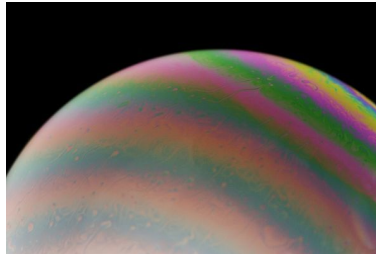


OPTI-210
PHYSICAL OPTICS I
SPRING 2022



Instructor

Dalziel Wilson

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Teaching Assistants

Mitul Dey Chowdhury (mituldc@email.arizona.edu)
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Lectures

Time: Monday, 12:00 AM - 1:15 PM & Wednesday, 11:30 AM - 12:45 PM
Location: Meinel 307

Office hours

- Instructor: Tuesday (office) & Friday (Zoom), 2:00 - 3:30 PM
- TA (Mitul): TBA
- TA (Christian): TBA

Course objectives

OPTI-210 will introduce students to concepts from physical optics, including:

Mathematical tools for describing waves (e.g. complex numbers)
Maxwell's equations and the electromagnetic wave equation
Plane electromagnetic waves
The Lorentz oscillator model of light-matter interaction.
Reflection and refraction at a dielectric interface
Thin film interference and the Fabry-Pérot cavity
Light polarization and its description using Jones calculus
1D Fraunhofer diffraction: single and double slit diffraction
2D Fraunhofer diffraction: square and circular apertures

Learning outcomes

After completing the course, students should be able to

1. Explain the concept of wave motion as applied to optics.
2. Describe the propagation of plane-wave optical fields
3. Explain the microscopic origin of material optical properties.
4. Analyze transmission and reflection at an interface.
5. Analyze multiple beam interference devices.
6. Describe polarized light using Jones calculus.
6. Analyze simple problems involving diffraction of optical waves.

Schedule of activities and topics

The class will consist of

- Two 75-minute lecture sessions per week.
- Ten problem sets distributed evenly over the semester.
- Two in-class mid-terms plus a final exam.

Lectures will cover the following topics, in chronological order

1. Review of vector calculus and complex numbers [2 lectures]
2. Basics of wave motion [4 lectures]
3. Maxwell's equation in integral and differential form [4 lectures]
4. Maxwell's wave equation and properties of the plane-wave solution [4 lectures]
5. Reflection & refraction at an interface [4 lectures]
6. Polarization and its description [4 lectures]
7. Interference and the Fabry-Perot [2 lectures]
8. Basic concepts of diffraction by planar objects [2 lectures]

Required materials

Two textbooks are required for the class:

1. *Optics* (4th Edition), Hecht
2. *Introduction to Modern Optics* (2nd Edition), Fowles

In addition, course and lecture notes will be made available on D2L.

Grading

Grades will be based on the following

Homework	(30%)
Midterm exam 1	(20%)
Midterm exam 2	(20%)
Final exam	(30%)

The suggested grading scale is: A: 90-100%, B: 75-89%, C: 60-74%, D: 50-59%, E: <49%. Final grades will be assigned using the clumping method to identify natural thresholds. If clumping results

in a lower grade, the suggested scale will be used. For scores at the threshold between two grades, demonstration of improvement over the course of the semester will be a deciding factor.

Note: Homework is governed by the honor system. Discussion with others is encouraged, but the work you hand in must be your own.

Remote course policy

This class is scheduled to be taught in the in-person modality. Students who cannot attend lecture may arrange with the instructor for access to lecture material, including recordings from 2021. Office hours will be conducted in-person and remotely using Zoom. All material will be exchanged through D2L, including homeworks and exams.

Face coverings are required during in-person meetings

Per UArizona's Administrative Directive, face coverings that cover the nose, mouth, and chin are required to be worn in all learning spaces at the University of Arizona (e.g., in classrooms, laboratories and studios). Any student who violates this directive will be asked to immediately leave the learning space, and will be allowed to return only when they are wearing a face covering. Subsequent episodes of noncompliance will result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied. The student will not be able to return to the learning space until the matter is resolved.

Physical distancing is required during in-person meetings

In-person class meetings will respect CDC guidelines, including restricted seating to increase physical distancing. Any student who does not maintain physical distance from others may be asked to immediately leave the learning space. Noncompliance may result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied.

Classroom attendance and COVID policy

Attendance is required at all lectures and encouraged at office hours, excepting complications arising due to the pandemic, viz:

- If you feel sick, or if you need to isolate and quarantine based on **University protocols**, please stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify the instructor or TAs if you will be missing an in person or online course meeting, or you will miss an assignment deadline.
- Non-attendance for any reason does not guarantee and automatic extension of due date or rescheduling of examinations/assessments. Please communicate and coordinate any request directly with your instructor.
- If you must miss the equivalent of more than one week of class, please contact the Dean of Students Office (DOS-deanofstudents@email.arizona.edu) to share documentation about the challenges you are facing.
- Voluntary, free, and convenient **COVID-19 testing** is available for students on Main Campus.
- If you test positive for COVID-19 and you are participating in on-campus activities, you must report your results to Campus Health. To learn more about the process for reporting a positive test, visit the **Case Notification Protocol**.

- The COVID-19 vaccine and booster is available for all students at [Campus Health](#).
- Visit the [Arizona COVID-19 webpage](#) for the most up-to-date information.

In accordance with UA policy, absences for any sincerely held religious belief, observance, or practice will also be accommodated where reasonable. See policy.arizona.edu/human-resources/religious-accommodation-policy for details.

Absences pre-approved by the UA Dean of Students (or dean's designee) will also be honored.

Final Examination Date and Regulations

The date and time of the final exam can be found at <http://www.registrar.arizona.edu/schedules/finals.htm>.

Final Exam Regulations can be found at <https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information>.

Classroom behavior policy

To foster a positive learning environment, students are asked to refrain from texting, chatting, reading a newspaper, making phone calls, or surfing the internet.

Threatening Behavior Policy

In accordance with the UA Threatening Behavior by Students Policy, threats of physical harm to any member of the University community, including to oneself, will not be tolerated. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Academic integrity policy

Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog: <http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>. In particular, plagiarism is strongly discouraged. See "Grading" for note about homework.

Nondiscrimination and anti-harassment policy

Students are expected, together with the instructor, to foster an environment that encourages expression of ideas without fear of harassment. As such, bullying and discrimination, as described in UA's Nondiscrimination and Anti-harassment Policy, <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>, will not be tolerated.

Accessibility and accommodations

Students faced with accessibility challenges, for example due to pregnancy or due to a disability, will be given reasonable accommodation. Please consult the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) for details.

Subject to change statement

Information contained in the course syllabus, other than grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.