## Instructor(s)
Xijia Gu [Coordinator]
Office: EPH-400C
Phone: (416) 979-5000 x 4151
Email: xgu@ryerson.ca
Office Hours: TBD in EPH400C

## Calendar Description
This course offers a comprehensive overview of the properties and behavior of light. It begins with the light transmission including ray optics and wave optics; followed by the generation of light by lasers and light-emitting diodes. Examples on various lasers will be given. Further topics include electro-optical devices for optical modulation, switching and scanning. The last chapter is the light detection, mainly by semiconductor photo-detectors. Numerous applications and engineering examples are presented throughout the course.

## Prerequisites
ELE 531 and ELE 635

## Antirequisites
None

## Corerequisites
None

## Compulsory Text(s):

## Reference Text(s):

## Learning Objectives (Indicators)
At the end of this course, the successful student will be able to:

1. Use a lens formula to design a two lens microscope; Explain the structure and operation principle of liquid crystal display (LCD) (1c)
2. Uses ray tracing to draw the object and its image (1d)
3. Uses judgment define what are the known parameter to the problem (2a)
4. Analyse the problem and choosing proper formula/process for the solutions Solves the problem and address limitations (2b)
5. Suggest some ideas and solutions to improve the performance of the device (4b)
6. The students should defines the design parameters according to the principle of the photonics device and gather information on the current state of the device and identifies constraints. (4a)
7. Based on the acquired knowledge of photonic principles, write and submit a written engineering design project on a photonics device at the time of the final examination - Writes the report using appropriate discipline specific conventions to clearly explain the principle, state-of-the-art of the device. -Research and propose an idea for the improvement of the device. -Demonstrates accurate use of technical vocabulary to explain and conclude your design. (7a)

**NOTE:** Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).

## Course Organization
3.0 hours of lecture per week for 13 weeks
2.0 hours of lab per week for 12 weeks
0.0 hours of tutorial per week for 12 weeks

## Teaching Assistants
TBA
### Course Evaluation

Course evaluation not set for course.

**Note:** In order for a student to pass a course, a minimum overall course mark of 50% must be obtained. In addition, for courses that have both "Theory and Laboratory" components, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the "Course Evaluation" section above for details on the Theory and Laboratory components (if applicable).

### Examinations

<table>
<thead>
<tr>
<th>Examinations</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-term test (Feb. 2020)</td>
<td>30 %</td>
</tr>
<tr>
<td>Final Examination (April, 2020)</td>
<td>40 %</td>
</tr>
</tbody>
</table>

### Other Evaluation Information

<table>
<thead>
<tr>
<th>Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Project (submit at final exam)</td>
<td>30 %</td>
</tr>
</tbody>
</table>

### Other Information

None

### Course Content

<table>
<thead>
<tr>
<th>Week</th>
<th>Hours</th>
<th>Chapters / Section</th>
<th>Topic, description</th>
</tr>
</thead>
<tbody>
<tr>
<td>week 1, 2</td>
<td>6</td>
<td>chapter 1</td>
<td>Ray Optics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.1 Postulates of ray optics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.2 Simple optical components</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.3 Graded-index optics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.4 Matrix optics</td>
</tr>
<tr>
<td>week 3, 4, 5</td>
<td>8</td>
<td>chapter 2</td>
<td>Wave Optics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.1 Postulates of wave optics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.2 Monochromatic waves</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.3 Simple Optical components</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.4 Interference</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.5 Diffraction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.6 Polychromatic light</td>
</tr>
<tr>
<td>week 6, 7</td>
<td>6</td>
<td>chapter 3</td>
<td>Laser Amplifiers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.1 The laser amplifier</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.2 Amplifier power source</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.3 Amplifier Nonlinearity and Gain Saturation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.4 Amplifier noise</td>
</tr>
<tr>
<td>week 8, 9</td>
<td>5</td>
<td>chapter 4</td>
<td>Lasers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.1 Theory of Laser oscillation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.2 Characteristics of the laser output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.3 Pulsed lasers</td>
</tr>
</tbody>
</table>
Laboratory(L)/Tutorials(T)/Activity(A) Schedule

No lab information set for course.

Policies & Important Information:

Students must be reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on the following URL: http://ryerson.ca/senate/course-outline-policies

1. Students are required to obtain and maintain a Ryerson e-mail account for timely communications between the instructor and the students;
2. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented;
3. Assignments, projects, reports and other deadline-bound course assessment components handed in past the due date will receive a mark of ZERO, unless otherwise stated. Marking information will be made available at the time when such course assessment components are announced.
4. Ryerson senate policy 157 requires that any electronic communication by students to Ryerson faculty or staff be sent from their official Ryerson email account.
5. Familiarize yourself with the tools you will need to use for remote learning. The Continuity of Learning Guide for students includes guides to completing quizzes or exams in D2L or Respondus, using D2L Brightspace, joining online meetings or lectures, and collaborating with the Google Suite.
6. The University has issued a minimum technology requirement for remote learning. Details can be found at https://www.ryerson.ca/covid-19/students/minimum-technology-requirements-remote-learning. Please ensure you meet the minimum technology requirements as specified in the above link.
7. Ryerson COVID-19 Information and Updates (available https://www.ryerson.ca/covid-19/students) for Students summarizes the variety of resources available to students during the pandemic.
8. Refer to our Departmental FAQ page for information on common questions and issues at the following link: https://www.ee.ryerson.ca/guides/Student.Academic.FAQ.html.

