Carleton UNIVERSITY | Department of Systems and Computer Engineering

SYSC 3503
Communication Theory II

Calendar description

Amplitude Modulation. Frequency Modulation. Performance of AM and FM in noise. Communication channels, channel models, noise sources, noise models. Digital modulation: ASK, FSK, PSK. Optimal reception, probability of error on the AWGN channel.

Includes: Experiential Learning Activity.

Lectures three hours a week, laboratory three hours alternate weeks.

http://calendar.carleton.ca/undergrad/courses/SYSC/

Prerequisites

SYSC 3500 and (STAT 2605 or SYSC 2510).

Precludes additional credit for SYSC 3501 or SYSC 4600.

Course objectives

This course provides an introduction to the fundamental principles of communication theory. The basic components of a communication system will be outlined and the concept of modulation will be explained, pointing out the differences between analogue and digital modulation. Important techniques for representing signals in the time and frequency domains will be presented, including signal-space diagrams. Analogue amplitude modulation and frequency modulation will be studied, including their performance in the presence of noise. Amplitude shift keying (ASK), frequency shift keying (FSK), and phase shift keying (PSK), three digital modulation techniques, will be defined, and the fundamental concepts of optimal reception of digitally modulated signals transmitted over an additive white Gaussian noise (AWGN) channel will be emphasized. Techniques for calculating the expected probability of error at the receiver output will be covered.

Learning outcomes

By the end of this course, students will be familiar with the fundamental terminology and theory behind communication systems, including modulation, signal space representation, optimal reception, and error probability analysis. Students will further develop their understanding of the mathematical tools, including calculus, probability theory, and Fourier transforms, that are required for the course material. Students will also improve their software development skills by simulating communication systems in

the lab. Students will acquire the necessary background to study more advanced material in communication theory, as offered in SYSC 4604 – Digital Communication Theory, SYSC 4607 – Wireless Communications, and SYSC 4700 – Telecommunications Engineering.

Graduate Attributes (GAs)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes at the time of graduation. Activities related to the learning outcomes listed above are measured throughout the course and are part of the department's continual improvement process. Graduate attribute measurements will not be taken into consideration in determining a student's grade in the course. For more information, please visit: https://engineerscanada.ca/.

Graduate Attribute	Learning outcome(s)
3.2: Problem Analysis: Developed: Design of experiment	
5.1: Use of Engineering Tools: Developed: Diagrams and engineering sketches	
5.2: Use of Engineering Tools: Developed: Document processing and graphics packages	
6.1: Individual and Team Work: Developed: Personal and group time management	
7.3: Communication Skills: Developed: Oral and written presentations	

Accreditation Units (AUs)

For more information about Accreditation Units, please visit: https://engineerscanada.ca/.

The course has a total of 46 AUs, divided into:

- Engineering Science: 75%
- Engineering Design: 25%

Instructor and TA contact

Specific to course offering (tbd)

Textbook (or other resources)

Specific to course offering (tbd)

Evaluation and grading scheme

Specific to course offering (tbd)

Breakdown of course requirements

Specific to course offering (tbd)

Tentative week-by-week breakdown

Specific to course offering (tbd)

General regulations

Specific to course offering (tbd)