Course Specification
(Bachelor)

Course Title:	**Waves & Optics**
Course Code:	**PHY 1240**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	4
Last Revision Date:	***29/09/2024***

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A. General information about the course:

1. 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: (Level 3/ Year2)					
4. Course General Description:					
This course is an introduction to waves and optics associated with physical phenomena. It is designed to analyze various situations or phenomena associated with waves, optics and modern physics using basic principles. Topics covered in waves and geometrical optics include: The Laws of geometric optics and image formation, Interference of light waves, diffraction patterns and polarization, Wave motion, Sound waves, Superposition and standing waves.					
5. Pre-requirements for this course (if any)**:**					
Classical Mechanics (1), PHY 1105 and Calculus (2), MAT 1102					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					

- **Analyze various situations or phenomena associated with waves and optics.**
- **Understand the laws of geometrical optics.**
- **Apply the characteristics of waves to light phenomena.**
- **Provide the fundamental concepts of wave motion, sound waves, waves interference, and superposition of standing waves.**
- **Develop critical thinking and analytical problem-solving skills.**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**45**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**30**
5.	**Others (specify)**	**0**
Total		75

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**State the physical principles that describe waves and geometrical optics.**	**K1, K2**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describethe wave propagation of light, interference, diffraction, polarization of light waves, and electromagnetic nature of light.**	**K1, K2**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the laws of refraction and reflection, and describe the principles of some optical instruments**	**K1, K2**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**			
2.1	**Explain and summarize the basic knowledge gained from studying waves and optical physics.**	**S1, S2**	▪ Lectures. ▪ Class discussions. ▪ Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and**	**S2, S3**	▪ Problem classes and group tutorial.	▪ Exams. ▪ Discussions.

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	analyze problems in physics related the topics covered by the course.		• Homework assignments as well as problems solutions.	• Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	• Exams. • Participation and activities of students in the course community and blackboard. • Homework.
3.0	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**			
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation. ▪ Homework. ▪ Mini-project(s).

C. Course Content

No	List of Topics	Contact Hours
1.	**The Laws of Geometric Optics and Image Formation:**Reflection, Refraction, Dispersion and prism, Total internal reflection, Images formed by flat mirror, Images formed by spherical mirrors, Images formed by refraction, Thin lenses.	**15**
2.	**Interference of Light Waves:** Conditions for interference, Young's double-slit experiment, Intensity distribution of the double-slit interference pattern, Change of phase due to reflection, Interference in thin films.	**15**
3.	**Diffraction Patterns and Polarization:** Introduction to diffraction patterns, Diffraction patterns from narrow slits, Resolution of single-slit and circular apertures, The diffraction grating, Polarization of light waves.	**15**
4.	**Wave Motion:** Propagation of a disturbance, Sinusoidal waves, The Speed of waves on strings, Reflection and transmission, Rate of energy transfer by sinusoidal waves on strings, The linear wave equation.	**15**
5.	**Sound Waves:** Speed of sound waves, Periodic sound waves, Intensity of periodic sound waves, The Doppler effect.	**15**
Total		**75**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2.	Midterm Exam 1	6thweek	25 %
3.	Midterm Exam 2	12thweek	25 %
4.	Final Exam	16thweek	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	- Jenkins F.A. and White H.E., ***Fundamentals of Optics,*** 4th edition, McGraw-Hill (2001). - Hecht E., ***Optics,*** 4th Edition, Addison-Wesley (2004).
Supportive References	- Raymond A. Serway, and John W. Jewett, ***Physics for Scientists and Engineers (with modern physics)*** – Brooks Cole – 8th Edition (July 21, 2003)
Electronic Materials	https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx
Other Learning Materials	Multimedia associated with the text book and the relevant websites.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	- Classrooms. - Labs.
Technology equipment (projector, smart board, software)	- Classroom equipped with a whiteboard and a projector.
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	- Students - Second examiner	- Indirect (The students complete the evaluation forms

Assessment Areas/Issues	Assessor	Assessment Methods
		at the end of term. Final exam is evaluated by the second examiner)
Effectiveness of Students assessment	- Instructors	Direct (exams, HW, project, …)
Quality of learning resources	- Faculty - Students	- Indirect (surveys)
The extent to which CLOs have been achieved	- Instructors - Program Leaders	- Direct (excel sheet)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Quality Unit-Physics Department
REFERENCE NO.	Department council No. 06
DATE	26/09/2024