Fairfield University School of Engineering

Electrical Engineering Department

COURSE: EE379/ECE479 Communications Systems - Spring, 2017

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INSTRUCTOR ASSISTANCE: Mon, Tues, Thurs & Fri. 2:00 - 3:00, in BNW 301C and by phone or email.

CLASS HOURS: T & F 12:30 – 1:45 pm, in Bannow 124

COURSE DESCRIPTION:

The course focuses on analog and digital communication systems and the effects of noise on those systems. It includes; Analog modulation and demodulation techniques (amplitude, frequency, and phase modulation); Digital Modulation and demodulation techniques (ASK, FSK, PSK, PCM, and delta modulation). It discusses performance analysis of analog and digital communication systems under noise with applications of probability theory to the analysis. It discusses information measure, source coding, error correcting codes and Spread spectrum systems. MatLab is used to solve homework problems and do the Team Design Project.

PREREQUISITES

EE 301, "Linear Signals and Systems" (or equivalent).
The student should be able to solve problems and simulate systems using MatLab.

COURSE OBJECTIVES AND LEARNING OUTCOMES

No.	Outcome	Cognitive Level	ABET a-k
1	Students will know the constituents of analog and digital communications systems.	Knowledge	c, i, j
2	Students will be able to analyze various methods of digital baseband and analog/digital bandpass transmission and detection methods.	Analysis	a, c, h, i, j, k
3	Students will know how to analyze and allocate performance objectives to components of a communications system.	Analysis,	a, c, e, i, j, k
4	Students will be able to design and simulate major communication subsystem	Synthesis	a, b, d, e, g, k

TEXT: "Modern Digital and Analog Communication Systems", B.P. Lathi and Zhi Dong, Oxford University Press, Fourth Edition, 2009.

REF: "Principles of Communication Systems", Herbert Taub and Donald L. Shilling, McGraw-Hill, 1986, ISBN 0-13-209172-0

"Analog and Digital Communication Systems", Hwei Hsu, Schaum's Outline Series, 2008, ISBN 0-07-140228-4

"Probability, Random Variables, and Random Processes", Hwei Hsu, Schaum's Outline Series, 2014, ISBN 0-07-182298-4

Digital Communications Videos, Dr. Ivica Kostanic, Florida Institute of Technology, 2013.

Lizhong Zheng, and Robert Gallager. 6.450 Principles of Digital Communications I, Fall 2006. (Massachusetts Institute of Technology: MIT OpenCourseWare), Videos, Lecture Notes

SW: The student should have access to MatLab (Full or Student Version, or Octave).

GRADING

Exams 1 and 2	25% each
Homework/Class Participation	25%
Project	25%

SCHEDULE

DATE	TOPIC	CHAPTER IN TEXT	HOMEWORK (due the next class)
1/17 1/20	Course Introduction, Signals Spectra &, Noise	Ch1, Noise, Ch2a, Channel-Capacity.	Review Pre-Requisite materials, get ahead by reading the Text.
1/24 1/27	Review: Fourier, Linear Systems and Convolution	Ch2b, Fourier Series Tutorial, Fourier Transform Tutorial, Linear Systems Tutorial	Design Project Introduction HW2 2.1-2,6,8; 2.4-3, 2.6-2, 2.9-2
1/31 2/3	Transmission of Signals Amplitude Modulation	Ch3a Ch3b	HW3 3.1-4,5; 3.4-2
2/7 2/10	Demodulating AM Frequency/Phase Modulation	Ch4a Ch4b	HW4 4.2-1,2,4; 4.2-7,8; 4.3-1,3
2/14 2/17	Demodulating FM Review for Exam 1	Ch5a Ch5b	HW5 5.1-2,3,4; 5.2-3,4; 5.3-1; 5.4-2
2/21 2/24	**Tuesday is Monday** **Exam 1 (Ch. 1-4)**	**No Class**	
2/28 3/3	Exam 1 Reprise, The Phase-Locked Loop Pulse Amplitude Modulation	PLL Sampling Tutorial	
3/7 3/10	PAM Continued Analog-Digital Conversion	Ch6a, Ch6b	HW6 6.1-1,4; 6.2-2,4,11
3/14 3/17	**Spring Break – No Classes**	ASCII table	
3/21 3/24	Digital Communication Inter-Symbol Interference Eye Diagrams	Ch7a, Ch7b, Ch7c	HW7a 7.3-2,7,12; 7.7-3,4
3/28 3/31	Bandpass Modulation Bandpass Demodulation Signal Detection in AWGN	Ch7d, Ch7e Sklar-Lecture 3c	HW7b 7.8-1
4/4 4/7	Linear Block Codes Review for Exam 2	Sklar-Lecture 6a	
4/11 4/14	**Exam 2 (Ch. 5-7)** **Easter Break**		
4/18 4/21	Exam 2 Reprise Project Seminar 1		
4/25 5/2	Project Seminar 2 Project Seminar 3		
5/5 8am	Project Seminar 4 Project Seminar 5	5/4-5/11 **Final Exam Week**	

