

ENEL 471 – Introduction to Communications Systems and Networks

Mohamed Helaoui

Dept. of Electrical and Computer Eng., SSE

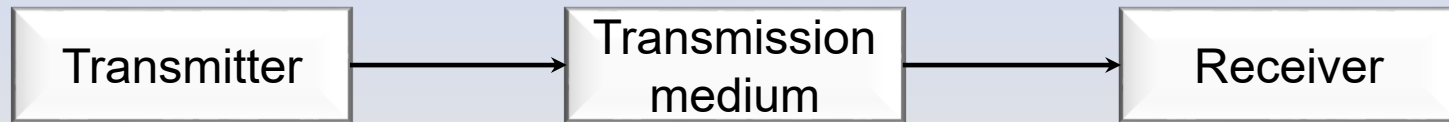
Office ICT 340

mhelaoui@ucalgary.ca

What is ENEL 471?

Communication Systems

- Communication link: transmit the information from one source to one or multiple destinations



Simple block diagram of a transmission link

- Examples and applications of communication systems and networks:
 - Radio and television broadcasting
 - Wireless phones
 - Wired and wireless networks
 - Military and satellite communication
 - Sensory systems and networks (with applications to all fields you can imagine including oil and gas, power systems, medical equipment ...)

What is ENEL 471?

Broadcasting Example – Favorite Radio Station

- What is your favorite radio station?
- At what frequency does it work?
- AM or FM? What does it mean?

What is ENEL 471?

The Focus

- In ENEL 471, we will focus on:
 - Modulation (shaping the information) in the transmitter
 - Demodulation in the receiver
 - Analyse the effect of the channel (transmission medium)
- Application of the tools learned in ENEL 327 to Communications
 - applications of system analysis in time and frequency domains to communication systems
 - Fourier Transform and its applications: amplitude modulation, filters, sampling

Course Objectives

At the end of this course, you will be able to:

- Describe the basic features and characteristics of communication systems and networks
- Define pass-band and stop-band of filters; and analyse their frequency response and impulse response
- Define the types of amplitude modulation; and describe the methods/circuits of modulation and demodulation
- Develop the spectral properties and assess the performance of amplitude modulation
- Define the types of angle modulation; and describe the methods of generating and demodulating angle modulated signals.
- Develop the spectral properties and assess the performance of angle modulation.

Course Objectives

- Describe the basic concept of digital baseband and passband modulation and demodulation.
- Analyse the bit error rate performance of baseband and passband binary modulation and demodulation formats when used over additive white Gaussian noise channel.
- Define communication network architectures and protocols, analyse the throughput-delay characteristics of medium access control protocols.

This Course is a Prerequisite for:

- *ENEL 529 – Wireless Communications Systems*
- *ENEL 571 – Digital Communications*
- *ENEL 559 – Analog Filter Design*
- *ENEL 519.60 – System Design of RF Transceivers*

Course Components

Section	Days of the Week	Start Time	Duration (Minutes)	Location
L01	MoWeFr	09:00	50 Min.	ICT 122
B01-04	TuWe	14:00	180 Min.	ENA 301/305
T01	Fr	12:00	50 Min.	EDC 179

- 10 Assignments: every week

Jan 17, Jan 24, Jan 31, Feb 7, Feb 14, Feb 28, Mar 6, Mar 13, Mar 20, Mar 27

- 8 Quizzes: At the end of the tutorial (from the assignment)

Jan 24, Jan 31, Feb 7, Feb 28, Mar 6, Mar 13, Mar 27, Apr 3

- 2 Midterms: *Feb 14* and *Mar 20 (from 12pm to 12:50pm) in EDC 179*

- 1 Final Exam

Course Components

- 5 Labs: biweekly
 - Pre-lab: familiarization with MATLAB (*Jan 21-22, Jan 28-29*)
 - AM signal generation (*Feb 4-5, Feb 11-12*)
 - AM demodulation (*Feb 25-26, Mar 3-4*)
 - *Phased lock loops and FM introduction (Mar 10-11, Mar 17-18)*
 - *Phased lock loops and FM Demodulation (Mar 24-25, Mar 31-Apr 1)*
- Groups of 2 or 3 persons (groups of 4 persons are not allowed)
- Presence is mandatory
- The lab manuals will be posted a week before the lab. You are asked to **read the lab manual** and **start the simulation part** before coming to the lab session.
- A report should be submitted at the end of each lab.

