Engineering Physics
ENGPHYS 3PD4
Photonic Devices
Undergraduate Studies
Winter 2026
Course Outline

Instructor Office Hours and Contact Information

Dr. Jon Bradley
JHE A413
jbradley@mcmaster.ca
ext. 24013

Office Hours:
By appointment

Lab Supervisor Office Hours and Contact Information

Mohammadreza Shahzadeh
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905-525-9140

Office Hours:
By appointment

Teaching Assistant Office Hours and Contact Information

TAs and Contact Information:
See course website

Office Hours:
By appointment

Course Website/Alternate Methods of Communication

The official means of communication with students is via the course webpage on Avenue to Learn.
It is the students' responsibility to regularly check the course webpage for updates and announcements.

Class Format

Course Dates: 01/05/2026 - 04/07/2026
Units: 4
Course Delivery Mode: All classes are in-person.
Course Description: This course covers the theory, design and operation of photonic devices such as waveguides, couplers, modulators, detectors and lasers, and their applications in integrated and fiber optical systems for communications, information processing and sensing.
Three lectures, one lab (three hours), second term
Prerequisite(s): One of ENGPHYS 3E03 or 3E04 or PHYSICS 3N03 or 3N04
Antirequisite(s): ENGPHYS 3PD3

The course is scheduled as follows:

- C01: lecture Monday 12:30 – 1:20 pm see Mosaic or Avenue for location
- C01: lecture Tuesday 1:30 – 2:20 pm see Mosaic or Avenue for location
- C01: lecture Thursday 12:30 – 1:20 pm see Mosaic or Avenue for location
- L01: lab Monday 2:30 – 5:20 pm see Mosaic or Avenue for location

- L02: lab Tuesday 2:30 – 5:20 pm see Mosaic or Avenue for location
- L03: lab Wednesday 2:30 – 5:20 pm see Mosaic or Avenue for location
- L04: lab Thursday 2:30 – 5:20 pm see Mosaic or Avenue for location
- L05: lab Friday 2:30 – 5:20 pm see Mosaic or Avenue for location

COURSE INTENDED LEARNING OUTCOMES

By the end of this course, students should be able to:

- Demonstrate fundamental knowledge related to photonic devices
- Understand the theory of planar, ridge and fiber-optical waveguides
- Understand the basic operation of passive photonic devices including splitters/combiners and cavities
- Understand the basic operation of active photonic devices including switches, modulators and photodetectors
- Experimentally characterize silicon passive and active integrated photonic devices using a fiber-optic probe station
- Demonstrate knowledge of applications of photonic integrated circuits and fiber-optic devices and systems

ENGINEERING ACCREDITATION: GRADUATE ATTRIBUTES AND LEARNING OUTCOMES

The Canadian Engineering Accreditation Board (CEAB) is a division of Engineers Canada and is responsible for accrediting undergraduate engineering programs across Canada. Accreditation by the CEAB ensures that the engineering programs meet a national standard of quality and cover essential educational requirements. Graduate Attributes are a set of qualities and skills that the CEAB expects engineering graduates to possess. These attributes are a benchmark for the learning outcomes of accredited engineering programs.
For more information on Engineering Accreditation, please visit: https://www.engineerscanada.ca

COURSE ORGANIZATION

The course is organized as follows:

- 3 classroom-based lectures per week
- Tutorials on photonic design (held during the regularly scheduled lecture time)
- 4 assignments
- 4 labs and reports
- 1 team project including a presentation and design report

Specific details about the course format and expectations will be provided in the first lecture.

LAB INFORMATION AND SAFETY

There will be 4 labs during the course, including an introductory lab on photonic measurements and labs on waveguides, passive devices, and active devices, as well as 4 lab reports. Students will be required to complete the relevant safety training, including laser safety training. See course webpage for lab details and instructions and important safety information.

COURSE SCHEDULE

A weekly breakdown of the course schedule

Week(s)	Topic	Readings
1	Introduction	See lecture notes

2-4	Optical waveguide theory	See lecture notes
5-8	Passive photonic devices	See lecture notes
9-11	Active optoelectronic devices	See lecture notes
12-14	Team project and presentations	See lecture notes

This lecture schedule is based upon current university and public health guidelines and may be subject to changes during the term. Any changes to the schedule or course delivery will be communicated on the course announcements section on Avenue to Learn. Please check the announcements prior to attending class.

REQUIRED/OPTIONAL MATERIALS AND FEES

Required Texts:
N/A

Recommended Additional Texts (available for free via the McMaster library):
Robert G. Hunsperger, *Integrated Optics: Theory and Technology*, 6th Ed., Springer, 2009
Govind P. Agrawal, *Fiber-Optic Communication Systems*, 4th Ed., Wiley, 2010
Lukas Chrostowski and Michael Hochberg, *Silicon Photonics Design*, Cambridge University Press, 2015

Calculator:
Only the McMaster Standard Calculator will be permitted in tests and examinations. This is available at the Campus Store.

