هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Optics (1)**
Course Code:	**PHY3403**
Program:	**B.Sc. Degree in Physics**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours:	**4**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 8 / Year 3**
4. Pre-requisites for this course (if any):	**General Physics** (3)
5. Co-requisites for this course (if any):	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	40	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers aberrations of lenses and design and functionality of optical instruments. It then gives an introduction to vibrations, wave optics and superposition of waves.

2. Course Main Objective

The course revises the basics of geometrical optics (reflection and refraction, as well as image formation in the case of mirrors and lenses). It also covers aberrations in lenses. Then the course gives a scientific description of some optical instrumentation used in real life. Introduction to wave optics is then given by teaching vibrations and wave laws as well as mathematical treatment to addition and superposition of waves to be used in the advanced Optics course.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.2	Define the concepts of waves, and superposition of waves.	K1 (P)
1.3	Describe physical laws governing the mirrors and lenses and their applications and aberrations.	K2 (P)
2	**Skills :**	
2.1	Solve geometrical optics problems and use the optics laws in optical instruments	S1 (P)
2.2	Explain the scientific laws governing wave addition, subtraction, and superposition.	S2 (I)
3	**Values:**	
3.1	Collaborate and contribute responsibly and effectively in teamwork	V2 (P)

C. Course Content

No	List of Topics	Contact Hours
1	**General Revision on Mirrors and Lenses** • Plane Surfaces and Prisms • Spherical Surfaces • Thin Lenses • Thick Lenses • Spherical Mirrors	6
2	**Lens Aberrations** • Spherical Aberration of a Single Surface • Spherical Aberration of a Thin Lens • Coma • Astigmatism • Curvature of Field • Distortion • Chromatic Aberration	6
3	**Optical Instruments** • The Human Eye • Cameras and Photographic Objectives • Meniscus Lenses • Symmetrical Lenses • Magnifiers • Microscopes • Astronomical Telescopes	6
4	**Vibrations and Waves** • Simple Harmonic Motion • Vibrating Spring • Transverse Waves • Phase Angles • Amplitude and Intensity • Frequency and Wavelength	6
5	**Superposition of Waves** • Addition of Simple Harmonic Motions along the Same Line	6

	• Vector Addition of Amplitudes • Superposition of Two Wave Trains of the Same Frequency • Complex Waves • Fourier Analysis • Group Velocity • Addition of Simple Harmonic Motions at Right Angles	
6	**Interference of Two Beams of Light** • Huygens' Principle • Young's Experiment • Interference Fringes from a Double Source • Intensity Distribution in the Fringe System • Fresnel's Biprism • Coherent Sources • Division of Amplitude. Michelson Interferometer • Circular Fringes	5
7	**Interference Involving Multiple Reflections** • Reflection from a Plane-Parallel Film • Fringes of Equal Inclination • Interference in the Transmitted Light • Newton's Rings • Fabry-Perot Interferometer • Brewster's Fringes • Other Interference Spectroscopes	5
Total		40

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Define the concepts of waves, and superposition of waves.	Demonstrating the basic information and principles through lectures and discussions.	Homework and Mid and final exams.
1.2	Describe the physical laws governing mirrors and lenses and their applications and aberrations.		
2.0	**Skills**		
2.1	Solve geometrical optics problems and use the optics laws in optical instruments	Lecturing, discussion, and problem-solving.	Homework and Mid and final exams
2.2	Explain the scientific laws governing wave addition, subtraction, and superposition.		
3.0	**Values**		
3.1	Collaborate and contribute responsibly and effectively in teamwork	presentations and discussion groups	Presentations and seminars

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Mid-Term Exam	11	30%
3	Homework, Quizzes, and report	Through term	20%
4	Final Exam	End of the term	50%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : Consultation and/or academic advice will be available during the teaching staff office hours

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	1. Francis A. Jenkins and Harvey E. White, "Fundamentals of Optics", 4th Edition, McGraw-Hili Primls, (2001).
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	data show
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Students	Questionnaires
achievement of course learning outcomes	Program Leader	Course Report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	