Department of Electrical and Computer Engineering
520.401 Basic Communications

2004-05 Catalog: This course covers the principles of modern analog and digital communication systems. Topics include: amplitude modulation formats (DSB, SSC VSB), exponential modulation formats(PM, FM) , superheterodyne receivers, digital representation of analog signals, sampling theorem, pulse code modulation formats (PCM, DPCM, DM, spread-spectrum), signals with additive Gaussian noise, maximum likelihood receiver design, matched filtering, and bit error rate analyses of digital communication systems. (3 credit hours/Elective)

Prerequisite(s): 520.214 Signals and Systems

Textbook: B. P. Lathi, *Modern Digital and Analog Communications Systems,* Third Edition, Oxford University Press, 1998

Course Objectives: The main objectives of the course are (i) to introduce the students to the fundamental concepts, theory, design, implementation, and applications of modern communication systems; (ii) to equip the students with the basic, but necessary, tools required for the further study of communication systems; and (iii) to motivate and sustain the students' interests in communications.

Topics Covered:
1. Introduction – basic concepts and review of Fourier transforms
2. Signal representations, signal power spectral density
3. Amplitude modulation formats (DSB, SSB, QAM, VSB)
4. Carrier acquisition – phase lock loops
5. Superheterodyne receivers
6. Frequency modulation formats (PM,FM)
7. FM receivers
8. Digital signaling – sampling theorem, quantization noise
9. Digital formats – PCM, DPCM, DM
10. Signal-to-noise ratio for analog systems
11. Maximum likelihood detection
12. Digital systems with additive Gaussian noise
13. Bit error rate calculations for digitial signal formats
14. Spread-spectrum communications

Class Schedule: Three – one hour lectures/week

Contribution of Course to Meeting the Professional Component (credit hours):

Engineering Science	Engineering Science and Design
3	

Relationship of Course to Program Educational Outcomes (√ those that apply):

x	Apply mathematics, probability and statistics, basic science, and computer science
	Design and conduct experiments, analyze and interpret data
x	Identify, formulate and solve electrical engineering problems
	Use technical skills and modern engineering tools to design to meet needs
	Communicate effectively and work on multidisciplinary teams
	Contemporary issues, ethical responsibilities, environmental, health, safety issues
	Engage in life-long learning

Prepared June 1, 2005 by: Frederic M. Davidson