

EE 329 - Signal Analysis for Surveying Students 3 (3,1,0)

Syllabus:

Motivation and Applications, Signal Classifications, Signal Operations, Singularity Functions; Linear time-Invariant Systems and Convolution; Correlation; Fourier Series and Transform for continuous and discrete time signals. Introduction to z-transform. Pre-requisite *EE 308*

Textbooks:

A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, "Signals & Systems", Prentice-Hall, 1997,
S. Haykin and B. V. Veen, "Signals and Systems", John Wiley & Sons, Inc., 1999.
G. E. Carlson, "Signal and Linear System Analysis with MATLAB", John Wiley & Sons, Inc., 1998.

Course Outline:

<i>Topic</i>
Signals and Systems
LTI systems
Fourier Series for Periodic Signals
The Continuous time Fourier Transform
The Discrete time Fourier Transform

Grading system:

15 % Home works
15 % Each Mid-Term examination
40 % Final examination

Course Schedule, Academic Year 1423/1424

week	subjects
1	Definition of a signal. Definition of a system. Continuous-time signals and systems. Discrete-time signals and systems. Analysis versus synthesis, and applications.
2	Continuous-Time (CT) and Discrete-Time (DT) Signals Classifications of CT and DT signals Deterministic signals. Random signals.

	<p>Periodic signals. Energy and power signals. Even and odd signals.</p>
3	<p>Transformations of the independent variable of CT and DT signals. Time shifting. Reflection. Time scaling.</p>
4	<p>Basic operations on CT and DT signals Convolution The convolution integral. The convolution sum.</p>
5	<p>Properties of convolution The commutative property. The distributive property. The associative property. Correlation Cross-correlation function. Autocorrelation function.</p>
6	<p>Properties of correlation functions. Relationship between convolution and correlation. Fourier series (FS) representations of CT and DT periodic signals Linear combinations of harmonically related complex exponentials. Determination of the FS representation.</p>
7	<p>Fourier transform (FT) representations of CT and DT signals Development of the FT representation.</p>
8	<p>Convergence of the FT. The FT for periodic signals Properties of the Fourier representations. Linearity. Conjugation and conjugate symmetry. Time and frequency shifting, and scaling Differentiation and integration. Differencing and summation. Convolution. Multiplication. Duality.</p>
9	<p>Differencing and summation. Convolution. Multiplication. Parseval's relation. Duality.] CT and DT Systems Interconnections of systems.</p>
10	<p>Basic system properties Systems with and without memory. Causal and noncausal systems. Stable and nonstable systems.</p>
11	<p>Linear and nonlinear systems. Time invariant and time varying systems. Invertibility and inverse systems. Linear time-invariant (LTI) systems</p>

12	<p>The response of LTI systems to an arbitrary input. The impulse response. Development of the convolution sum. Development of the convolution integral. Relationship between step and impulse responses.</p>
13	<p>Properties of LTI Systems LTI systems interconnected in cascade and parallel LTI systems with and without memory. Invertibility of LTI systems. Causality for LTI systems. Stability for LTI systems.</p>
14	<p>The response of LTI systems to a complex exponential The frequency response. System response to a periodic signal. Filtering. DT processing of CT signals. The sampling theorem. Basic system components. Systems characterized by linear constant-coefficient and difference equations</p>