interference (v) The Michelson Interferometer (vi)The Fabry-Perot interferometer (6 sessions) **Unit 2. Diffraction** (i). Fresnel Diffraction (ii) Fraunhofer Diffraction by a single slit (iii) Fraunhofer diffraction by s double slit (iv) Diffraction grating (v)Concave grating Echelon grating (vi) Chromatic resolving power of a (6 Sessions) **Unit 3. Polarization** (i).Polarization (ii) Double refraction (iii) Wave plates (iv)Optical activity of soilds and liquids (v) The Kerr electro optic effect (vi) Lasers (vii) Types of lasers and their applications to science and technology (viii) Holography (8 Sessions) **Unit 4. Practicals (No. 6)**	
Teaching Learning methods	*Self-learning/independent learning* • *Instructional course material (IL)* • *Online assignments and activities (OL)* • *Additional reading materials/ recommended reading (RE)* •*Library use* *Compulsory contact sessions* • *Practical classes,* • Assessments (AS) and Feedback – MCQs (MCQ);Structured Essay (SEQ); Reports (RE); *Non-compulsory contact sessions* • *Day schools, group discussion during the day school (DS)*	
Assessment strategy	**Overall Continuous Assessment Mark (OCAM): 40 %**	**Final Assessment: 60 %**
	Details: Continuous Assessment (CA): 36% of Best NBT + 24% of other NBT % (2 hrs) Practical Assessment (PA) : (2 hrs) 40% of PM% (Should obtain minimum of 40% in practical assessment to sit for the final examination)	Final Evaluation Theory: 100 % of two hour duration
Recommended Readings:	1. F.A. Jenkins and H.E. White, Fundamentals of Optics, Published by McGraw Hill 2. John Kellock Robertson, Introduction to Physical Optics, Publisher: D. Van Nostrand Company (1950) 3. F.Graham Smith & J.H. Thompson, Optics, John Wiley & Sons Ltd. 1971	