The University of Texas at Tyler
Department of Electrical Engineering

EENG 4312– Communications Theory (Required)

Syllabus

Catalog Description:

modulation techniques, effects of noise in communications system, signal to noise ratio, digital data transmission, probability of error, wireless channel, diversity, cellular network, multiple access schemes.

Prerequisites: EENG 4311, Co-requisite MATH 3351

Credits: (3 hours lecture, 0 hours laboratory per week)

Text(s): Communication Systems Engineering by John G. Proakis, Masoud Salehi, 2nd Edition, Prentice Hall, ISBN-13: 9780130617934
Wireless Communications , A. Goldsmith, Cambridge University Press, 2005.

Additional Material: Lecture Handouts

Course Coordinator: Jounsup Park, PhD

Topics Covered: (paragraph of topics separated by semicolons)

Amplitude Modulation; Frequency Modulation; Information Theory; Digital Communications; Wireless Communications; Diversity; Medium Access Schemes;

Evaluation Methods: (only items in dark print apply):

1. Examinations / Quizzes
2. Homework
3. Report / Paper
4. Computer Programming
5. Project / Model
6. Presentation
7. Course Participation

Course Learning Objectives[1]: By the end of this course students will be able to:

1. Compute symbol information, information transmission rate, channel [1]
2. Select mixer filter combinations that will upshift and down shift spectra to desired specifications.[1]
3. Apply Fourier analysis to characterize communication Signals [4]
4. Design communication filter or circuit test it using simulation software [4]
5. Use simulation software to solve problems in time and frequency domain for communication systems[4, 6]
6. Analyze and predict bandwidth and power distribution properties for amplitude modulation systems AM (with carrier, suppressed carrier, single side band, vestigial sideband)[1,4]
7. Analyze and predict bandwidth and power distribution properties for angle modulation systems phase modulation, frequency modulation[1,4]
8. Explain operation for AM circuits, modulation schemes, demodulation schemes, envelope detectors[1]
9. Explain operation of FM circuits, modulation schemes, demodulation schemes, limiters [1]

10. Explain operation of phase lock loops and solve examples taken from applications in communication [1]
11. Explain advantages and disadvantages of super-heterodyne receivers and be able to solve for the local oscillator frequency and potentially interfering image frequencies[1]
12. Compute signal to noise power rations for AM and FM systems[1]
13. Compute parameters for quantization, and transmission bandwidth for analog to a pulse code modulation process, also TDM, digital data transmission[1]
14. Predict bit error probabilities in presence of additive white Gaussian noise [1]
15. Explain the wireless channel models using mathematical form [1]
16. Predict the performance of wireless communication systems [1]
17. Apply diversity schemes to design reliable wireless communication systems [4, 6]
18. Demonstrate knowledge of terminology, concepts, FCC rules to provide basis to communicate effectively with others in the technical community [1]
19. Find article from IEEE Spectrum, or other source that has relevance. Describe in short essay to describe this items.[3]

[1]*Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Student Outcomes (only items in dark print apply)[2]: This course supports the following Electrical Engineering Student Outcomes, which state that our students will possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics; [1,2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18]
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors; [19]
3. an ability to communicate effectively with a range of audiences;
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts; [3, 4, 5, 6, 7, 17]
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions; [5, 17]
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. [19]

[2]*Numbers in brackets refer to course objective(s) that address the Program Outcome.*

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:	0	hours
Engineering Sciences and Design:	3.0	hours
General Education Component:	0	hours

Prepared By:	Ron J. Pieper	Date:	Aug 17, 2012
Modified By:	Hector A. Ochoa		June 3, 2013
	Hector A. Ochoa		Aug 18, 2014
	Ron J. Pieper		Aug 20, 2015
	Seyed Ghorshi		Aug 20, 2016
	Jounsup Park		Aug 24, 2019
			May 28, 2020
			Sep 23, 2020

Outline:

week	M	W	F	Contents
1	Aug. 23	25	27	Introduction of Communication Systems
2	30	Sep. 1	3	Review of Signals and Systems
3	**6**	8	10	Power and Energy
4	13	15	17	Bandpass Signal
5	20	22	24	AM DSB-SC
6	27	29	Oct. 1	AM DSB-TC
7	4	6	8	AM SSB/VSB
8	11	13	15	Midterm Exam
9	18	20	22	Angle Modulation FM and PM (1)
10	25	27	29	Angle Modulation FM and PM (2)
11	Nov. 1	3	5	Probability Review
12	8	10	12	Random Process and Noise Modeling
13	15	17	19	Noise
14	29	Dec. 1	3	Digital Modulation and Optimum receiver
15	6	8	10	Final Exam