RECORDED LECURES

COURSE REQUIREMENTS

Each student is expected to attend all of the scheduled classes if for some reason the student cannot make a class the Instructor should be contacted in advance, if possible, to arrange to turn in homework and to get the assignment for the following class. The course includes homework problems, two semester exams and a Seminar/Design Project (Project report, PPT, and simulation files uploaded to Blackboard). Students are expected to turn in all work on time; late work will be penalized. Since all exams are "Open Book" but no computer or phone, you should have a hard copy of the text and not just rely on an eBook or pdf of the text as that would put you at a disadvantage.

Required Software:

1. MatLab (Student Edition with the communications toolbox) or **Octave for Windows**
   MatLab Tutorial by B. Aliane

Web Resources:

1. The **Blackboard** system along with our course **web site** will be used to manage this course.
2. Students must submit their assignments into Blackboard for archival and grading. All work is to be typed (including equations), drawings are to be computer-base, not scanned, hand written work. The best file format to use is MS Word (doc or docx), but PDF can also be used.

Performance Indicators and Grading:

Two exams will be given covering several concepts each.

Class participation/Homework	25%
Design Project	25%
Exams (2)	50%
Total	100%

Exam Grading:

The purpose of the exams is to convey your understanding of the material; therefore, it is important that you show your work. Even if you feel that the solution to a problem is obvious; you must still explain why it is obvious. Furthermore; if you are asked to solve a problem using a given technique; then please use that technique; otherwise, I have no way to judge your understanding of the technique being tested.

Homework policy:

Homework will be assigned from the book as your primary preparation for the exams. We will review select homework problems in class and you will be asked to work them on the board for a participation grade. We will also incorporate design problems / projects as appropriate to the material. These problems are designed to challenge you to think beyond what the book has told you, and do real engineering. There may be more than one correct answer. If you know in advance that you will be missing class please contact me to make arrangements so that you can keep up.

If you understand how to do the homework problems you will have an easier time with the Exams.

Distance Education Students:

The course lecture notes and supplementary videos are accessible via links in this syllabus. You should submit scanned copied of assigned HW and your Exams via email. Your project materials should be directly uploaded to Blackboard in the designated assignment area. I will arrange for a weekly, web enabled Q&A discussion once the class begins. Distance Ed students should plan on attending the presentation sessions at the end of the semester of the design projects.

Academic Integrity:

Working with classmates to study, resolve problems, and learn the material is expected and encouraged during normal course work. However, during individual evaluations (e.g. quizzes, exams, individual projects, etc.) you are expected to comply with all standards of academic honesty. You will be graded fairly, and so your work should fairly represent your knowledge, abilities, and effort, not that of others. Any breach of integrity (including but not limited to: copying solutions, internet solutions, copying from peers, claiming work or designs without proper citation, etc.), will not only impact your ability to learn the material and my ability to help you through proper feedback, it will result in academic penalty. Any individual found in breach of this code will fail the afflicted assignment and will be asked to meet privately; any other offenses will be referred to the Dean for further action, and could result in penalties as severe as expulsion from the University.

CLASS EXPECTATIONS:

TEACHER:

- Distribute syllabus.
- Review the material described in the syllabus.
- Explain material.
- Identify additional materials, Internet sites or books that clarify the material.
- Relate material to "real world" situations when possible.
- Answer questions.
- Be available to discuss problems.
- Be receptive to new ideas.
- Announce business/class conflicts in advance.
- Make up missed classes
- Prepare/administer 2 exams and a number of quizzes.
- Grade fairly.
- Assign appropriate homework problems.

STUDENT:

- Be familiar with the prerequisite material
- Ask questions.
- Stay current.
- Study the material described in the syllabus, preferably before it is covered in class.
- Complete the assigned homework (all chapter problems with answers).
- Obtain class notes if a class is missed.
- Use the library and the Internet to obtain supplemental material.
- Prepare for quizzes/exams.
- Ask for help (tutors are available for assistance)
- Follow standards of academic integrity.