EE3TR4
Communication Systems

Objectives

- To provide an understanding of the practical communication systems such as AM radio and digital modem.
- To introduce the mathematical concepts such as Fourier transform and random process, and apply them to communication systems.

Text Books/Reference Books

- Communication Systems, S. Haykin and M. Moher, 5e Edition, John Wiley and Sons, Inc. (Preferred)

or

- An Introduction to Analog and Digital Communications, S. Haykin and M. Moher, 2nd Edition, John Wiley and Sons, Inc.

- **Course notes**: will be placed on Avenue to Learn

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Course Outline

The course material will cover the first few chapters of Haykin. The material will cover Ch. 2,3, 4,5,8 and 9.

This material will include:

- Review of Fourier theory
- Amplitude modulation (AM) systems
- Review of random processes and noise, and modeling of noise in communications systems.
- Digital transmission systems.

Labs

There will be 5 numerical experiments throughout the course. The outline for the labs:

- Practical application of Fourier transforms
- Standard Amplitude modulation and demodulation
- Double sideband suppressed carrier modulation
- Quadrature carrier multiplexing
- Random processes and noise.

You can work individually or work in pairs. Your lab partner need not be from your lab section.

Lab Timeline

- Fourier theory – typically starts from the third week of Jan and runs for two weeks. The output of a function generator is passed through a filter. The output of the filter is analyzed using an oscilloscope and spectrum analyzer. You will be doing the numerical experiment on Matlab.
- Standard AM – runs from the first/second week of Feb for two weeks. You will be doing a numerical experiment. You will be provided with an audio data which will modulate a carrier. At the receiver side, you will demodulate using a diode and RC circuit.

Lab Timeline

- DSB-SC modulation and demodulation: runs from the third week of Feb for two weeks. You will be doing a numerical experiment of modulating a 64 KHz carrier with a 4 KHz sinusoidal message.
- Quadrature-carrier multiplexing (QCM): runs from the second week of March and runs from two weeks. You will be doing a numerical experiment on QCM.
- Random processes – starts from the first week of Apr. You will be doing a numerical experiment. Evaluate the autocorrelation and power spectral density of the output of a filter driven by a white noise.

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Evaluations

- Final Exam 35%
- Midterm 20%
- Labs 25%
- Quizzes 20%

Two best quizzes out of 3 will be selected. Quizzes will be conducted during tutorials.

Assignments will be handed out but will not contribute towards the course grade.

Lecture Timings

- Mondays and Wednesdays – Live lecture – 11:30 am-12:20 am.
- No lecture on Fridays.
- I record one lecture per week (typically on Fridays)
- No tutorials this week or next week. The tutorials will start from the week of Jan 25.

Midterm

- **Date: Thursday, Mar 4**
- **Time: 7:00 pm – 8:30 pm**
- **Extra 30 minutes to upload.**

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Contact Info

- **Instructor: Dr. S. Kumar**
- **Office hours: Mondays and Wednesdays 1:30-2:30 pm, on Teams.**
- **Office: ITBA-322, Extn: 26008**
- **Announcements will be made on Avenue**

E-mail: skumar@mcmaster.ca

Important: Please include '3TR4' in the subject line of your email. You may not get a response from me without '3TR4' on the subject line.

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Email Contacts

- For questions related to labs, quizzes and midterms, please contact the TA, Mr. Ryan Scott (scottr8@mcmaster.ca)

  Do not contact me for such routine tasks.

  However, if the problem is not resolved, you could contact me.

- If you have questions related to lectures, contact me.

Questions?

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