ELEC1200 A System View of Communications: From Signals to Packets

Course Description

Have you ever wondered what technologies go into your mobile phone or a WiFi hotspot? Through hands on work with a simple but fully functional wireless communication system, you will understand the basic engineering tools used and tradeoffs encountered in the design of these systems. This course is centered on weekly laboratories, each designed to introduce an important concept in the design of these systems. The lab sessions are supported by two one hour lectures and a tutorial that introduces the concepts for the next laboratory, as well as reviewing and expanding the concepts learned in the previous laboratory.
Corequisite(s): (COMP 1021 OR COMP 1022P OR COMP 1022Q (prior to 2020-21)) AND (MATH 1003 OR MATH 1014 OR MATH 1020 OR MATH 1024)

List of Topics

Lecture Topics

Week 1	Course introduction, Signals
Week 2	Real World Channels
Week 3	Transmitting Data, Intersymbol Interference and Eye Diagram
Week 4	Feedback Model of the Channel, Channel Equalization
Week 5	Noise
Week 6	Error Correcting Codes
Week 7	The Frequency Domain, Discrete Fourier Transform/Frequency Response
Week 8	Lossy Source Coding, Signal Transmission – Modulation
Week 9	I-Q Modulation
Week 10	Introduction to Networking, Link Layer
Week 11	Network Layer
Week 12	Transport Layer, Application Layer
Week 13	Course Review

Laboratory Topics

1. Introduction to MATLAB
2. Characterizing and Modeling an IR Channel
3. Communication Protocol and Bit Error Rate
4. Eye Diagram and Equalization
5. Bit Errors and SNR
6. Error Correcting Codes
7. Time-frequency Analysis
8. Frequency Division Multiplexing
9. Transmitting data on I and Q channels
10. Link Layer and ALOHA
11. Network and Application Layer

Statement of Objectives/Outcomes:

CO1 - Through the study of a voice communication system, students will understand the practical context of the concepts that they study in more theoretical detail in other classes.

CO2 - Students will be able to explain typical problems and tradeoffs encountered in electronic and computer engineering systems.

CO3 - Students will be able to analyze simple approaches to deal with these problems and tradeoffs.

CO4 - Students will be able to use software tools, such as MATLAB to investigate potential solutions to these problems and tradeoffs in order to validate the above analysis, as well as to handle cases not amenable to simple analysis.

CO5 - Students gain experience working and learning in a cooperative setting on real hardware where the simplifying assumptions used in theoretical analysis may be violated, and gain an understanding of the benefits and limitations of such analysis.

Textbook(s):

Lecture notes

Reference Book(s):

Frenzel, Louis E, "Principles of electronic communication systems." McGraw-Hill, 2008
Alan V. Oppenheim, Alan S. Willsky and S. H. Nawab, Signals and Systems, 2nd Ed., Prentice Hall, 1997

Relationship of Course to Program Outcomes:

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme:

Pre-lab Exercises	10%
Lab Check-off Points	5%
Post-lab Interviews	10%
Homework	10%
Midterm Exam	25%
Final Examination	40%