

Concordia University
Department of Electrical and Computer Engineering

Fall 2015: Course outline

ELEC 425/6261: Optical devices for high-speed communications

Instructor: Dr. M. Z. Kabir
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Office hours: Wednesday, 10:00 –12:00

Course Web site: <http://www.encs.concordia.ca/~kabir/ELEC425.htm>

Lectures: Tuesday, 2:45 – 5:30, H-433

Course content:

Overview of optical properties of semiconductors. The fundamental principles for understanding and applying optical fiber technology, fundamental behaviour of the individual optical components and their interactions with other devices. Lasers, LED's optical fibers, light detectors, optical switches. Concepts and components of WDM and DWDM. A comprehensive treatment of the underlying physics like, noise and distortion in optical communications, light polarization, modulation and attenuation

Text: (1) S. O. Kasap, *Optoelectronics & Photonics*, 2nd edition (Publisher: Pearson Education Inc. ISBN-13: 978-0132151498)
(2) Selected class notes and Lab manual (these will be posted on the course web site)

Reference: (1) John M. Senior, *Optical Fiber Communications*, 3rd edition (Publisher: Prentice Hall, ISBN-9780130326812)
(2) Amnon Yariv and Pochi Yeh, *Photonics-Optical electronics in modern communications*, 6th edition (Publisher: Oxford, ISBN-978019517946-0)
(3) Shun L Chuang, *Physics of Photonic Devices*, 2nd edition (Publisher: John Wiley & Sons, ISBN: 978-0-470-293195)
(4) <http://www.epanorama.net/links/opto.html>

Course outline:

- Wave nature of light: plane wave, Fresnel's equation, diffraction grating (Chapter 1)
- Optical fibers: characteristics, losses, couplers and isolators (Chapter 2 and Ref. 1)
- Optical sources: LED and LASERS (Chapters 3 and 4)
- Photodetectors and Image Sensors (Chapter 5)
- Polarization and modulation of light (Chapter 7)

Outcome of this course:

This course is designed to provide an essential knowledge in the area of optical processes, optical properties of materials, light and matter interaction, physics of operations of light emitting diodes, Lasers, and photodetectors. By the end of this course students should acquire in-depth knowledge on the fundamental principles of optical fiber technology, Lasers, LED's, light detectors, and optical switches. They get concepts and components of WDM and DWDM. They also get a comprehensive treatment of the underlying physics like noise and distortion in optical communications, light polarization, modulation and attenuation.

Grading Scheme

Lab/project	15 %
Assignments	10 %
Midterm (close book)	15 %
Final exam (close book)	60 %

- *Undergraduate Students will have to complete work in the Laboratory and write a laboratory report. Specific requirements for the laboratory report will be informed by the lab instructor. The lab manual will be found on the course website.*
- *Graduate Students will have to write a project report. The requirements for the project will be posted on the web site.*
- *Assignments are compulsory. The assignments will be corrected. Assignments and their submission deadlines will be announced on the class website. The solution (or the methods or hints) will be posted.*
- ***The midterm will be held on October 27, 2015, during class time.** The midterm will be closed book. No crib sheet is allowed. A formula sheet will be provided.*
- *The final exam will be closed book. No crib sheet is allowed. A formula sheet will be provided.*

Office hours:

Office hours are provided for any extra help. If anyone finds the time schedule inconvenient, he/she should contact the instructor for getting an appointment.

Calculator policy:

During the tests and the exam, only one of the two ENCS-approved calculators (CASIO FX-300MS and SHARP EL-531) will be allowed.

Graduate attributes:

The following graduate attributes are selected for this course:

A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.

Life-long learning: An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Self-study material: Text book, Ch.3, sections 3.1 to 3.4

Expectations of originality and Professionalism:

It is imperative that students develop proper morale, ethics, and attitude towards becoming a prudent engineer. An aspect of this non-technical training shows a clear image of professionalism in the classroom, tutorials, and laboratories. It is vital that students do not talk or make other noise during lectures, or during the laboratory sessions.

Another important component of professionalism is academic integrity. Please pay attention to [academic integrity](#). The copying of materials from anywhere (internet, books, labs and assignments of other students) is not permitted, and is deemed a serious academic offence. *Plagiarism* is a common form of academic misconduct. There are many other forms of academic misconducts. Please consult Concordia Website for detailed descriptions of academic misconducts.

<http://www.concordia.ca/students/academic-integrity.html>

Cheating is a serious offence. You must abide by the [Academic Code of Conduct](#) as described in the University Calendar. *Any suspected violation of the Code will be reported* to the Associate Dean for investigation. Penalties can be as severe as dismissal from the University.

- 1. Submit the expectations of originality form with your signature, full name, ID #, and date and attach with your first assignment.**
- 2. Write “I certify that this submission is my original work and meets the faculty’s Expectations of originality” with your signature, full name, ID #, and date in all other assignments.**

Laboratory:

Laboratory Coordinator: Mr. Shailesh Prasad (Ex. 4106, E-mail: shailesh@ece.concordia.ca)

Lab Demonstrators:

Lab schedule will be posted in the course website.