Course Objectives
The course starts with an introduction to light and optics. Light sources of different types are discussed, including lasers and Light Emitting Diodes (LEDs). Light modulation and detection methods are also discussed. Finally the course covers fiberoptic systems including fiber optic communications.

Prerequisites
ECE 3600 Physical Electronics

Course Content
The following topics will be covered:
- Light: Properties, Vision, Radiometry and Photometry
- Optics: Mirrors, Lenses, Ray Tracing and Imaging
- Radiation Sources: Radiation Profiles, Gas Discharge, LEDs
- Lasers: Principles of Operation, Types of Lasers, Modes of Operation
- Laser Diodes: Principles of Operation, Structures, Main Characteristics
- Detectors: Thermal Detectors, Photodiodes, Sources of Noise
- Light Modulators: Electro-optics, Acousto-optics, Liquid Crystals
- Fiber Optics: Theory of Operation, Characteristics of Fibers
- Fiber Optic Communications

Accreditation Units
Mathematics: 0%
Natural Science: 30%
Complementary Studies: 0%
Engineering Science: 70%
Engineering Design: 0%

Web Page
http://ece.eng.umanitoba.ca/undergraduate/ECE4580

Textbook
Notes available from instructor

Evaluation Details
The final course grade is determined by the student’s performance on assignments, presentation, in laboratories, and on examinations. Students must complete all the laboratories in order to be eligible to receive a passing grade.

Mid-Term
Monday, October 27th, 2014 (in class)

Instructor
Prof. Arkady Major
Room: E3-559 EITC
Telephone: (204) 474-7541
Email: a.major@umanitoba.ca
Office Hours
Mondays and Wednesdays 10:00-11:00 AM, or by appointment.

Teaching Assistants
TBA

Voluntary Withdrawal Date
Wednesday, November 12th, 2014.

Requirements/Regulations
- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.
- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.

Academic Integrity
Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism or any other form of cheating in examinations, assignments, laboratory reports or term tests is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.

Learning Outcomes
1. Understand fundamental properties of light and operation principles of basic optical components.
2. Demonstrate a mastery of basic mechanisms of light generation (including lasers) through detailed understanding and analysis of operation principles, characteristics, design architectures and trade-offs of semiconductor lasers.
3. Understand and compare operation principles, characteristics, design architectures and trade-offs of optical detectors and modulators of light.
4. Understand basic system design of fiber optic communication link and fundamental theory of fiber optics.
5. Hands-on testing, measurement and development of optical systems in a range of areas spanning the course.

Expected Competency Level **

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Attribute*</th>
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<tbody>
<tr>
<td></td>
<td>A1</td>
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</tbody>
</table>
*Attributes:*
A1 A knowledge base for engineering  
A2 Problem analysis  
A3 Investigation  
A4 Design  
A5 Use of engineering tools  
A6 Individual and team work  
A7 Communication skills  
A8 Professionalism  
A9 Impact of engineering on society/ environment  
A10 Ethics and equity  
A11 Economics and project management  
A12 Life-long learning

**Competency Levels:**
1 - Knowledge (Able to recall information)  
2 - Comprehension (Able to rephrase information)  
3 - Application (Able to apply knowledge in a new situation)  
4 - Analysis (Able to break problem into its components and establish relationships)  
5 - Synthesis (Able to combine separate elements into whole)  
6 - Evaluation (Able to judge of the worth of something)

**Student Contact Time (Hrs)**
- Lectures: 3 hrs lecture/week × 13 weeks/term = 39 hrs  
- Laboratories: 3 hrs laboratory × 5 weeks = 15 hrs  
- Tutorials: 0 hr tutorial × 13 weeks = 0 hrs

**Evaluation**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Methods of Feedback *</th>
<th>Learning Outcomes Evaluated</th>
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<tr>
<td>Assignments</td>
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<tr>
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<td>Final Examination</td>
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<td>S</td>
<td>1, 2, 3, 4</td>
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* Methods of Feedback:  
  F - formative (written comments and/or oral discussion),  
  S - summative (number grades)