مركز الاعتماد وضمان الجودة
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Course Syllabus

1	Course title	Optics-1
2	Course number	0302221
3	Credit hours	3 theory
	Contact hours (theory, practical)	3 theory
4	Prerequisites/corequisites	Practical Physics-2 (0302112)
5	Program title	BSc. In Physics
6	Program code	
7	Awarding institution	The University of Jordan
8	School	School of Science
9	Department	Department of Physics
10	Course level	2nd year
11	Year of study and semester(s)	1st 2023/2024
12	Other department(s) involved in teaching the course	-
13	Main teaching language	English
14	Delivery method	☒ Face to face learning ☐ Blended ☐ Fully online
15	Online platforms(s)	☒ Moodle ☐ Microsoft Teams ☐ Skype ☐ Zoom ☐ Others……
16	Issuing/Revision Date	October 2023/January 2024

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17 Course Coordinator:

Name: **Dr. Hanan Sa'adeh**
Contact hours: Announced on the website: eacademic.ju.edu.jo/hanan.saadeh/default.aspx
Office number: Physics Building, 2nd Floor, Room 220 Phone number: 065355000 Ext. 22029
Email: Hanan.Saadeh@ju.edu.jo

18 Other instructors:

None

19 Course Description:

As stated in the approved study plan. Introductory Course of Optics: Topics include: Nature of Light, Huygen's Principle, Fermat's Principle, Wave Equations, Superposition of Waves, Interference of Light, Optical Interferometry, Production of Polarized Light, Fraunhofer Diffraction, Diffraction Grating.

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20 Course aims and outcomes:

A- Aims:

1- Equipping the student with a set of general tools to understand basic optical phenomena and model simple optical devices.
2- Connecting theoretical concepts to real-world applications and experiments.
3- Developing an intuitive capability to research and to uncover the working principles of things that involve light.

B- Students Learning Outcomes (SLOs):

For purposes of mapping the course SLOs to the physics program SLOs, at the successful completion of the physics program, graduates are expected to be able to:

SLO (1) Master professionally a broad set of knowledge concerning the fundamentals in the basic areas of physics: Quantum Mechanics, Classical Mechanics, Electrostatics and Magnetism, Thermal Physics, Optics, Theory of Special Relativity, Mathematical Physics, Electronics.

SLO (2) Apply knowledge of mathematics and fundamental concepts in the basic areas of physics to identify and solve physics related problems.

SLO (3) Utilize computers and available software in both data collections and data analysis.

SLO (4) Utilize standard laboratory equipment, modern instrumentation, and classical techniques to design and conduct experiments as well as to analyze and interpret data.

SLO (5) Develop a recognition of the need and ability to engage in life-long learning.

SLO (6) Demonstrate ability to use techniques, skills, and modern scientific tools necessary for professional practice.

SLO (7) Communicate clearly and effectively in both written and oral forms.

SLO (8) Apply proficiently team-work skills and employ team-based learning strategies.

SLO (9) Apply professional and ethical responsibility to society.

Upon successful completion of this course, students will be able to:

Program SLOs / Course SLOs	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)	SLO (9)
1. understand the fundamentals of geometrical and physical optics.	✓								
2. describe and interpret most geometrical and physical phenomena in optics.	✓	✓							
3. understand basic optical systems.	✓	✓							
4. master general concepts of wave propagation that can be applied in a variety of different contexts, from acoustics to microwaves.	✓	✓							
5. set up equations for relevant optical phenomena and solve for relevant quantities of interest	✓	✓							

21. Topic Outline and Schedule:

Week	Lecture	Topic	Intended Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1 1.2 1.3	**Nature of Light** A Brief History Particles and Photons The Electromagnetic Spectrum	1	Face to Face	Lecture room	Synchronous	HW &/Or Quiz	Ch.1 Sec 1-3
2	2.1 2.2 2.3	**Geometrical Optics** Huygens' Principle Fermat's Principle Principle of Reversibility Reflection in Plane Mirrors	1,2,3	Face to Face	Lecture room	Synchronous	Discussion	Ch. 2 Sec. 1-11
3	3.1 3.2 3.3	Refraction Through Plane Surfaces Imaging by an Optical System Reflection at a Spherical Surface						
4	4.1 4.2 4.3	Refraction at a Spherical Surface Thin Lenses Vergence and Refractive Power Newtonian Equation for the Thin Lens						

