ENGG*3210 Communication Systems
Winter 2014

UNIVERSITY of GUELPH
[School of Engineering](#)
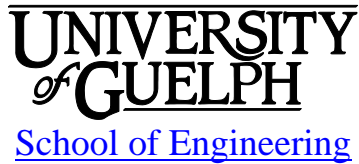
(Revision 0: November 21, 2013)

1   INSTRUCTIONAL SUPPORT

1.1   Instructor

Instructor: Arafat Al-Dweik, Ph.D.
Office: THRN 2513, ext. 52153
Email: aaldweik@uoguelph.ca
Office hours: TBA on Courselink or by appointment

1.2   Lab Technician

Technician: Nate Groendyk
Office: THRN 2308, ext. 53873
Email: groendy@uoguelph.ca

1.3   Teaching Assistants

GTA	Email	Office Hours
Ahmad Elsamman	aelsamma@uoguelph.ca	TBA on Courselink

2   LEARNING RESOURCES

2.1   Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*3210 Courselink site. You are responsible for checking the site regularly.

2.2   Required Resources

1. Behrouz A. Forouzan, Data Communications and Networking, 5/e, Copyright year: 2013.

2. Bernard Sklar, Digital Communications: Fundamentals and Applications, 2nd Edition, 2001

2.3   Recommended Resources

1. Modern Digital and Analog Communication Systems (Oxford Series in Electrical and Computer Engineering), B. P. Lathi (Author), Zhi Ding (Author) .

2. Data and Computer Communications, (Pearson Prentice hall), William Stallings (Author)

2.4   Additional Resources

Lecture Information: All the lecture notes are posted on the web page (week #1 - #12).

Lab Information: The handouts for all the lab sessions are within the lab section. All types of resources regarding tutorials, links to web pages can be found in this section.

Assignments: Download the assignments according to the schedule given in this handout. All the solutions will be posted as indicated.

Exams: Some midterms and finals of previous years are posted as samples of exams. The solutions are also posted for your convenience.

Miscellaneous Information:

2.5   Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

3 ASSESSMENT

3.1 Distribution

Quizzes: (29 January, 05 March, 26 March), 15%

Room: in class Quizzes

Labs: 30%

> **Reports:** 15%
>
> **Project (Hardware/Software):** 15%
>
> See section **Error! Reference source not found.** below for due dates

Midterm Test (12 February): 25%
> Room: In Class

Final Exam (8 April 2014): 30%
> Room TBA on Webadvisor

3.2 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Passing grade: In order to pass the course, you must pass both the laboratory and exam course portions. Students must obtain a grade of 50% or higher on the exam portion of the course in order for the laboratory write-up portion of the course to count towards the final grade.

Missed midterm tests: If you miss a test due to grounds for granting academic consideration or religious accommodation, the weight of the missed test will be added to the final exam. There will be no makeup midterm tests.

Lab Work: You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab.

Late Lab Reports: Late submissions of lab reports will not be accepted.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

This course is an introduction to the fundamentals of data communication and computer networking. The data communication basics will cover signal transmission and signal encoding techniques such as: multiplexing techniques, signaling, encoding and decoding, error detection and recovery, sliding window techniques. Computer networking basics will cover: communication network components and topologies, multiple access design issues and performance analysis, switching, routing, services and applications, and security. The course will also cover the mathematical tools (Fourier transform, etc.) used in signal analysis.

Prerequisite(s): MATH 2130, STAT 2120, ENGG 2400

4.2 Course Aims

This course aims at providing the students with the necessary tools to understand, analyze and design the fundamental components of the communication processes, which includes: data format, modulation, communication media, error control, routing, multiplexing and multiple access techniques.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Utilize the basic mathematical concepts to describe and analyse various signals and systems.
2. Describe analog and digital modulated signals in both time and frequency domains.
3. Understand the main communication protocols and layers.
4. Understand the requirements for single and multiple users' communication systems.
5. Describe basic structure of communication networks.
6. Understand the basic concepts of error control coding.
7. Understand the principles of multiplexing, FDM, and TDM.
8. Understand the principles of wired and wireless networks
9. Design the baseband section of a communication system to satisfy certain constraints.
10. Analyse the performance of a communication system

4.4   Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1, 2, 10	Quizzes, Exams
2. Problem Analysis	10	Quizzes, Exams,
3. Investigation	3, 5	Labs
4. Design	9	Exams, Quizzes
5. Use of Engineering Tools	1, 6, 7	Labs
6. Communication	2, 5	Labs
7. Individual and Teamwork	-	Labs
8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	-	-
10. Ethics and Equity	-	-
11. Environment, Society, Business, & Project Management	4, 7	Exams, Quizzes
12. Life-Long Learning	5	-

4.5   Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink/D2L but these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and project.

4.6   Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and tutorials. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

4.7   Relationships with other Courses & Labs

Previous Courses:

ENGG*2400: Analytical solution techniques in time and transform domains, numerical solution and simulations, Laplace solution and frequency response.

MATH*20130: solution of a single nonlinear equation, interpolation, numerical differentiation and integration.

STAT*2120: probability, conditional probability and independence; Bayes' theorem; probability distributions; probability densities.

Follow-on Courses:

ENGG*4540: basics of pipeline structure, interconnection networks, network bandwidth and latency, synchronization

5   TEACHING AND LEARNING ACTIVITIES

5.1   Timetable

Lectures:

Monday	8:30 – 9:50	CRSC, Room 101
Wednesday	8:30 – 9:50	CRSC, Room 101

Laboratory:

Friday	Sec 01	9:30 - 11:20	THRN 2307

5.2   Lecture Schedule

Lectures	Lecture Topics	References	Learning Objectives
1-2	Introduction to Communication Systems	Ch 1	5
3-4	Network Models	Ch 2	3
5	Introduction to physical layer	Ch 3	3
6-11	Digital Transmission	Ch 4	1, 2, 9
12-17	Analog Transmission	Ch 5	1, 2, 9
18-20	Bandwidth Utilization: Multiplexing	Ch 6	4
21-22	Spectrum Spreading	Ch 6	4, 7
23-25	Transmission Media	Ch 7	8
26-27	Switching	Ch 8	4, 8
28-31	Error Detection and Correction	Ch 10	5, 6, 9, 10
32-34	Media Access Control (MAC)	Ch 12	4, 7, 8
35-36	Wired and Wireless LANs	Ch 13, 15, 16	4, 8

5.3 Design Lab Schedule

Week	Activity	References
1	Introduction to Simulink	
2	PCM-Transmitter	
3	PCM-Receiver	
4	BER in AWGN channels	
5	AM Modulation, time and frequency analyses	
6	Amplitude Shift Keying (ASK)	
7	Frequency Shift Keying (FSK)	
8	Phase Shift Keying (BPSK)	
9	Flow Control	
10	Error Detection	
11	Error Correction Codes	
12	Spread Spectrum	

5.4 Other Important Dates

Monday, January 6 2014: First day of class
Monday, February 17 – Friday, February 21 2014: Winter Break
Friday, March 7: drop date – 40th class
Friday, April 4 2014: last day of class

6 LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

If the laboratory rules are not followed, consequences will include removing student's access to the lab. If this results in lab work not being completed, the student will receive a grade of 0.

7 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

Please also review the section on Academic Misconduct in your Engineering Program Guide.

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.uoguelph.ca/csd/

9 RECORDING OF MATERIALS

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

10 RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: http://www.uoguelph.ca/registrar/calendars/index.cfm?index