هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	Wave physics Lab
Course Code:	PHYS 395
Program:	B.Sc. in Physics
Department:	Department of Physics and astronomy
College:	College of Science
Institution:	King Saud University
Version:	2.0.0
Last Revision Date:	Sep 2023

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	2(0+0+4)				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	sixth level / third year.				

4. Course general Description

The course incorporates several hands-on experiments that students will perform. The experiments include:

1. Young's double-slit experiment: Students will explore the phenomenon of interference by observing the interference pattern produced when light passes through two closely spaced slits.
2. Measuring the effect of sugar concentration on the refractive index: Using an Abbe refractometer, students will investigate how the refractive index of a solution changes with varying sugar concentrations.
3. Verification of the inverse square law and measurement of light absorption coefficient in glass: Students will use a photovoltaic cell to measure the intensity of light at different distances from a source and determine the absorption coefficient of light in glass.
4. Determining specific rotation using a polarimeter: Students will use a polarimeter to measure the angle of rotation of polarized light passing through a substance, allowing them to determine its specific rotation.
5. Newton's rings in transmitted monochromatic light: Students will observe the interference pattern created by the reflection and transmission of light between a plano-convex lens and a glass plate, known as Newton's rings.
6. Lloyd's mirror experiment: By analyzing the interference pattern formed by light reflected from a mirror and a partially reflective surface, students will investigate the principles of interference.
7. Interference at a Fresnel's biprism: Students will study the interference pattern produced by a Fresnel's biprism, which consists of two prisms placed in contact.
8. Measurement of the refractive index of a prism using a spectrometer: Students will use a spectrometer to measure the angles of incidence and refraction of light passing through a prism, allowing them to calculate its refractive index.
9. Measuring wavelengths with a diffraction grating: Students will use a diffraction grating to observe the diffraction pattern produced by light passing through it and measure the wavelengths of different spectral lines.
10. Melde's experiment: Students will investigate the relationship between tension, frequency, and wavelength by studying the standing wave patterns produced on a vibrating string.

Through these experiments, students will gain practical experience and a deeper understanding of various wave phenomena, including interference, diffraction, refraction, polarization, and standing waves.

5. Pre-requirements for this course (if any): Phys 331

6. Co- requirements for this course (if any): None

7. Course Main Objective(s)

1. To introduce students to the fundamental principles of wave physics.
2. To provide hands-on experience with various wave phenomena and their experimental measurements.
3. To enhance students' understanding of interference, diffraction, and refraction through practical experiments.
4. To develop students' skills in using scientific instruments such as refractometers, spectrometers, polarimeters, and diffraction gratings.
5. To enable students to apply mathematical concepts and principles to analyze and interpret experimental data.
6. To explore the relationship between physical properties, such as refractive index and absorption coefficient, and their effects on light propagation.
7. To foster critical thinking and problem-solving skills by investigating the behavior of light waves in different experimental setups.
8. To encourage students to make observations, analyze experimental results, and draw conclusions based on their findings.
9. To promote collaboration and teamwork among students through group experiments and discussions.
10. To lay a foundation for further studies in optics, wave theory, and related fields.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	52	100%
2.	E-learning	0	0
3.	Hybrid • Traditional classroom • E-learning	0	0
4.	Distance learning	0	0

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	0
2.	Laboratory/Studio	52
3.	Field	0

4.	Tutorial	0
5.	Others (specify)	0
	Total	52

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Understand optical phenomena such as polarization, birefringence, interference, wave propagation of light, and diffraction in terms of the wave model.	K1	• Give extensive examples during lecture. • Give problem sheets to be discussed during lecture. • The students learn independently and take up responsibility •	• Hold Class discussion, tutorial sessions. • Give quizzes, mid-term exam and final exam.
1.2	Use laboratory equipment conduct relevant experiments, to generate data, save and record results, re-experiment to obtain accuracy in readings and measurements.	K2		
2.0	Skills			
2.1	Ability to make measurements and analyze it.	S1	• Give extensive examples during lecture • Give problem sheets to be discussed during lecture and labs. • assignments. • Discussions in the classes • Writing reports on selected parts of the course	• Hold Class discussion, tutorial and lab sessions. • Give quizzes, mid-term exam and final exam.
2.2	How to use physical laws and principles to understand the subject.	S2		
2.3	How to simplify problems and analyze phenomena.	S3		
2.4	Analyze and explain experiment's data.	S4		
3.0	Values, autonomy, and responsibility			
3.1	Work as a team and acknowledge others' work.	V1	• assignments. • Homework • Lab group	Hold Class discussion

C. Course Content

No	List of Topics	Contact Hours
1.	Young's double-slit experiment	4
2.	Measuring the effect of sugar concentration on the refractive index	**4**
3.	Verification of the inverse square law and measurement of light absorption coefficient in glass	**4**
4.	Determining specific rotation using a polarimeter	**4**
5.	Newton’s rings in transmitted monochromatic light	**4**
6.	Lloyd's mirror experiment	**4**
7	Interference at a Fresnel's biprism	**4**
8.	Measurement of the refractive index of a prism using a spectrometer	**4**
9.	Measuring wavelengths with a diffraction grating	**4**
10.	Melde's experiment	**4**
Total		40

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Midterm examination**	**Approx. 7**	**30%**
2.	**Labs**	**Weekly**	**30%**
4.	**Final examination**	**Approx. 14**	**40%**

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	-Introduction to Optics, Frank J. Pedrotti, Leno M, Leno S. Pedrotti New Jersey -An introduction to modern optics, Ghata, Ajoy K McGraw-Hill Book Company, 1972
Supportive References	-Optics, Eugene Hecht Addison Wesle 2002 - 2009 عبد الله الضويان ومحمد الصالحي، مقدمة في الضوء، جامعة الملك سعود
Electronic Materials	None
Other Learning Materials	Internet sites relevant to the course

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	It is important to have multiple versions of each experiment to accommodate all students in the course and facilitate hands-on learning.
Technology equipment (projector, smart board, software)	Whiteboard and Smart board
Other equipment (depending on the nature of the specialty)	Not applicable

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students\ Peer Reviewer	Indirect \ direct
Effectiveness of students assessment	Students- Faculty	Direct
Quality of learning resources	students	Indirect
The extent to which CLOs have been achieved	Faculty	Indirect
Other	None	None

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Physics Department's council
REFERENCE NO.	6th (1st term/1446)
DATE	22/05/1446