

**Faculty of Science Course Syllabus (Section A)**  
**Department of Department of Physics and Atmospheric Science**

PHYC 3540 / 3.0 Credit Hours

Optics and Photonics

Fall 2022/2023

*Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.*

**Instructor:** Dr. Chongyin Yang ([website](#))

**Office:** Dunn 224

**Email:** c.yang@dal.ca

**Office Phone:** 902-494-3915

**Lectures:** Tuesday & Thursday, 1:05 pm - 2:25 pm, Life Sciences Centre - OCEANOGRAPH O3655 (Sep 06, 2022 - Dec 07, 2022)

**Office Hours:** Tuesday & Thursday, 2:30 pm - 3:30 pm, or by appointment (email), Dunn 224

**Tutorials:** Once before Midterm, and once before Final. 1.5 hours for each.

**Course delivery:** In-person

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### **Course Description**

Topics in physical and geometrical optics will be covered. Selected applications will be presented in certain areas of photonics, including micro-optic sensors, semiconductor lasers and detectors, optical waveguides and fibres, optical signal processing and telecommunications.

It is expected that students are familiar with the mathematics of complex numbers and simple ODE/PDE analysis.

### **Course Prerequisites**

- PHYC 2150 - Physics Tools: Experiment and PHYC 2510 - Electricity and Magnetism and MATH 2002 - Intermediate Calculus II, or
- Permission of instructor

### **Learning Objectives**

This course is designed to be an introduction to the principles of geometric and physical optics. On successful completion of this course, you will be familiar with:

- the review of the production and measurement of light.
- the theory of geometric optics (mirrors, lenses, prisms, etc) with applications to some instruments.
- some detail physical optics; that is, light as described by Maxwell's equations.
- the propagation of light, properties of electromagnetic waves in vacuum/linear media, group velocity, polarization, coherence, interference, Fourier analysis, interferometry (i.e., Michelson-Morely & Fabry-Perot), diffraction and time permitting, the optics of solids.

## Course Materials

Textbook: Introduction to Optics, by F. L. Pedrotti, L. M. Pedrotti, L. S. Pedrotti, 3rd Edition.

- Hard copy available online for approximately \$76
- PDF version also widely available

## Course Assessment

Assessment	Weight (% of final grade)	Date
Assignments (6)	60%	Due date will be announced with each assignment
Midterm exam	15%	To be determined
Final exam	25%	To be determined

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D	(50-54)
A (85-89)	B (73-76)	C (60-64)	F	(<50)
A- (80-84)	B- (70-72)	C- (55-59)		

## Course Policies on Missed or Late Academic Requirements

**Assignments:** The assignments will be handed out **in class** and the solutions will be submitted on **Brightspace**. Instructions for how to submit assignments will be provided with the first assignment. Due date will be announced with each assignment. Any assignment submitted for marking after the due date will incur a 10% per day penalty. Any work submitted more than 5 days late will receive a zero. Due date extensions can be granted for valid medical or other reasons. Please email me before the due date, if requesting an extension.

**Mid-term Exam:** There will be one open-book midterm exam and it will be held during the class time after we finished “Geometric Optics” section.

**Final Exam:** There will be one open-book final exam. It will be scheduled by the registrar.

**Missed exams:** Students with valid excuse must contact Dr. Yang at least one hour prior to the start of the midterm exam to be excused. There will be no makeup midterm exam and the weight of the midterm will be transferred to the final exam. Generally, there will be no makeup for final exam.

**Communications:** Announcements will be made in class and also via Brightspace.

## Course Policies related to Academic Integrity

Students are expected to complete the assignments on their own. Discussions between students to solve assignments problems is encouraged, however the work submitted by each student for grading should be unique. Copying another student answer is cheating and doing so will result in a mark of zero on the assignment in question.

## Course Content

- (1) Production and Measurement of Light
- (2) Geometric Optics: Lenses, Stops, Mirrors, Prisms, Optical Systems, Aberration Theory, GRIN lenses

*Midterm exam*

- (3) Propagation of light: Maxwell’s equations, waves, polarization, Fresnel’s equations for reflection and

refraction, critical reflection

(4) Coherence and Interference: Superposition, Fourier analysis, Fourier transform spectroscopy, Multiple Beam interference, Fabry-Perot interferometry

(5) Diffraction: Fraunhofer and Fresnel diffraction, Applications to Fourier transform spectroscopy

*And time permitting*

(6) Optics of solids: Propagation of light in conducting and dielectric media, reflection of light at the boundary of absorbing media.

*Final exam*

## Section B: University Policies and Statements

**This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate**

### **Academic Integrity**

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

**Information:** [https://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](https://www.dal.ca/dept/university_secretariat/academic-integrity.html)

### **Accessibility**

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

**Information:** [https://www.dal.ca/campus\\_life/academic-support/accessibility.html](https://www.dal.ca/campus_life/academic-support/accessibility.html)

### **Student Code of Conduct**

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

**Code:** [https://www.dal.ca/dept/university\\_secretariat/policies/student-life/code-of-student-conduct.html](https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html)

### **Diversity and Inclusion – Culture of Respect**

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

**Statement:** <http://www.dal.ca/cultureofrespect.html>

### **Recognition of Mi'kmaq Territory**

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) ([elders@dal.ca](mailto:elders@dal.ca)).

**Information:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

### **Important Dates** in the Academic Year (including add/drop dates)

[https://www.dal.ca/academics/important\\_dates.html](https://www.dal.ca/academics/important_dates.html)

### **University Grading Practices**

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/grading-practices-policy.html](https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html)

## Section C: Student Resources and Support

### Advising

**General Advising** [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)

**Science Program Advisors:** <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

**Indigenous Student Centre:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

**Black Students Advising Centre:** [https://www.dal.ca/campus\\_life/communities/black-student-advising.html](https://www.dal.ca/campus_life/communities/black-student-advising.html)

**International Centre:** [https://www.dal.ca/campus\\_life/international-centre/current-students.html](https://www.dal.ca/campus_life/international-centre/current-students.html)

### Academic supports

**Library:** <https://libraries.dal.ca/>

**Writing Centre:** [https://www.dal.ca/campus\\_life/academic-support/writing-and-study-skills.html](https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html)

**Studying for Success:** [https://www.dal.ca/campus\\_life/academic-support/study-skills-and-tutoring.html](https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html)

**Copyright Office:** <https://libraries.dal.ca/services/copyright-office.html>

**Fair Dealing Guidelines** <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

### Other supports and services

**Student Health & Wellness Centre:** [https://www.dal.ca/campus\\_life/health-and-wellness/services-support/student-health-and-wellness.html](https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html)

**Student Advocacy:** <https://dsu.ca/dsas>

**Ombudsperson:** [https://www.dal.ca/campus\\_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html](https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html)

### Safety

**Biosafety:** <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

**Chemical Safety:** <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

**Radiation Safety:** <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

**Scent-Free Program:** <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

**Dalhousie COVID-19 information and updates:** <https://www.dal.ca/covid-19-information-and-updates.html>