E E 1 7 1 (August 29, 2011)

Signal & Systems

Fall Semester 2011

C O U R S E S Y L L A B U S

There are a total of 27 classes this semester. With 2 in-class exams, we will have 25 lectures. In addition, we have a recitation session each week. Attendance in these sessions is mandatory and we will be engaged in problem solving. There will be 2 in-class exams and 1 Final. Software Labs will be in 229 Votey Hall while hardware Labs, if we have time, will be in the Signal & Image Processing Lab (330 Votey).

Note: This semester, all my lecture notes will be posted on the class web site.

Material covered will be as follows. You will find it helpful if you read the listed sections *before* the corresponding lecture.
Text: Signals & Systems, Oppenheim & Willsky with Nawab.
Prentice Hall, Second Edition, 1996.

L E C T U R E S

		Sections
Lecture 1	Continuous-time and discrete time signals	1.1 - 1.2.3
	Signal energy and power	
	Transformation of independent variable	
	Periodic signal; even and odd signals	
Lecture 2	Exponential and sinusoidal signals	1.3.1
	Continuous-time complex exponential & sinusoidal signal	
Lecture 3	Discrete-time complex exponentials & sinusoidal signals	1.3.2 - 1.3.3
	Periodic properties of (discrete) complex exponentials	
	Fundamental frequency and period of complex exponentials	
	Harmonically related complex exponentials	
	Unit impulse and unit step function	1.4
Lecture 4	Continuous-time and discrete-time systems	1.5
	Basic system (continuous and discrete) properties	1.6
	Memory, invertibility, causality, stability, time-invariance,linearity	1.6
Lecture 5	Linear Time-Invariant Systems	2.0
	Discrete system: The Convolution Sum	2.1
	Impulse response, linear time-invariant systems and the convolution sum	
	Examples of calculation using the convolution sum	
Lecture 6	More examples	2.1
Lecture 7	Continuous system: The Convolution Integral	2.2
	Cont. signal representation in terms of integral	2.2.1
	Convolution integral representation of LTI systems	2.2.2

	Examples	
Lecture 8	LTI System Properties	2.3
	Commutative, distributive, associative and memory property of LTI systems	2.3.1 - 2.3.4
Lecture 9	Invertibility of LTI systems	2.3.5
	Causality, stability of LTI systems	2.3.6 - 2.3.7
	Unit step response of LTI (cont. & disc.)	2.3.8
Lecture 10	Differential and difference equations	2.4
	Transient and steady-state solution of differential equations	
	Transient and steady-state solution of difference equations	
Lecture 11	Singularity functions	2.5
	Unit impulse as an idealized short pulse	2.5.1
	Operations with singularity functions	2.5.2
Lecture 12	Other singularity functions	2.5.3
	Correlation	
Lecture 13	Fourier series rep'n. of periodic signals	3
	Response of LTI (cont.) system to complex exponentials	3.2
	Response of LTI (discrete) system to complex exponentials	3.2
Lecture 14	Fourier series rep'n. of continuous-time periodic signals	3.3
	Determination of Fourier series	3.3.2
Lecture 15	Fourier series (continuous) - properties	3.5
	Linearity, Time shifting, Time reversal, Time scaling, Multiplication, Conjugation, Parsevals's relation	3.5.1 - 3.5.7
Lecture 16	Examples of Fourier series determination	3.5.8, 3.5.9
	Examples 3.6, 3.7, 3.8	
Lecture 17	Fourier series rep'n. of discrete-time periodic signals	3.6
	Harmonicall related complexexponentials	3.6.1
	Determination of Fourier series	3.6.2
Lecture 18	Example of determination of Fourier series	3.6.2
	Example 3.10, 3.12	
Lecture 19	Properties of discrete-time Fourier series	3.7
	Fourier series and LTI systems (discrete)	3.8
Lecture 20	Filtering	3.9, 3.9.1
Lecture 21	Discrete-time filters	3.11
Lecture 22	Continuous-time Fourier transform	4
	Representation of aperiodic signals	4.1
	Example of signals and their Fourier transforms	4.1.3
Lecture 23	Fourier transform calculations	4.1.3
	Delta-function, pulse; uncertainty principle.	
	Examples 4.1, 4.2, 4.3, 4.4, 4.5	
Lecture 24	Fourier Transform of periodic signal	4.2
	Fourier Transform properties	4.3.1 - 4.3.7
	Linearity, time-shifting, conjugation, differentiation	
Lecture 25	Fourier Transform, Laplace Transforms	4.4, 4.5, 4.5.1, 4.6
	The system function $H(jw)$, $H(s)$ and partial fraction expansion	