



Programs & Courses

www.preview.bcit.ca/study/outlines/20131078044

ELEX 7860 - Wireless System Design

School:	School of Energy
Program:	Bachelor of Engineering in Electrical Engineering
Course Credits:	4.5
Start Date:	January 28, 2013
End Date:	May 24, 2013
Total Hours:	68
Total Weeks:	17
Hours/Weeks:	4
Delivery Type:	Lecture
Prerequisites:	and ELEX 7630 and ELEX 7640 and ELEX 7710*MATH 7510 (* may be taken concurrently)
CRN:	78044

Instructor Details

Name: Eduardo Casas
 Email: ec Casas@my.bcit.ca
 Location: SW1-3069 (via SW1-3059), phone 604-432-8936
 Office Hours:

Wednesday	2:30 PM	4:30 PM
Thursday	12:30 PM	3:30 PM

or other times by appointment (call or e-mail).

Course description

This course builds on the prerequisite core courses to explore important technical topics in modern wireless communications systems. The evolution of cellular systems from 1G to 3G is discussed, and other contemporary standards such as wireless LAN and wireless PAN are reviewed. Mathematical representation of the wireless channel is presented, and effects such as multipath, fading, and shadowing are discussed. The performance of various digital modulation schemes in the presence of noise is evaluated. Contemporary radio transceivers are presented and evaluated, including radio architecture, radio components, and performance measures. System design concepts such as link budget are used to engineer basic wireless systems.

Course learning outcomes / competencies

Upon successful completion of this course, the student will be able to:

- Outline the evolution of cellular systems from 1G to 3G. Describe and contrast common standards used in cellular communication, wireless LAN, and wireless PAN.
- Describe the loss mechanisms in the wireless channel, and effects such as multipath fading and shadowing. Calculate and predict losses using mathematical models of the wireless channel.
- Calculate link budgets and estimate fade margin requirements.
- Assess the merits, disadvantages and noise performance of various digital modulation schemes.
- Explain the cellular concept: frequency reuse, handoff, and SIR calculations associated with cluster size.
- Describe and contrast various multiple access schemes such as FDMA, TDMA, and CDMA.
- Describe the key aspects of various radio architectures such as super-heterodyne, low-IF, and direct conversion. Explain the advantages and disadvantages of each scheme.
- Describe the key blocks within a modern radio transceiver. Explain the important specifications associated with each block, such as Noise Figure and Third Order Intercept point.
- Calculate radio performance using cascaded noise figure and IP3 analysis.

Evaluation criteria

Criteria	%	Comments
Final Exam	40	week of May 21, 2013
Mid-Term Exam	20	tentatively scheduled for March 27, 2013
Labs	20	6 labs, see schedule below

Assignments	18	approximately every two weeks
Participation	2	for asking/answering questions on-line

Learning resources

Optional Text:

Wireless Communications: Principles and Practice, 2nd Edition, Theodore S. Rappaport, 2002, Prentice-Hall.

Course schedule and assignments

ELEX7860 (Wireless System Design) Schedule for Winter 2013

	<i>Mon</i>	<i>Tues</i>	<i>Wed</i>	<i>Thurs</i>	<i>Fri</i>
<i>Labs From</i>	9:30 AM				
<i>Lectures From</i>	11:30 AM	1:30 PM	11:30 AM		
<i>To</i>	12:30 AM	2:30 PM	12:30 PM		
<i>Labs</i>	SW1-3555				
<i>Lectures</i>	SE12-302	SW1-2009	SE6-112		
Week of					
Jan 28	Lec	Lec	Lec		
Feb 04	Lab 1	Lec	Lec		
Feb 11	Lec	Lec	Lec		
Feb 18	Lab 2	Lec	Lec		
Feb 25	Lec	Lec	Lec		
Mar 04	Lab 3	Lec	Lec		
Mar 11	Lec	Lec	Lec		
<i>Labs</i>	SW1-3555				
<i>Lectures</i>	SE6-108	SW1-2020	SW1-3190		
Mar 18	Lab 4	Lec	Lec		
Mar 25	<i>Holiday</i>	Lec	<i>Midterm</i>		
Apr 01	Lec	Lec	Lec		
Apr 08	Lab 5	Lec	Lec		
Apr 15	Lec	Lec	Lec		
Apr 22	Lab 6	Lec	Lec		
Apr 29	Lab 6	Lec	Lec		
May 06	Lec	Lec	Lec		
May 13	Lec	Lec	Lec		

Note: Monday mornings alternate between lectures (1 hour) and labs (3 hours).

Course topics

1. Introduction
2. Channel Modeling
3. Digital Modulation
4. Radio Receiver Architecture
5. System Level Concepts

BCIT policy

The following statements are in accordance with the BCIT Policies 5101, 5102, and 5104, and their accompanying procedures. To review these policies and procedures please click on the links below.

Attendance/Illness:

In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with his/her instructor or Program Head or Chief Instructor, indicating the reason for the absence. Prolonged illness of three or more consecutive days must have a BCIT medical certificate sent to the department. Excessive absence may result in failure or immediate withdrawal from the course or program. Please see [Policy 5101 - Student Regulations, and accompanying procedures](#) !

Academic Integrity:

Violation of academic integrity, including plagiarism, dishonesty in assignments, examinations, or other academic performances are prohibited and will be handled in accordance with [Policy 5104 - Academic Integrity and Appeals, and accompanying procedures.](#)²

Accommodation:

Any student who may require accommodation from BCIT because of a physical or mental disability should refer to BCIT's Policy on Accommodation for Students with Disabilities (Policy #4501), and contact BCIT's Disability Resource Centre (SW1 2360, 604-451-6963) at the earliest possible time. Requests for accommodation must be made to the Disability Resource Centre, and should not be made to a course instructor or Program area.

Any student who needs special assistance in the event of a medical emergency or building evacuation (either because of a disability or for any other reason) should promptly inform their course instructor(s) and the Disability Resource Centre of their personal circumstances.

Policy for School of Energy

Attempts: Students must successfully complete a course within a maximum of three (3) attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from their respective program.

Approved

I verify that the content of this course outline is current.
Eduardo Casas, Instructor

Note: Should changes be required to the content of this course outline, students will be given reasonable notice.

Links

1. bcit.ca/files/pdf/policies/5101.pdf
 2. bcit.ca/files/pdf/policies/5104.pdf
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