Final Grade Determination

Component	Weight	
Quizzes	10	%
Labs	10	%
First Midterm Examination	15	%
Second Midterm Examination	15	%
Final Examination	50	%
Total	100	%

- It is not necessary to earn a passing grade on the final exam in order to pass the course
- Exams and quizzes are closed notes and closed books
- Non programmable calculators are allowed

Course Textbook

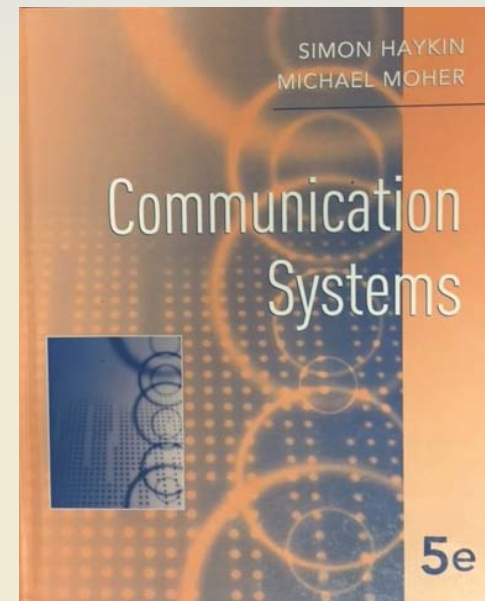
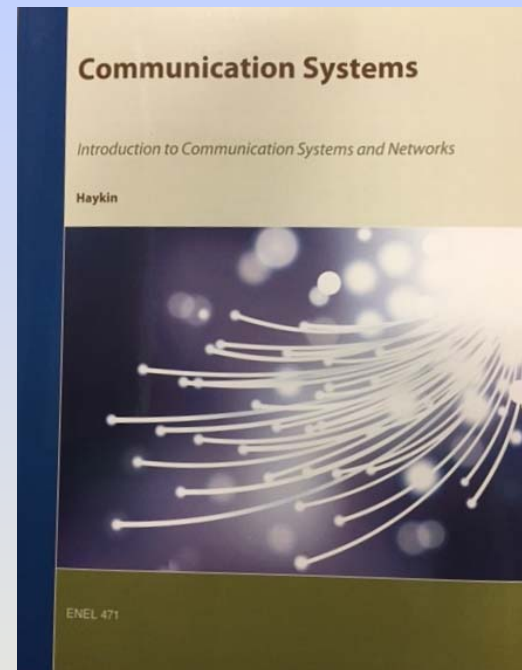
Selected chapters from:

Communication systems

S. Haykin,

Fifth Edition, 2009

John Wiley



Course Content

- Introduction to communication systems and networks (2 hours)
- Filter overview (3 hours)
- Amplitude modulation and demodulation (9 hours)
- Frequency modulation and demodulation (9 hours)
- Sampling of analog waveforms (3 hours)
- Digital baseband modulation and demodulation (4 hours)
- Digital passband modulation and demodulation (4 hours)
- Overview of communication networks (5 hours)

Availability

- Office Hours ??
 - Wednesdays 1:00 – 2:00 PM
 - Thursdays 12:00 – 1:00 PM
- Outside office hours :
 - Send me an e-mail to request a meeting
 - Or just drop by (not guaranteed)

Course Agreement

Create a good learning environment is a common responsibility:

- Respect each other
- Feedback is welcome and appreciated (in person, e-mail)
- Course material (available on D2L):
 - A summary of each lecture will be posted
 - Assignment solutions, last year's exams , additional material
- Cell phones (off or silent), music players (not allowed)