CME 452
Digital Communications (Required Course)
Syllabus
Second Semester 2011/2012

Course Coordinator
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Office Hours: Sun., Tues. and Thurs.:10:00 -11:00, Mon and Wed: 11:30-12:30

Catalog Data
Introduction, transmission of binary waveforms in AWGN environment, performance
analysis and error probability, bandpass modulation binary and M-level (ASK, PSK and
FSK), performance analysis, channel coding and modulation trade off. (3 credit hours)

Course Objectives
- To introduce students to digital communication systems and their applications
  (PEO1,2)
- To introduce students to the fundamentals of digital modulation and demodulation
  (PEO2)
- To provide students tools needed to design and analyze the performance of digital
  modulations in noise, includes base band and band pass. (PEO1)

Textbook
- Digital Communication, Fundamental and application”, Prentice –Hall, second
  edition.

References
- Zeimer R. E. and Petersons, “Introduction to Digital Communications”, Prentice-
  Hall, second edition.
  edition
- Proakis J. and Salehi M, “Communication System Engineering”, second edition,
  Prentice- Hall

Prerequisite by Course and Topic
- CME 450 Communication Systems
- CME 314 Probability and Random Process for Engineers.
- CME 312 Signals and Linear Systems

Course Outcomes as Related to Program Outcomes
- Introduce student to the principle features of digital communication systems and
  their current and future applications (h, I and j)
- Introduce the students to the baseband pulse transmission, including matched
  filter and correlator receiver, and provide tools to analyze the performance of
different PCM waveform in noise (a and c).
- Understand signal design for intersymbol interference channels (a, c, and a).
- Understand Bandpass digital modulation and demodulation (binary and M-level;
  ASK, PSK and FSK), including their performance in noise. (a, c, e and k)
Understand basic concept of channel error correcting codes. (a and c)

Understand Coding and Modulation Tradeoff. (a, c, e and k)

Course Topics

Chapter 1: Introduction, 2 weeks
- Introduction to digital communication
- Review of the statistical methods in digital transmission
- Bandwidth of digital data

Chapter 2: Pulse modulation, 2 weeks
- Base Band system
- Sampling theorem and type of sampling
- Pulse Amplitude Modulation
- Time division Multiplexing
- Pulse Position Modulation
- The Quantization
- Pulse Code Modulation
- Delta and Sigma Delta Modulation
- Differential Pulse Code Modulation

Chapter 3: Base band Pulse Transmission, 2 weeks
- Detection of Binary signal in Gaussian Noise
- Intersymbol interference and Eye pattern
- Pulse Shaping and Nyquist Criterion

Chapter 4: Band Pass Modulation, 3 weeks
- Band pass System and Model
- Geometric Interpretation of Signals
- Response of Bank of Correlator to Noisy input
- Coherence Detection of Signal in AWGN
- Bit error rate of binary ASK, PSK and FSK.

Chapter 5 Multi level band pass modulation, 2 weeks
- Bit error rate of M-level ASK, PSK and FSK
- modulation trade off

Chapter 6 Channel Coding, 3 weeks
- Block codes
- Convolutional Codes
- Modulation and coding trade-offs

Computer Usage

- Students use MATLAB in analyzing and simulating mobile communication systems
- Students use the internet to collect information about digital communication systems

Tests, Projects and Grading Policy

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<thead>
<tr>
<th>Grading Component</th>
<th>Points</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Test #1</td>
<td>25%</td>
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<tr>
<td>Test #2</td>
<td>25%</td>
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<tr>
<td>Final Exam</td>
<td>50%</td>
<td>Will be announced by the faculty</td>
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<tr>
<td>Total</td>
<td>100%</td>
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Hijjawi Faculty for Engineering Technology
Communications Engineering Department

Class/Laboratory Schedule
- Three 50-minute or two 75 minute lectures/discussion sessions per week.
- Punctuality in attending classes is executed for all the students. Yarmouk University’s policy on excessive absence will be followed.

Contribution of Course to Meeting the Professional Component
- Engineering Topics: 100%

Prepared by: Dr. Mohammad M. Banat
Date: 7 February 2012