ELECTRICAL ENGINEERING DEPARTMENT
KING ABDULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Fall 2012

EE 242/EE 571 Digital Communication and Coding

Instructor:

Dr. Tareq Y. Al-Naffouri

Office: Building 3, Room 303 (KAUST)
Building 59, Room 1085 (KFUPM)
Phone: 02-808-0298
Email: tareq.alnaffouri@kaust.edu.sa
Web: http://faculty.kfupm.edu.sa/ee/naffouri

Course Description:

This course is designed to introduce to the student the fundamentals of the theory of communications and coding, in particular of digital communications. The course will provide in-depth knowledge of communication fundamentals, which include Digital transmission of information across discrete and analog channels. Sampling; quantization; noiseless source codes for data compression: Huffman's algorithm and entropy; block and convolutional channel codes for error correction; channel capacity; digital modulation methods: PSK, MSK, FSK, QAM; matched filter receivers. Performance analysis: power, bandwidth, data rate and error probability.

Text Book:

J. Proakis, Digital Communications, 5th edition, McGraw-Hill Science/Engineering/Math, 2006.

Additional References:

1. John R. Barry, David G. Messerschmitt, and Edward A. Lee, Digital Communication, Springer; 2003
2. David Tse and Pramod Viswanath, Fundamentals of Wireless Communication, Cambridge University Press
3. B. Sklar, Digital Communications: Fundamentals and Applications, Prentice Hall, 2001
4. Theodore Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Prentice Hall, 2001
5. R. G. Gallager Principles of Digital Communication, under preparation, (Draft available online).

Course Webpage:

http://faculty.kfupm.edu.sa/ee/naffouri/courses/ee242.html

Homework Assignments:

Homework will be assigned approximately biweekly

Problem Sessions:

This course will require lots of practice to understand the course material. As such, I will carry one problem session outside class on a need basis. Attendance is optional but is highly encouraged.

Office Hours (Tentative):

- **KFUPM**

Sunday: 10:00 AM-12:00 PM

- **KAUST**

Saturday: 10:30 AM -12:00 PM
Tuesday 1:00 PM - 2:30 PM

Grading Policy (Tentative):

Students will be assigned grades on the following basis:

Homeworks/Projects	20%
Major Exam I	20%
Major Exam II	20%
Final Exam	40%

Coverage Outline: *(Time and emphasis may be adjusted as needed)*

No.	Topic	Lectures	Reading
1	**Introduction** • Basic Elements of Digital Communication Systems • Communication Channels	**2**	Ch1
2	**Source Coding** • Sampling, Quantization, and PCM • Entropy and mutual information • Coding for discrete memoryless sources	**4**	Ch3
3	**Characterization of Communication Signals and Systems** • Representation of Band-Pass Signals and Systems • Signal Space Representations • Representation of Digitally Modulated Signals	**5**	Ch4
4	**Optimum Receivers for the Additive White Gaussian Noise Channel** • Optimum Receiver for Signals Corrupted by Additive White Gaussian Noise • Performance of the Optimum Receiver for Memoryless Modulation • Trade off of power, bandwidth, data rate, and error probability	**6**	Ch 5
5	**Nyquist Pulse Shaping**	**2**	
6	**Error Correcting Coding and Channel Capacity** • Block coding • Convolutional coding • Channel capacity	**7**	Ch7, Ch8
7	**In Class Major Exams**	**2**	