

ABET COURSE SYLLABUS

ECSE-4520: Communication Systems

Course Catalog Description: An introduction to signals and noise in electrical communication systems. Spectral analysis and filtering, including random signals. Modulation theory and techniques. System performance in the presence of noise. Other topics include television and radar systems, digital communication, receiver noise, and information theory. Prerequisites: ECSE-2010 and ECSE-2410; ECSE-4500 desirable. Fall, spring, and summer terms annually. *3 credit hours.*

Pre-Requisite Courses: ECSE-2010 and ECSE-2410

Co-Requisite Courses: None

Prerequisites by Topic:

1. Properties of continuous and discrete-time signals
2. Fourier series and transforms
3. Time- and frequency-domain linear systems analysis
4. Transfer functions, impulse response, step response

Textbook: Communication Systems, 4th Edition, Carlson, Crilly, and Rutledge
(and/or other required material)

References: None

Course Coordinator: Gary J. Saulnier

Overall Educational Objective: The overall objective of this course is to introduce students to the fundamental principles of communication system analysis and design.

Course Learning Outcomes:

1. Apply mathematical tools to the analysis of communication systems
2. Represent analog amplitude, phase and frequency modulated signals in the time and frequency domains
3. Draw block diagrams of modulator and demodulator structures for analog modulations
4. Design analog communication systems to meet certain specifications
5. Evaluate the performance of analog modulations in additive white Gaussian noise

How Course Outcomes are Assessed: This course is delivered in lecture format. Homework assignments are assigned on a weekly basis. The grade will be determined as follows: 3 Quizzes @ 30% each for 90% and homework 10% (lowest grade is dropped). Students are encouraged to work together on homework assignments

Relation to EE/CSE/EPE Outcomes

N = none
M = moderate
H = high

Outcome	Level	Demonstrate Proficiency
	N, M, H	e.g. Exams, projects, HW
Mathematics, science and engineering	H	Quizzes, HW
Basic disciplines in Electrical Engineering	N	
Depth in Electrical Engineering	H	Quizzes, HW
Basic disciplines in Computer & Sys. Eng.	N	
Depth in Computer and Systems Eng.	H	Quizzes, HW
Electromagnetics, electromechanics, power semiconductors	N	
Power system behavior	N	
Electrical energy conversion	N	
Conduct experiments and interpret data	N	
Identify, formulate and solve problems	H	Quizzes, HW

Design a system, component or process	M	Quizzes, HW
Communicate in written and oral form	N	
Function as part of a multi-disciplinary team	N	
Preparation for life-long learning	N	
Ethical issues; safety, health, public welfare	N	
Humanities and social sciences	N	
Laboratory equipment and software tools	N	
Variety of instruction formats	N	

**Topics Covered:
(number of hours or classes for each)**

1. Review of Fourier series and transforms (3)
2. Review of linear systems (1)
3. Distortionless transmission and filtering (1)
4. Transmission loss and decibels (.5)
5. Correlation and spectral density (.5)
6. Bandpass signals and systems (1)
7. Amplitude modulation (AM) signals and spectra (2)
8. AM modulators and demodulators (2)
9. Exponential (phase and frequency) modulation (PM and FM) signals and spectra (2)
10. Generation and detection of PM and FM (2)
11. Effect of interfering signals (.5)
12. Heterodyne, superheterodyne, double conversion and direct conversion receivers (1)
13. Multiplexing techniques: frequency-domain, time-domain, quadrature carrier (2)
14. Phase-locked loops (1)
15. Television (.5)
16. Thermal noise and noise equivalent bandwidth (1)
17. Bandpass noise (1)
18. Performance of linear modulations with noise (2)
19. Performance of exponential modulations with noise (2)

Computer Usage:

Students may use MATLAB or Maple for some homework assignments

Laboratory Experiences:

None

Design Experiences:

1. Some homework problems incorporate design

Independent Learning Experiences:

None

Class/Lab Schedule:

MR 10 – 11:20 AM

**Contribution to the
Professional Component:**

- | | |
|---|------------------|
| (a) College-level mathematics and basic sciences: | 0.5 credit hours |
| (b) Engineering Topics (Science and/or Design): | 2.5 credit hours |
| (c) General Education: | 0 credit hours |

Prepared by:	
Date:	