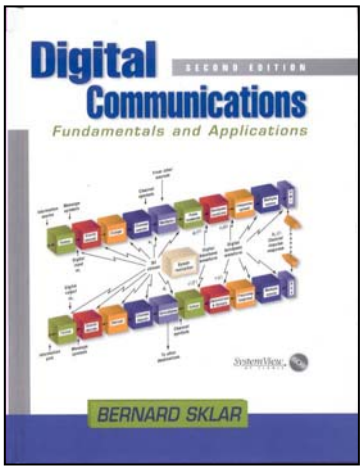
Electrical and Computer Engineering
EE521 Analog and Digital Communications

James K Beard, PhD
Office: Ft. Washington 115
Email:. jkbeard@temple.edu
Office Hours: Wednesdays 3:00 PM to 4:30 PM; 5:30 PM to 6:00PM
Location: Ft. Washington 107
Time: Tuesdays 6:00 PM – 8:30 PM
Web Page: http://temple.jkbeard.com

Texts: Bernard Sklar, *Digital Communications*, Second Edition, Prentice Hall P T R, 2001 (2004 printing), ISBN 0-13-084788-7, *Digital Communication Systems Using SystemVue*, by Dr. Silage, ISBN 1-58-450850-7



This spring graduate ECE course considers digital data communication with noise, modulation including digital phase coding, codes including linear, block, cyclic, convolutional, and decoding including TDMA, and spread spectrum and CDMA.

The lecture material will be supplemented by coordinated laboratory assignments and an individually assigned Term Project in computer simulations using *SystemView* by Elanix (http://www.elanix.com), included with the text. The grade for EE320 will consist of the following:

- Two Exams, 40%
- Individually Assigned Project, 40%
- Final Exam 20%
- Attendance – deductions for absences
- Occasional unannounced 10-minute quizzes – deductions for missing or incorrect responses

Jan 25: Course overview, Introduction to *SystemView*; Chapter 2, Formatting and Baseband Modulation; Baseband Signals, Messages, Characters, and Symbols, Formatting Analog Information
Feb 1: Using *SystemView*; Chapter 2; Sources of Corruption, Pulse Code Modulation, Uniform and Non-uniform Quantization
Feb 8: Chapter 2; Baseband Modulation, Baseband Demodulation/Detection, Signals and Noise, Detection of Binary Signals in Gaussian Noise, Inter-symbol Interference, Equalization, Chapter 4, Bandpass Modulation and Demodulation/Detection
Feb 15: Chapter 4, Why Modulate, Digital Bandpass Modulation Techniques, Detection of Signals in Gaussian Noise, Coherent Detection, Non-coherent Detection
Feb 22: Chapter 4; Complex Envelope

First Examination
Project Assignment

Mar 1: Chapter 4; Error Performance, M-ary Signaling and Performance, Symbol Error Performance for M-ary Systems (M>2)

Mar 8: **Spring Break**

Mar 15, Chapter 6, Channel Coding: Part I; Waveform Coding and Structured Sequences, Types of Error Control, Structured Sequences, Linear Block Codes, Error-Detecting and Correcting Capability, Usefulness of the Standard Array, Cyclic Codes, Well-Known Block Codes

Mar 22: Chapter 7, Channel Coding: Part 2; Convolutional Encoding, Convolutional Encoder Representation, Formulation of the Convolutional Decoding Problem, Properties of Convolutional Codes, Other Convolutional Decoding Algorithms

Mar 29: Chapter 9, Modulation and Coding Trade-Offs; Goals of the Communications System Designer, Error Probability Plane, Nyquist Minimum Bandwidth, Shannon-Hartley Capacity Theorem, Bandwidth Efficiency Plane

Second Examination

April 5: Chapter 9; Modulation and Coding Trade-Offs

April 12: Chapter 9; Defining, Designing, and Evaluating Digital Communication Systems, Bandwidth-Efficient Modulation

April 18: Chapter 9; Modulation and Coding for Band-Limited Channels, Trellis-Coded Modulation

April 26: ***Term Project Due; Term Project Presentations and Demonstrations***

May 3: Study Day

May 10: ***Final Examination***

Appointments: The preferred, professional manner to *schedule* an appointment to discuss the material of this course and for questions or concerns is via *email*.

Accommodation: Any student who has a need for accommodation based on the impact 9of a disability should contact me privately to discuss the specific situation as soon as possible. The student should also contact Disability Resources and Services at (215) 204-1280, located at 100 Ritter Annex, to coordinate reasonable accommodations for students with documented disabilities.

Attendance and Participation: Attendance at the lectures of this course is considered as participation and is *mandatory*. Each unexcused absence will result in a 0.5% reduction of the final grade.

Unannounced Quizzes: Students should be prepared throughout the course by *diligently* performing the problem assignments, even though they are not collected or graded *per se*. Unannounced 10 minute quizzes will be given on material from completed problem assignments in lieu of attendance checks. Absence or unfamiliarity with the material apparent in the quiz answer will result in a 1% reduction in the final grade.

Course Objectives and Outcomes: The objectives and outcomes for all courses in ECE are maintained as part of the ABET accreditation criteria.

TUARC: ECE students interested in digital data communications should visit the Temple University Amateur Radio Club K3TUwebsites at
http://www.temple.edu/ece/tuarc.htm
and
http://www.temple.edu/k3tu
for an interesting technical diversion.