King Saud University
College of Computer and Information Sciences
Department of Computer Engineering

CEN 340 - SIGNALS AND SYSTEMS 3 (3,0,1)
Semester I, Academic Year 2014-2015
Required Course
Time: Sun, Tue, Thu - 10:00-10:50 and 11:00-11:50

Course Description (catalog):
Mathematical description and classification of various signals and systems: introduction to mathematical software packages (e.g. MATLAB), continuous linear time-invariant systems, convolution and correlation, Fourier series and transforms, Laplace transform, applications to communication systems: modulation/demodulation of AM, double sideband suppressed carrier, single sideband, and FM/PM systems.

Prerequisites: - **Courses** Math 204
- **Topics** Differential Equations

Textbook(s) and/or Other Required Materials:

Primary: Oppenheim A. and Willsky A. with S. Nawab, *Signals and Systems*, 2nd Ed., 1997, Prentice Hall.
Supplementary: E. W. Kamen and B. S. Heck., *Fundamentals of Signals and Systems Using the Web and Matlab*, 3rd Ed., 2007, Prentice Hall
Haykin, S., *Communication Systems*, 4th Edition, 2001, John Wiley & Sons, New York

Course Learning Outcomes: This course requires the student to demonstrate the following:
1. Use of MATLAB software for simulation of signals and systems.
2. Express signals in terms of other basic signals such as the unit step function, the rectangular pulse, and the unit impulse function.
3. Sketch signals and perform basic time-domain operations on them
4. Classify signals into periodic/non-periodic, energy/power signals
5. Perform convolution for continuous time signals.
6. Determine if a system is linear, time-invariant, causal, memoryless, and stable.
7. Describe a linear time-invariant system by its impulse/step response, differential/difference equation, and block diagram.
8. Explain the concepts of function orthogonality and basic functions; Fourier series.
9. Apply the basic definitions of the Fourier representation and its inverse.
10. Determine the frequency response: magnitude and phase
11. Apply the basic definitions of the Laplace Transform and its inverse.
12. Explain modulation and demodulation of AM, PM and FM systems.

Major Topics covered and schedule in weeks:

Introduction to MATLAB	1
Signal classification and basic operations on signals	2
Time-domain Analysis of signals and systems	2
Fourier Representations of signals and systems	3
Applications of Fourier Representations	2
Laplace transform and its applications	2
Modulation /demodulation of AM/FM signals	2
Review and evaluation	1

Grading:	**Home Work:**	10%
	Quizzes:	10%
	2-Midterms (20% each)	40%
	Final	40%

Course Outline

	Topic	Approximate Time in Hours
1	Introduction to MATLAB	3
2	Introduction to signal and Systems	2
3	Basic System Properties (1.6)	2
4	LTI Systems: The convolution Sum (2.1)	2
5	LTI Systems: The convolution Integral (2.2)	2
6	Properties of LTI Systems (2.3)	2
7	LTI Systems described by differential equation and difference equation (2.4)	2
	Mid - Term Exam 1	
8	Fourier Series representation (Chapter 3)	7
9	Continuous-Time Fourier Transform and applications (chapter 4)	8
	Mid - Term Exam 2	
10	The Laplace Transform and its applications (chapter.9)	6
11	Application to communication systems (Chapt.8)	6
12	Review	3

Contribution of Course to Meeting Curriculum Disciplines:

Curriculum Discipline	Percentage
Mathematics and Basic Science	30
Engineering Science	60
Engineering Design	10
General Education	

Course Policies:

- **Late** homework will NOT be accepted.
- The quizzes may be pop or announced, and may be given at anytime during class-time
- Students are encouraged to discuss homework problems but **not copy**.
- **All exams are closed book.**
- **The final exam will be comprehensive.**

Relationship of Course to Student Outcomes

Outcome	Student Outcome Description	Contribution
(a)	an ability to apply knowledge of mathematics, science, and engineering	✓
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
(d)	an ability to function on multidisciplinary teams	
(e)	an ability to identify, formulate, and solve engineering problems	✓
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	✓
(j)	a knowledge of contemporary issues	
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	✓

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