5	5.1 5.2 5.3	**Optical Instrumentation** Prisms **Wave Equations** One-Dimensional Wave Equation Harmonic Waves Complex Numbers (***Self-Reading***)	3 2,4	Face to Face	Lecture room	Synchronous	Discussion Exam	Ch.3 Sec. 3 Ch.5 Sec. 1-6, 8, 9
6	6.1 6.2 6.3	Harmonic Waves as Complex Functions Plane Waves Spherical Waves Electromagnetic Waves Light Polarization						
7	7.1 7.2 7.3	**Superposition of Waves** Superposition Principle Superposition of Waves of the Same Frequency	2,4,5	Face to Face	Lecture room	Synchronous	Discussion	Ch. 6 Sec. 1-6
8	8.1 8.2 8.3	Random and Coherent Sources Standing Waves The Beat Phenomenon Phase and Group Velocities						
9	9.1 9.2 9.3	**Interference of Light** Two-Beam Interference Young's Double-Slit Experiment Double-Slit Interference with Virtual Sources	1-5	Face to Face	Lecture room	Synchronous	Discussion Exam	Ch.7 Sec. 1-8
10	10.1 10.2 10.3	Interference in Dielectric Films Fringes of Equal Thickness Newton's Rings Film-Thickness Measurement by Interference Stokes Relations **Optical Interferometry**						
11	11.1 11.2 11.3	The Michelson Interferometer Applications of the Michelson Interferometer						Ch.8 Sec. 1-4

12	12.1 12.2 12.3	Variations of the Michelson Interferometer (Self-Reading) The Fabry-Perot Interferometer (Self-Reading)						
13 14 15	13.1 13.2 13.3 14.1 14.2 14.3 15.1 15.2 15.3	**Fraunhofer Diffraction** Diffraction from a Single Slit Beam Spreading Rectangular and Circular Apertures Resolution Double-Slit Diffraction Diffraction from Many Slits (***Self-Reading***) **The Diffraction Grating** The Grating Equation Free Spectral Range of a Grating Dispersion of a Grating Resolution of a Grating	1-5	Face to Face	Lecture room	Synchronous	Discussion Project Exam	Ch. 11 Sec. 1-6 Ch. 12 Sec. 1-4

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Assignment &/Or Quizzes	5	Chapter 1	1 & 2	Oct 2023	On Campus
Midterm Exam	30	Chapters 1-3 & 5	1 & 2	Dec 2023	On Campus
Second Exam		Chapters 6 & 7	1 & 2	January 2023	On Campus
Group Project	15	Any subject related to the material	1-9	Dec-Jan 2023	Elearning + On Campus
Final Exam	50	All material	1 & 2	Jan 2023	On Campus

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23 Course Requirements

Textbook, Lecture Notes, Scientific Calculator.

24 Course Policies:

A- Attendance policies:

Class attendance is expected. Past experience has shown that students who do not attend the lectures invariably receive poor grades.

A student whose absence exceeds 15% of lectures will be dismissed.

B- Absences from exams and submitting assignments on time:

Absence from exams without an acceptable excuse means ZERO.

Some homework assignments will be graded. Some problems will be selected and discussed in an extra lecture for every chapter.

C- Health and safety procedures:

No special precautions.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

All these issues will be considered according to the regulations and laws adopted at the University of Jordan.

E- Grading policy:

Homework & Quizzes: 5%

Midterm Exam: 30%

Group Project: 15%

Final Exam: 50%

F- Available university services that support achievement in the course:

Class Room, Ibn Al-Haytham Laboratory, Students Computer Lab, Library

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25 References:

A- Required book(s), assigned reading and audio-visuals:

Introduction to Optics, 3rd Edition (2014), by F. L. Pedrotti, L. M. Pedrotti, and L. S. Pedrotti.

B- Recommended books, materials, and media:

1- Optics, 5th Edition (2017), by E. Hecht.

2- Schaum's outlines - Optics, by E. Hecht (McGraw-Hill).

3- Ibn Sahl Corner for Optics at PhysLAB: https://www.physlab.org/optics-lab/

26 Additional information:

None

Name of Course Coordinator: **Dr. Hanan Sa'adeh** Signature: ---------- Date: **14/01/2024**
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------