Other Materials (available for free for students taking the course):
MATLAB, Synopsis RSoft, and Luceda software will be used for photonic device and system design and simulation.

COURSE ASSESSMENT DETAILS

Component	Weight
Assignments	40%
Labs	30%
Team project	30%
Total	100%

GRADING SCALE

The McMaster 12 Point Grading Scale

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62

D+	3	57-59
D	2	53-56
D-	1	50-52
F	0	0-49

COURSE POLICY ON MISSED WORK, EXTENSIONS, AND LATE PENALTIES

1. It is the students' responsibility to regularly check the course webpage (Avenue to Learn) for updates and announcements.
2. Missed work and late polices:
   - A McMaster Student Absence Form (MSAF, https://www.mcmaster.ca/msaf/) must be submitted to the course instructor (Jon Bradley, jbradley@mcmaster.ca) not to the TA, for all missed work, otherwise a late penalty of -5%/day for late assignments and lab reports up to a maximum of -50% will be applied. The MSAF must normally be submitted within 2 WORKING DAYS of the missed work. If an MSAF is submitted, 1 extra week will be given from the regular assignment or lab report due date.
   - All assignments and lab reports must be completed. A grade of zero will be given for any incomplete assignment or lab report.

GENERATIVE AI

Students may use generative AI for editing/translating/outlining/brainstorming/revising their work throughout the course so long as the use of generative AI is referenced and cited following citation instructions given on Avenue to Learn. Use of generative AI outside the stated use of editing/translating/outlining/brainstorming/revising their work with citation will constitute academic dishonesty. It is the student's responsibility to be clear on the limitations for use and to be clear on the expectations for citation and reference and to do so appropriately.
Students must prepare their assignments, lab reports, and team projects themselves, including working out solutions and carrying out simulations themselves, and be able to explain the work they submit.

APPROVED ADVISORY STATEMENTS

EQUITY, DIVERSITY, AND INCLUSION

Every registered student belongs in this course. Diversity of backgrounds and experiences is expected and welcome. You can expect your Instructor to be respectful of this diversity in all aspects of the course, and the same is expected of you.

The Department of Engineering Physics and the Faculty of Engineering are committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexual orientations, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our Department, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Undergraduate Chair, Academic Advisor or to contact the Equity and Inclusion Office.

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy*, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty:
1. plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. improper collaboration in group work.
3. copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

McMaster is committed to an inclusive and respectful community. These principles and expectations extend to online activities including electronic chat groups, video calls and other learning platforms.

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

Academic Advising

Academic Advisors are available to assist you with any problems or questions you may have. This includes course selections, changes to your enrolment, McMaster Student Absence Form (MSAF), Religious, Indigenous, or Spiritual Observances (RISO) forms, exams, taking courses at another university (for credit at McMaster), Petitions for Special Consideration, and much more. Below is the contact information for the Office of the Associate Dean (Academic) in the Faculty of Engineering:

JHE-Hatch 301
https://www.eng.mcmaster.ca/programs/academic-advising
(905) 525-9140 ext. 24646

Physical and Mental Health

For a list of McMaster University's resources, please refer to the Student Wellness Centre.

Requests for Relief for Missed Academic Work

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work". An abbreviated version is provided below.

The University recognizes that students periodically require relief from academic work due to extenuating circumstances. Students seeking relief for missed academic term work are expected to read the ***McMaster Student Absence Form Policy***. The Policy aims to manage these requests by taking into account the needs and obligations of students, instructors and administrators. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in their course. Any concerns regarding the granting of relief should be directed to the Faculty Office.

1. **Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three (3) calendar days:**

- Use the McMaster Student Absence Form (MSAF) on-line self-reporting tool. No further documentation is required.
- Students may submit requests for relief using the MSAF once per term.
- An automated email will be sent to the course instructor, who will determine the appropriate relief. Students must immediately follow up with their instructors. Failure to do so may negate the opportunity for relief.
- The MSAF cannot be used to meet a religious obligation or to celebrate an important religious holiday.
- The MSAF cannot be used for academic work that has already been completed or attempted.
- An MSAF applies only to work that is due within the period for which the MSAF applies, i.e. the 3-day period that is specified in the MSAF; however, all work due in that period can be covered by one MSAF.
- The MSAF cannot be used to apply for relief for any final examination or its equivalent. See *Petitions for Special Consideration* above.

2. **For medical or personal situations lasting more than three (3) calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has been used previously in that term:**

    - Students must report to their Faculty Office to discuss their situation and will be required to provide appropriate **supporting documentation**.
    - If warranted, the Faculty Office will approve the absence, and the instructor will determine appropriate relief.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.