

Physics 3380
Optics and Photonics
Course Information: Winter 2019

1. Course Description

An introduction to the principles of optics and modern optical devices. Topics include geometrical optics, interference, diffraction, reflection, transmission, and polarization, modulation of light waves, fiber-optical light guides, optical communication systems, integrated optics.

Antirequisites: none

Prerequisites: Physics 2101A/B or 2800 or Materials Science 2800, and Calculus 2302A/B or 2502A/B.

3 lecture hours, 0.5 course.

Note: Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Learning Outcome

The course will deliver the following learning outcomes:

Fundamental knowledge of optics and photonics; literacy in the field of optics and photonics; ability to translate knowledge into applications by recognizing optics/photonics concepts for design of opt. instrumentation; problem solving skills; gather, select, comprehend, organize, present and illustrate new material on an assigned optics/photonics topic in form of a talk and a handout; write short, crisp and informative teaching summary document in a scientific format; critical thinking; communication skills; assessment is conducted iter alia by assignments, exams, and assessing the peers talk's quality.

3. Timetable

Physics 3380	Section 001
Lecture Times:	Tuesdays 12:30 - 14:30 in Physics & Astronomy 34 Thursdays 14:30 - 15:30 Arts & Humanities Building 1B04
Instructor:	Prof. Silvia Mittler
e-mail:	smittler@uwo.ca
Phone:	(519) 661-2111 x 88592
Office:	P&A 208
Web Sites:	OWL: https://owl.uwo.ca/

4. Course Materials

Textbook: Students are encouraged to go to the library and find books according to class content and their assigned talk/handout topic.

5. Course Content

The course content is outlined in the following table.

Topic	Delivery
The electro-magnetic wave: intensity, momentum, refractive index, Fermat's Principle	lectures
Geometrical optics or ray optics	lectures
Interference and diffraction: Interferometer, plan parallel films, optical coatings, coherence, Snell's law, resolution of optical instruments, numerical aperture	lectures
Transmission and reflection: Fresnel equation, reflection coefficient, Brewster angle and its application, total internal reflection, Goos-Hänchen shift, evanescent fields	lectures
Guided waves and integrated optics: Waveguides, coupling into a waveguide, focusing beams, mode spectra, TE and TM, channel waveguides	lectures
Plasmonics (if time is left)	lectures
Fluorescence spectroscopy (theory and spectrometer)	talk and handout
Fluorescence microscopy	talk and handout
Polarization optics: $\lambda/2$, $\lambda/4$ plates, etc.	talk and handout
Polarization and Stokes vectors	talk and handout
TIRF microscopy	talk and handout
The eye, its problems and how to correct	talk and handout
The colors of the sky (light scattering)	talk and handout
Dispersion	talk and handout
Laser	talk and handout
Scanning near field optical microscope (SNOM)	talk and handout
Localized Surface Plasmon Resonance (LSPR)	talk and handout

Your final grade in this course will be derived according to:

Midterm in class	15%
Final Examination	30%
Assignments	15%
Talk	20%
Handout for other students	15%
Assessment of talk quality of peers	5%

The Department of Physics and Astronomy may, in rare cases, adjust the final course marks in order to conform to Departmental policy.

7. Midterm

There will be a midterm written in class on Tuesday, February 12th, 2019 from 12:30 - 14:20 in Physics and Astronomy 34, covering the material presented in class until (including) Thursday, February 7th, 2019.

8. Talk, Handout and Assessments of Talks

After the topics for the talks and handouts have been chosen and the presentation times are set, the students are supposed to start searching for appropriate material in the library and on-line by themselves. On-line sources alone are not accepted. The hand out should not extend 6 pages. It should contain the information from the talk. It should be edited similar to a scientific publication: title of talk and name of author present, date of talk given, figures have a number and a figure caption, tables have a title, used resources are cited where they were used including images and figures and are summarized at the end.

Timeline:

When	What
3-4 weeks before the talk	Meeting I with Dr. Mittler on sighting the collected material and on the student's plan on what material to present: scheduled by student
2-3 weeks before the talk	Meeting II with Dr. Mittler with a first draft of a power point presentation and a first draft of the handout. Dr. Mittler will guide to improve both: scheduled by student
1-2 week before the talk	Meeting III with Dr. Mittler to receive a Window Word File with the handout for assessment and printing and a ready power point presentation: scheduled by student
talk	Give talk and hand out the handout (printed by Dr. Mittler)

The handout is assessed by finding the necessary time for Dr. Mittler to get it into a printable form, both content wise and editing wise. Examples for "perfect" handouts are found on the OWL. Each minute spend to fix it, after having it read completely once, deducts 1 mark from 100. Content and editing includes name and date, proper chapter headings, figure captions, table captions, mentioning of tables and figures in the text, page numbering, citation and citation sequence according to scientific journals, numbering of equations, tables and figures, spelling, grammar, overlap between talk and handout.

