

**Course Description:** Review of wave optics; electromagnetic optics; polarization optics; guided wave optics; interference; interferometry; resonator optics; semiconductors; lasers and detectors. Photonic devices using silicon: passive devices (waveguides), active devices (modulators, lasers, photodetectors), opto-electronic integration, applications in bio-medical sensing, telecommunication, and renewable energy.

**Instructors:** **Professor Winnie Ye** (<https://SiPhotonics.carleton.ca/>) Email: [winnie.ye@carleton.ca](mailto:winnie.ye@carleton.ca)  
Office hours: **Thursdays @14:25-15:25 (MC3074)**

**Prerequisite:** Advanced EM theory

**Learning Modality:** In-person lectures on **Tuesdays** and **Thursdays** at **13:00 to 14:30** in **Canal Building CB2400**

**Suggested Textbooks:** **Silicon Photonics: The State of the Art**, Graham T. Reed; Wiley 2008. ISBN: 9780470025796  
**Silicon Photonics: An Introduction**, Graham T. Reed and Andrew P. Knights; Wiley 2004. ISBN: 0470870346  
**Fundamentals of Photonics**, B.E.A. Saleh and M.C. Teich; Wiley, 2007. ISBN:9780471358329

**Course Material:** Course information will be posted on **Brightspace** (<https://brightspace.carleton.ca/>). Check at least weekly for course related information. All course materials will be posted online.

**For uOttawa students, you need to get access to Brightspace. Please go to: <https://gradstudents.carleton.ca/faculty-of-graduate-and-postdoctoral-affairs-access-to-brightspace/>**

**Marking Scheme:** Final Exam – closed book (50%); Assignments (20%); Term Project (30%)  

- *Final exams are for evaluation purpose and will not be returned to students.*

**Required Software:** Lumerical (You will need a VLSI account, please contact Nagui for setting up your account.)  
 Technical support: Mr. Nagui Mikhail  
 Email: [Nagui.Mikhail@carleton.ca](mailto:Nagui.Mikhail@carleton.ca)  
 Phone: 613-520-2600 Ext.5766  
 Office: ME5124

**Tentative Weekly Outline:** (Please log onto **Brightspace** for the most up to date information)

Week	Topics
1	Chapter 1: Introduction
2	Chapter 2: Waveguides Theory and Properties
3	Chapter 3: Coupling Theory
4	Chapter 4: Passive Devices: Directional Couplers, MMIs, Y-junctions, MZI, AWG
5	Chapter 5: Resonators: Ring Resonators, Photonic Crystals
6	<i>*Note: Oct 10<sup>th</sup> lecture will be offered by my PhD student Ilyas Kandid and a pre-recorded video</i>
7	Chapter 6: Active Devices: Modulators

8	Fall break: <b>Oct 23<sup>rd</sup> to Oct 27<sup>th</sup>, 2023</b>
9	Chapter 7: Active Devices - Optical Sources (light-emitting diodes, optical amplifiers, lasers)
10	Chapter 8: Active Devices - Light Detectors (photodetectors, photodiodes, avalanche photodiodes)
11	Chapter 9: Optoelectronic Integration
12	Chapter 10: Applications
13	Review

### Deferred Final Examinations

Students who are unable to write the final examination because of a serious illness/emergency or other circumstances beyond their control may apply for accommodation by contact the Registrar's office. Consult the Section 4.3 of the University Calendar:

<https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/examinations/>

### Self-Declaration form and Deferred Term work

Calendar language (Section 4.4:

<https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/examinations/#deferred-term-work>):

Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases this must occur no later than three (3) days after the term work was due. The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule.

Instructors can require (or not) the student to submit the self-declaration form. Include the following statement if you require the student to submit a completed self-declaration form:

**Consult with the instructor no later than 3 days after any missed course work or midterm examination.**

or

**Contact the instructor with the completed self-declaration form no later than 3 days after the date/deadline of term work including test/midterm, labs, assignments.**

### Copyright

The materials (including the course outline and any slides, posted notes, videos, labs, project, assignments, quizzes, exams and solutions) created for this course and posted on this web site are intended for personal use and may not be reproduced or redistributed or posted on any web site without prior written permission from the course instructor.

### Advising and Counselling services

#### a) Engineering Academic Advising

The Engineering Academic Support Service: <https://carleton.ca/engineering-design/current-students/graduate-student-resources/> assists graduate engineering students with course selection, registration, and learning support. The website lists the Academic Advisors Contacts.

#### b) Student Mental Health Service

As a University student you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. Carleton's Wellness Services Navigator <https://wellness.carleton.ca/navigator/> is

designed to help students connect with mental health and wellness resources. If you need to talk to someone, please reach out for assistance: <https://carleton.ca/health/emergencies-and-crisis/>.

## Learning and Working Environment

The University and all members of the University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at [equity@carleton.ca](mailto:equity@carleton.ca).

We will strive to create an environment of mutual respect for all through equity, diversity, and inclusion within this course. The space which we work in will be safe for everyone. Please be considerate of everyone's personal beliefs, choices, and opinions.

## Academic Integrity and Plagiarism

a) Please consult the Faculty of Engineering and Design information page about the Academic Integrity policy and our procedures: <https://carleton.ca/engineering-design/current-students/fed-academic-integrity> Violations of the Academic Integrity Policy will result in the assignment of a penalty such as reduced grades, the assignment of an F in a course, a suspension or, expulsion.

b) One of the main objectives of the Academic Integrity Policy is to ensure that the work you submit is your own. As a result, it is important to write your own solutions when studying and preparing with other students and to avoid plagiarism in your submissions. The University Academic Integrity Policy defines plagiarism as "presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one's own." This includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source.

Examples of violations of the policy include, but are not limited to:

- any submission prepared in whole or in part, by someone else;
- using another's data or research findings without appropriate acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own; and
- failing to acknowledge sources of information through the use of proper citations when using another's work and/or failing to use quotations marks.

**\*\*Use of generative AI tools (such as ChatGPT) in course work is prohibited unless explicitly authorized by the course instructor for specific elements of the course.**

## Academic Accommodations

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation:** write to the course instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For accommodation regarding a formally-scheduled final exam, you must complete the [Pregnancy Accommodation Form](#).

**Religious obligation:** write to the course instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details [click here](#).

**Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and **no later than two weeks** before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the [PMC website](#) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

**Survivors of Sexual Violence:** As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: <https://carleton.ca/equity/sexual-assault-support-services>

**Accommodation for Student Activities:** Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation will be provided to students who compete or perform at the national or international level. Write to the course instructor with any requests for academic accommodation **during the first two weeks of class**, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>