ELEC 1200 – A System View of Communications: from Signals to Packets

School:	**School of Engineering**
Subject Area:	**Electronic and Computer Engineering**
Course Credit:	**4**
Instructor:	**CHEN Shibo**
Pre-requisite/co-requisite:	**Details Here**

Notes:

- The syllabi provided here is for reference only and may be subject to changes and adjustments as determined by the course instructors.

[Course Title] A System View of Communications: From Signals to Packets

[Course Code] ELEC 1200

[No. of Credits] 4

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Office Hours: Thursday, 14:00-17:00

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 introduce the concepts for the next laboratory, as well as reviewing and expanding the concepts learned in the previous laboratory.

List of Topics

Lecture Outline

1	Course Introduction
2	Signals; Real World Channels
3	Linear Time Invariant Systems
4	Transmitting Data; Inter-symbol Interference and Eye Diagram
5	Feedback Model of the Channel; Channel Equalization
6	Noise
7	Noise; Error Correcting Codes
8	Error Correcting Codes; Midterm Exam
9	The Frequency Domain
10	Filter and Frequency Response; Time-Frequency Analysis/source Coding
11	Signal Transmission – Multiplexing; Signal Transmission – De-multiplexing;
12	Introduction to Networks; Link Layer
13	Network Layer; Transport Layer
14	Application Layer; Course Review

Laboratory Outline

1. Introduction to MATLAB

2. Characterizing and Modeling an IR Channel

3. Communication Protocol and Bit Error Rate

4. Eye Diagram and Equalization

5. SNR and Bit Error Rate

6. Time-Frequency Analysis of Signals

7. Signal transmission using Frequency Division Multiplexing

Intended Learning Outcomes:

CO1:   Examine a voice communication system to identify the practical context of key theoretical concepts in ECE.

CO2:   Identify typical problems and tradeoffs encountered in electronic and computer engineering systems.

CO3:   Analyze simple approaches to address a range of problems and tradeoffs.

CO4:   Use software tools, such as MATLAB, to investigate potential solutions to problems and tradeoffs in order to validate an analysis, and to handle cases not amenable to simple analysis.

CO5:   Work in a cooperative setting on real hardware where the simplifying assumptions used in theoretical analysis may be violated, and assess the benefits and limitations of such analysis.

Textbook(s):

N/A

Reference Book(s)/Materials:

(F) Frenzel, Louis E, "Principles of electronic communication systems." 5th Edition, McGraw-Hill, 2023 (ebook).

(OWN) Alan V. Oppenheim, Alan S. Willsky and S. H. Nawab, Signals and Systems, 2nd Ed., Prentice Hall, 1997

Relationship of Course to Program Outcomes:

PO1   An ability to apply knowledge of mathematics, science and Electronic and Computer Engineering. (CO1, CO2, CO3, CO4)

PO2   An ability to design and conduct experiments, as well as to analyze and interpret data. (CO5)

PO3   An ability to design efficient and economical Electronic and Computer Engineering systems, components or process subject to practical constraints.

PO4   An ability to function in a multi-disciplinary environment through teamwork.

PO5   An ability to identify, formulate and solve Electronic and Computer Engineering problems. (CO1, CO2, CO3, CO4)

PO6   An ability to understand professional practices and ethical responsibilities.

Grading Scheme:

Lab	25%
Homework	10%
Midterm Exam	25%
Final Exam	40%