Evaluating student name:
 Name of student giving the talk:
 Topic of talk:

Scoring Rubric for Talk

Category	Scoring Criteria	Total Points	Score
Organization (12)	A proper introduction is present.	2	
	Information is presented in a logical sequence.	5	
	Presentation appropriately cites reliable references.	5	
Content 47	Introduction is attention-getting, lays out the problem well, and establishes a framework for the rest of the presentation.	2	
	Technical terms are well-defined in language appropriate for the target audience.	5	
	Presentation contains accurate information.	10	
	Material included is relevant to the overall message/purpose.	10	
	Appropriate amount of material is prepared, and points made reflect well their relative importance.	10	
	There is a conclusion summarizing the presentation.	5	
	The power point slides are clearly readable and are not overloaded.	5	
Presentation 41	Lots of images and necessary key words are present.	5	
	A single power point style is chosen throughout the presentation.	2	
	Speaker maintains good eye contact with the audience and is appropriately animated (e.g., gestures, moving around, laser pointer use, etc.).	5	
	Speaker uses a clear, audible voice.	5	
	Delivery is poised, controlled, and smooth.	5	
	Good language skills and pronunciation are used.	5	
	Length of presentation is within the assigned time limits.	5	
	Information was well communicated.	9	
Score	Total Points	100	
Comments:			

After each talk there will be an Assessment Sheet (available on OWL) to be filled out by all non-presenting students. These Assessment Sheets are judging the quality of a given talk. The Assessment Sheets will be collected on the course OWL site and marked according to the rational with which the positive or negative criticism is delivered according to the talk rubric and the Comments box.

9. Examinations: Final

The final exam time will be posted on the course OWL site when available. Students needing to make travel arrangements are advised to book a travel date after the end of the examination period. *No makeup exams will be given to accommodate travel!*

It is an open everything exam besides devices able to allow communication with a person within the examination room or outside the examination room.

Exams will consist of a combination of multiple-choice questions designed to test conceptual understanding of topics covered in class and numerical problems (which may consist of multiple parts) that test problem-solving abilities. The material from the student talks and handouts are subject to the final.

10. Calculators

Any calculator can be used in exams.

11. Accommodations for Religious Holidays

When course scheduling unavoidably conflicts with religious holidays that a) require an absence from the University or b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate department chair and, if necessary, the student's Dean.

It is the responsibility of such students to inform themselves concerning the material covered in classes from which they are absent and to take appropriate action.

A student who, for either of the situations outlined in paragraph one above (a or b), is unable to write examinations and term tests on a Sabbath or Holy Day shall give notice of this fact in writing to his or her Dean as early as possible, but not later than November 15 for mid-year examinations and March 1 for final examinations, i.e., approximately two weeks after the posting of the mid-year and final examination schedule, respectively. In the case of midterm tests, such notification is to be given in writing to the instructor within 48 hours of the announcement of the date of the midterm test. If a Special Examination is offered as an alternative means to satisfy the academic requirements, the instructor(s) in the case of midterm tests and the dean in the case of final examinations will arrange for special examination(s) to be written at another time. In the case of final examinations, the accommodation must occur no later than one month after the end of the examination period involved. It is mandatory that students seeking accommodations under this policy give notification before the deadlines in order for Faculty to accommodate these requests.

For purposes of these policies, the University has approved a list of dates that are recognized religious holidays that require members of those religions to be absent from the University; this list is updated annually and is available at Departmental, Deans' and Faculty advising offices.

12. Make-up Policy

Final Examination. In accordance with Senate Policy, a Special Examination will be held within thirty days of the regular final examination for students who are unable to write the regular examination for medical or other documented reasons. Requests for such a Special Examination must be made to the Associate Dean, Faculty of Science.

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see:

<http://westerncalendar.uwo.ca/2014/pg12.html>

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.

13. Class Website

All course information such as the most recent version of this document, lecture schedules, exam information, marks, etc. is available on the secure OWL (Sakai) site. To access this site, you will need to go to:

<http://owl.uwo.ca>

and log on using your UWO *username* and *password*. If you need information about setting up and using your account (or forwarding your mail from uwo.ca to other mail services), information can be found at the ITS website (<http://www.uwo.ca/its/>). Some aspects of these websites require Adobe Acrobat Reader (5.0 or higher), which is available for free.

14. Cheating (Scholastic Offenses)

Cheating

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalty, which may include expulsion from the program. If you are caught cheating, there will be no second warning. Cheating includes having available any electronic devices other than a watch and the Sharp calculator discussed previously above during a test or exam. You may not have a cell phone accessible during exams, even to use as a calculator or watch. Complete information on the University policy on academic offenses can be found at:

http://www.westerncalendar.uwo.ca/2014/print_pg113.html

Plagiarism

Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

15. Classroom Conduct

Disruptive behaviour will not be tolerated in class (or the course OWL chat room). Please respect the rights of your classmates to benefit from the lecture by limiting your conversations to those essential to the class. Students who persist in loud or rude behavior will be asked to leave.

16. Complaints and Suggestions

If you have a concern about something, please let us know. We rely on your feedback. Please contact initially the person most directly concerned; this will usually be your instructor. If that is not satisfactory, or if there is something more general bothering you, talk it over with the Physics & Astronomy Department Chair or the Associate Chair of Undergraduate Affairs (for contact information see <http://www.physics.uwo.ca>).

17. Contacting Us

The simplest way to contact us outside of lectures is via your UWO e-mail account. Please allow 2–3 working days for a response. *We will not **respond** to e-mails from addresses that do not end in "@uwo.ca".*

18. Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111, extension 82147 for any specific question(s) regarding an accommodation.

19. Mental Health

"Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help."