KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
ELECTRICAL ENGINEERING DEPARTMENT
First Semester (071)

EE 571 Digital Communications I

Instructor:

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Office Hours:

Saturday: 12:30 PM–1:30 PM
5:15 PM–6:15 PM
Monday: 12:30 PM–1:30 PM
(also by appointment)

Course Objectives: This course is designed to introduce to the student the fundamentals of the theory of communications, in particular of digital communications. The course will provide in-depth knowledge of communication fundamentals, which include probability, random variables, stochastic processes, digital signals and their characteristics, baseband and bandpass digital communications. Performance of digital transmission in the presence of noise. Optimum detection of digital signals and performance measures.

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

Review ($2\frac{1}{2}$ weeks) Major concepts in analog and digital communications (EE 370), probability, random variables, and stochastic processes.

Detection Theory (2 weeks) Vector channels, detection of signals in noise, decision rules such as MAP and maximum likelihood rules, waveform channels, error probability of baseband signals.

Modulation Techniques (4 weeks) Bandpass signal representation, noise characterization in bandpass systems, orthogonal expansion of signals, phase and frequency shift keying, quadrature modulation, differentia and M-ary modulation schemes, coherent and noncoherent receivers, correlator, matched filter, and envelope detector.

Performance of Modulation Techniques ($1\frac{1}{2}$ weeks) Computation of the error probability for different modulation techniques and water-fall error curves.

Spectral Characterization ($2\frac{1}{2}$ weeks) Spectral characterization of modulation techniques, bandwidth definitions, phase shaping, spectrally efficient modulation techniques such as OQPSK, pi/4-QPSK, MSK GMSK, and CPM.

Text Book: 1. J. Proakis, Digital Communications, 3rd /4th Edition, McGraw-Hill, 1995/2000.

Additional References:

1. Wozencraft and Jacobs, Principles of Communication Engineering, 1966.
2. S. Haykin, Communication Systems, 3rd Edition, Prentice-Hall, 1994.
3. S. Wilson, Digital Modulation and Coding, Prentice-Hall, 1995.
4. L. Couch, Digital and Analog Communication Systems, 1987. 5. Bernard Sklar, Digital Communications:Fundamentals and Applications, Prentice-Hall, 1998.
5. R.E. Ziemer and R. L. Peterson: Introduction to Digital Communications, 2nd Edition, 2001.
6. S.G. Wilson: Digital Modulation and Coding, McGraw Hill, 1996.
7. R.E. Blahut: Digital Transmission of Information, Addison Wesley, 1990.
8. R. G. Gallager Principles of Digital Communication, under preparation, (Draft available on WebCT).

Grading Policy: Students will be assigned grades on the following basis:

Assignments	12
Quizes(2)	12
Matlab project	6
Term Paper	15
Midterm	20
Final Exam	35

Homework Assignments: One homework assignment approximately every two weeks.

Extra Credit Assignment:

Give a problem session to students: You are to prepare a few problems on a certain topic and solve these problems to the students in class.

Participate in the online discussion: Online discussion is strongly encouraged. Here are a couple of possibilities we can discuss

1. Questions and highlights to what is discussed in class
2. Some online material that shed and enhance the material we cover in the course
3. Issues related to the communication industry which might sound interesting