هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Optical Physics**
Course Code:	**2033104-4**
Program:	**Bachelor in Physics**
Department:	**Physics Department**
College:	**College of Science**
Institution:	**Taif 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: 8th level/3rd year
4. Pre-requisites for this course (if any)**: Waves and vibrations 2032201-4**
5. Co-requisites for this course (if any)**: NONE**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**7**	**100%**
2	**Blended**	**0**	**0%**
3	**E-learning**	**0**	**0%**
4	**Distance learning**	**0**	**0%**
5	**Other**	**0**	**0%**

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**50**
2	**Laboratory/Studio**	**20**
3	**Tutorial**	**0**
4	**Others** (specify)	**0**
	Total	**70**

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers many items related to the light phenomena and its characterization. Students will study the nature of light and its propagation. Theories that described the nature of light will be studied. Also, the interference and diffraction of light waves will be covered. The polarization of light waves will be included. Students will train on many measuring tools based on interference, diffraction and polarization of the light. Moreover, about ten experiments related to the optics will be studied.

2. Course Main Objective

- Provides the theoretical background of the nature of light
- Study the phenomena of interference, diffraction and polarization of light waves.
- Understand the basic concepts in physical optics for variety of applications.
- Develop the skills which require the knowledge of ray optics and optical interferometry.
- Demonstrate basic experimental skills by setting up laboratory equipment safely and efficiently.
- Carry out experimental procedures, and report the results of the experiments related to interference, diffraction and polarization.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	List the physics theories discussing the nature of light.	K3
1.2	Identify the basic concepts of light interference, diffraction and polarization.	K1
2	**Skills :**	
2.1	Solve problems related to light wave interference.	S2
2.2	Compare different types of light diffraction and derive the resultant distance of the interference fringes for many applications.	S3
3	**Values:**	
3.1	Work effectively within groups to set up many experiments in physical optics.	V2
3.2	Act responsibly and be able to prepare a written scientific report	V3

C. Course Content

No	List of Topics	Contact Hours
1	Unit 1: **Nature of light** • Theories of light • Dualism nature of light	3
2	Unit 2: **Simple harmonic motion** • Phase angle • Differential equation of wave motion	5
3	Unit 3: **Interference of light waves 1** • In the same direction (four cases) • In opposite and perpendicular directions	7
4	Unit 4: **Interference of light waves 2** • Reflection • Refraction	7
5	Unit 5: **Studying applications of light interference and solving related problems** • Young's double slit exp. • Newton's rings • Lloyd's mirror • Frenerl's double mirror • Frenel's biprism • Michlson interferometer • Jamin interferometer	7
	First periodic exam	2
6	Unit 6: **Diffraction of light** • Frenel's diffraction from an edge • FraunHofer diffraction (single slit, double slits and diffraction grating)	7
7	Unit 7: **Polarization of light:**	7

	• Definition of light polarization • Techniques of light polarization • Polarization by reflection: Brewster's law • Polarization by refraction • Polarization by divergence • Applications: the polarometer	
	Second periodic exam	2
8	**Final revision**	3
Part 2 (Lab work)		
1	**Experiment 1:** Determination of the refractive index of a solution using Abbe's apparatus	2
2	**Experiment 2:** Determination of the specific rotational index of a solution using a polarometer	2
3	**Experiment 3:** Carrying out Newtons experiment for both reflection and transition mode	2
4	**Experiment 4:** Determination of the light wavelength of a mercury gas lamp using Newtons rings	2
5	**Revision**	2
6	**Experiment 5:** Determination of different spectra wavelengths using a diffractometer	2
7	**Experiment 6:** Determination of the angle of glassy prism	2
8	**Experiment 7:** Determination of the refractive indexes of different media using a prism	2
9	**Experiment 8:** Transmittance spectrum using UV-visible spectrophotometer	2
10	**Reports evaluation and lab final exam**	2
Total		**70**

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	List the scientific theories that discuss the nature of the light	Lecture	Written exam
1.2	Identify the basic concepts of light interference, diffraction and polarization	Lecture and Group discussion	Written exam
2.0	**Skills**		
2.1	Solve problems related to the interference of two light wave	Lectures	Written exam and Homework reports
2.2	Compare between Frank Hover and Fresnel's diffractions	Lecture and Group discussion	Written exam Homework reports

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.0	**Values**		
3.1	Work effectively within groups to set up many experiments in physical optics.	Practical	Lab reports Lab exam
3.2	Act responsibly and be able to prepare a written scientific report	Practical	Lab reports Lab exam

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm exam I	6th	20%
2	Activities	Periodically	10%
3	Lab reports	Weekly/ 10th	20%
4	Final Lab Exam	10th	10%
5	Final exam	11th	40%

***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:

- Each faculty member is assigned a group of students for continuous academic advice during six office hours weekly (6 hrs./week).
- Also teaching staff are available for individual student consultations during office hours

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Fundamentals of optics, Fourth Edition; Francis A. Jenkins and Harvey E. White, New York McGraw-Hill, Inc./ 1976, Print ISBN-13: 978-0072561913
Essential References Materials	• Principles of Physical Optics 1st Edition; Charles A. Bennett; ISBN-13: 978-0470122129; 2007 • Optics Letters Optical Society of America journal
Electronic Materials	• Interactive simulations for science and math: https://phet.colorado.edu/ • Blackboard lectures. • YouTube websites
Other Learning Materials	• CD associated with the textbooks (when available). • Lecture notes and PowerPoints presentations prepared by the lecturer.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room with max 60 seats • Optics Labs with max 20 places for each (some are provided with Data show). • Quantum optics research lab.
Technology Resources (AV, data show, Smart Board, software, etc.)	• data show • Smart Board • software
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Optics lab • Lasers • Spectrophotometer

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	• Students	Direct
Evaluation of Teaching	• Instructor • Program coordinator • Departmental council • Faculty council	Indirect
Improvement of Teaching	• Program leaders • Relevant committee	Direct
Quality of learning resources	• Students • Instructor • Faculty	Indirect
Extent of achievement of course learning outcomes,	• Program leaders	Direct
Course effectiveness and planning for improvement	• Program leaders • Instructor	Indirect

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	October 2, 2022