هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title: **Physical Optics**
Course Code: **312PHYS**
Program: **Physics**
Department: **Physics**
College: **Science**
Institution: **Jazan University**
Version: **Phys 2215**
Last Revision Date: **06/04/1444 H**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	4				
2. Course type					
a.	University ☐	College ☐	Department ☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	**Level8/Year3**				
4. Course general Description The course provides background knowledge of several optics phenomena with an emphasis on the light as electromagnetic waves. It covers the concepts of superposition, interference, diffraction, and polarization of light. The course also covers applications and experiments related to these concepts. The course material will be covered in traditional lecture format as well as laboratory demonstrations and hands-on activities.					
5. Pre-requirements for this course (if any): **212PHYS (Waves and vibrations)**					
6. Co- requirements for this course (if any): **NIL**					
7. Course Main Objective(s) The concept of the nature of light and wave theory of light. - The concept of superposition of light - The interference of light and related experiments. - The principles of the diffraction of light for many cases and diffraction grating. - The principles of polarization of light. - Hands on experience in the laboratory experiments to understand the related concepts					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	62%
2.	E-learning		
3.	Hybrid ● Traditional classroom ● E-learning		
4.	Distance learning		
5.	Other (lab)	20	38%

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	20
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	53

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	**Recall** the superposition of waves, the wave velocity, and the group velocity, difference between interference and diffraction and their types as well as the light polarization and its various methods	**PLO1.1**	Lectures, blackboard and visualization, group and interactive guided discussion, Interactive discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect**: student survey
1.2	**Define** the concepts of Huygens's principle, interference and diffraction of light, superposition of waves, and its applications, and calculate the aspects of the polarization of light, the birefringence, the Brewster's angle and polarization by reflection	**PLO1.1**	Lectures, blackboard and diagram illustration, group discussion, Interactive illustrations-Student contribution	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
1.3	**Discuss** various types of interference,		Lectures, blackboard and	**Direct** (formative and

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	various types of diffraction as well as various types of polarization	**PLO1.2**	visualization, brain storming, group and interactive discussion, Interactive illustration – Problem based learning	summative): In class interactive questioning, quizzes, written exams **Indirect**: student survey
2.0	Skills			
2.1	**Solve** various problems related to interference and diffraction such as the film thickness by interference and conditions of maxima and minima for interference in films, fringes of equal thickness Newton's Rings, and Michelson interferometer, double slit interference, and single, double and multi slit diffraction	**PLO2.1**	Lectures, blackboard and visualization, brainstorming, group and interactive discussion, Interactive illustration – Problem based learning	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect**: student survey
2.2	**Derive** the expression for irradiance of light for double slit interference, single, double and multi slit diffraction.	**PLO2.2**	Lectures, blackboard and visualization, brain storming, group and interactive discussion, Interactive illustration – Problem based learning	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect**: student survey
2.3	**Perform experiments** about interference in Young's double slit,		Hands on lab demonstrations-	**Direct** (formative and summative):

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	diffraction from single and double slit, and hair, thickness, Newton's Rings, Michelson interferometer, and Malus' law of polarization, Optical activity and polarization and analyze their related data	**PLO2.3**	guided discussion – guided discovery	Evaluation of assignments, Step-by-step checkpoint assessment of experiment, In lab interactive questioning, quizzes, written exams **Indirect:** student survey
2.4	**Develop** competencies in critical thinking, communication and writing lab reports.	**PLO2.4**	Lectures, blackboard and visualization, brainstorming, group and interactive discussion, Interactive illustration – Problem based learning	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
3.0	Values, autonomy, and responsibility			
3.1	**Demonstrate** abilities to work in groups and bear individual responsibility during lab work, interactive discussion, and group assignments.	**PLO3.1**	Interactive and Group discussion, expository and discovery teaching	**Direct** (formative and summative): In lab interactive questioning **Indirect**: student survey
3.2	**Show** awareness of safety for own and others when dealing with lab equipment	**PLO3.3**	Case study-interactive demonstration-guided discussion	**Direct** (formative and summative): In lab interactive questioning

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				Indirect: student survey
...				

C. Course Content

Theoretical Part

No	List of Topics	Contact Hours
1.	**Nature of light and wave theory of light** - Concept of light as a particle - Concept of light as a wave - Concept of light as an electromagnetic wave	**3**
2.	**Vibrations and waves** - Simple harmonic motion (SHM) - Transverse wave - Wave velocity	**3**
3.	**Superposition of waves** - Addition of SHM - Superposition of two waves - Superposition of many waves - Group velocity	**6**
4.	**Interference of light** - Huygens' principle - Young's experiment - Thin film interference - Film thickness by interference - Newton's ring - Other interferometers apparatuses	**7**
5.	**Diffraction of light** - Single slit diffraction - Resolving power - Diffraction grating - Rayleigh's criterion - Fraunhofer diffraction - Double slit diffraction - Diffraction from many slits - Diffraction grating - Fresnel diffraction	**8**
6.	**Polarization of light** - State of polarization and polarizer - Malus' law - Dichroism	**6**

	- Birefringence - Brewster's angle - Polarization by reflection	
Total		33

Experimental Part

No	List of Topics	Contact Hours
1	**Interference of light using Young's double-slit**	**2**
2	**Diffraction of light through a single slit**	**2**
3	**Diffraction grating spectrometer**	**2**
4	**The diameter of a Human Hair by Laser Diffraction**	**2**
5	**Michelson interferometer**	**2**
6	**Newton's interference rings**	**2**
7	**Malus' law of polarization**	**2**
8	**Optical activity and polarization**	**2**
9	**Brewster's angle**	**2**
10	**Kerr effect**	**2**
Total		**20**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework assignment- Contribution in interactive discussion	2	3 (3%)
2.	Quiz 1	3	5 (5%)
3.	Mid-term exam	6	15 (15%)
4.	Homework assignment- Contribution in interactive discussion	8	3 (3%)
5.	Homework assignment- Contribution in interactive discussion- Group work-essay or Project discussion	10	4 (4%)
6.	Laboratory Exam	11	20 (20%)
7.	Final Exam	12	50 (50%)

*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 by Frank L Pedrotti, Leno M Pedrotti , Leno S Pedrotti . Addison-Wesley; 3rd edition (April 17, 2006).
Supportive References	Fundamental of Optics; F. A. Jenkins and H. S. White, McGraw-Hill Priml Custom Publishing, 2001. - Optics; Eugene Hecht, 4th Edition, Addison- Wesley, 2001.
Electronic Materials	https://spie.org/ http://hyperphysics.phy-astr.gsu.edu/
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**1 Lecture room(s) for groups of 50 students.** **- 1 Laboratory for group of 25 students.**
Technology equipment (Projector, smart board, software)	Data show- smart board
Other equipment (Depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (CES)- Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Students, Faculty members	Indirect
The extent to which CLOs have been achieved	Instructor	Direct/Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	**DEPARTMENT BOARD**
REFERENCE NO.	**PHYS2304**
DATE	**28/2/2023**