

# ECE 3311 Principles of Communication Systems

<b>When/Where:</b>	MTWRF 10:00 – 10:50 am, AK 219
<b>Instructor:</b>	Berk Sunar < <a href="mailto:sunar@wpi.edu">sunar@wpi.edu</a> >, office: AK 302
<b>Tutor:</b>	Sabah Razavi < <a href="mailto:srazavi@wpi.edu">srazavi@wpi.edu</a> >
<b>Teaching Assistant:</b>	Kuldeep Singh Gill < <a href="mailto:ksgill@wpi.edu">ksgill@wpi.edu</a> >

## Catalog Course Description

**Cat. I** This course provides an introduction to analog and digital communications systems. The bandpass transmission of analog data is motivated and typical systems are analyzed with respect to bandwidth considerations and implementation techniques. Baseband and passband digital transmission systems are introduced and investigated. Pulse shaping and intersymbol interference criteria are developed in relation to the pulse rate transmission limits of bandlimited channels. Finally, digital carrier systems and line coding are introduced in conjunction with applications to modern modem transmission schemes.

**Recommended background:** MA 1024 and ECE 2312. (Knowledge of Matlab)

**Suggested background:** ECE 2305.

## Textbook

Software Receiver Design: Build Your Own Digital Communications System in Five Easy Steps by C.R. Johnson, Jr., W.A. Sethares, and A.G. Klein Cambridge University Press, 2011.

## Website

Material relevant to the course will be made available on the course website including lecture notes, code, assignments, supplementary reading documents. In addition, the website will be updated frequently with announcements, e.g. new assignment, class cancellation etc. <http://users.wpi.edu/~sunar/courses/ece3311/>

## Honor Code

The WPI Academic Honesty Policy will be in effect. Please review this policy at <http://www.wpi.edu/Pubs/Policies/Honesty/policy.html>.

## Students with Disabilities

If you are entitled to accommodation in accord with documentation on file at the Disabilities Service Office, let me know as soon as possible.

## Tentative Course Outline

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Week of	Chapters	Subjects
<b>Oct 25</b>	1, 2, 3	Introduction, overview of a transceiver. No HW due, no quiz.
<b>Oct 31</b>	4, 5, 6	Modelling corruption/non-idealities, review of signals, frequency domain, sampling. Amplitude modulation, AM, suppressed carrier. HW #1 due, quiz #1.
<b>Nov 7</b>	7, 8, 9	Review of digital filtering, DFT. Converting bits to symbols. Practical impairments to reliable communication. HW #2 due, quiz #2.
<b>Nov 14</b>	10	Carrier recovery via PLL, Costas loop, decision direction. HW #3 due, quiz #3.
<b>Nov 21</b>	11, 12	Pulse shaping, matched filtering, Nyquist criterion. Timing recovery algorithms. HW #4 due, no quiz.
<b>Nov 28</b>	13	Multipath and intersymbol interference, linear equalization via trained and blind methods. HW #5 due, quiz #4.
<b>Dec 5</b>	15	End-to-end receiver design. HW #6 due, quiz #5.
<b>Dec 12</b>	14	Line codes, tradeoffs between bit rate and accuracy of pulse code modulation and delta modulation. No HW due, quiz #6, project due.

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## Grading

**Grades:** A:100%-90%, B:89%-80%, C:79%-70% : Homework 15%, Quizzes 60%, Project 25%,

**Homeworks:** Will be assigned weekly, to be handed in at the beginning of each Tuesday class. Each graded problem will be out of 3 points (0=nothing, 3=tried something). Homework will include two types of problems: Matlab assignments which will ultimately be essential pieces of your final project, and problems similar to those on the quizzes. No late material (project, homework) will be accepted unless prior arrangements have been made.

**Project:** Your goal is to simulate a digital radio receiver. The Matlab assignments will form critical pieces of your project work. More information on the project will be shared later.

**Quizzes:** Will test your knowledge of material from assigned readings, lectures, and homeworks, and will be conducted during the first half (25 minutes) of the Thursday class session. Similarly, absences during quizzes will not be accommodated unless prior arrangements have been made. Quizzes will be closed-book, though you will be permitted to bring one sheet of handwritten notes. There will be no opportunity for extra credit.