Missed Classes and/or Evaluations

When possible, students are required to inform their instructors of any situation which arises during the semester which may have an adverse effect upon their academic performance, and must request any consideration and accommodation according to the relevant policies as far in advance as possible. Failure to do so may jeopardize any academic appeals.

1. Academic Consideration Requests for missed work (e.g. missing tests, labs, etc) - According to Ryerson Senate Policy 134, sections 1.2.3, if you miss any exams, quizzes, tests, labs, and/or assignments for health or compassionate reasons you need to inform your instructor(s) (via email whenever possible) in advance when you will be missing an exam, test or assignment deadline. When circumstances do not permit this, you must inform the instructor(s) as soon as reasonably possible "In the case of illness, a Ryerson Student Health Certificate, or a letter on letterhead from an appropriate regulated health professional with the student declaration portion of the Student Health Certificate attached. For reasons other than illness, proper documentation is also required (e.g. death certificate, police report, ITC report). ALL supporting documentation for illness or
Academic Integrity

Turnitin (if used in this course)

Virtual Proctoring Information (if used in this course)

Turnitin (if used in this course)

Academic Integrity
Policy 60 (Sections 2.8 and 2.10). Intellectual property includes, but is not limited to:

1. Slides
2. Lecture notes
3. Presentation materials used in and outside of class
4. Lab manuals
5. Course packs
6. Exams

For more detailed information on these issues, please refer to the Academic Integrity policy ([https://www.ryerson.ca/senate/policies/pol60.pdf](https://www.ryerson.ca/senate/policies/pol60.pdf)) and to the Academic Integrity Office website ([https://www.ryerson.ca/academicintegrity/](https://www.ryerson.ca/academicintegrity/)).

**Academic Accommodation Support**

Ryerson University acknowledges that students have diverse learning styles and a variety of academic needs. If you have a diagnosed disability that impacts your academic experience, connect with Academic Accommodation Support (AAS). Visit the [AAS website](https://www.ryerson.ca/academicaccommodation/) or contact aasadmin@ryerson.ca for more information.

Note: All communication with AAS is voluntary and confidential, and will not appear on your transcript.

**Important Resources Available at Ryerson**

1. The Library ([https://library.ryerson.ca/](https://library.ryerson.ca/)) provides research workshops and individual assistance. Inquire at the Reference Desk on the second floor of the library, or go to library.ryerson.ca/guides/workshops
2. Student Learning Support ([https://www.ryerson.ca/studentlearningsupport](https://www.ryerson.ca/studentlearningsupport)) offers group-based and individual help with writing, math, study skills and transition support, as well as resources and checklists to support students as online learners ([https://www.ryerson.ca/studentlearningsupport/online-resources/](https://www.ryerson.ca/studentlearningsupport/online-resources/)).
3. You can submit an Academic Consideration Request ([https://prod.appx.ceu.ryerson.ca/senateapps/acadconsform](https://prod.appx.ceu.ryerson.ca/senateapps/acadconsform)) when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill and academic requirement. You may always visit the Senate website ([https://www.ryerson.ca/senate/](https://www.ryerson.ca/senate/)) and select the blue radial button on the top right hand side entitled: Academic Consideration Request (ACR). COVID 19 specific statement for Fall 2020 related to academic consideration has been built into the on-line academic consideration system and is also on the senate website.
4. At Ryerson, we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis. Below are resources we encourage all Ryerson community members to access to ensure support is reachable. [https://www.ryerson.ca/mental-health-wellbeing](https://www.ryerson.ca/mental-health-wellbeing). If support is needed immediately, you can access these outside resources at anytime:
   - Distress Line - 24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
   - Good2Talk - 24/7 hour line for postsecondary students (phone: 1-866-925-5454)
5. Ryerson COVID-19 Information and Updates for Students ([https://www.ryerson.ca/covid-19/students/](https://www.ryerson.ca/covid-19/students/)) summarizes the variety of resources available to students during the pandemic.
6. Familiarize yourself with the tools you will need to use for remote learning. The Continuity of Learning Guide ([https://www.ryerson.ca/centre-for-excellence-in-learning-and-teaching/learning-guide/](https://www.ryerson.ca/centre-for-excellence-in-learning-and-teaching/learning-guide/)) for students includes guides to completing quizzes or exams in D2L or Respondus, using D2L Brightspace, joining online meetings or lectures, and collaborating with the Google Suite.