Signal and System Analysis (AEE 2410)

Dr. Abdelouahab Bentrcia

Chapter 0: Introduction

Introduction

- Signal and System Analysis (AEE 2410)
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- Office Number: S111
- TA: Eng. Ahmed Nafees
- Class Timings: check time table
- Tutorial: ?
- Office Hours: Sun. Tue. Wed. (08:00 – 10:00) or by appointment

Introduction

Pre-requisites:

- AEE 2110 Electric Circuits I.

Credit hours:

- 3(3,1,0) hours

Textbook (s):

- A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, "Signals and Systems", Prentice Hall, 1997.

Other references

- C.-T. Chen, Signals and Systems, Oxford University Press, NY, 2004..

Introduction

Chapters covered: 1-5 and 9 (A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, "Signals and Systems", Prentice Hall, 1997).

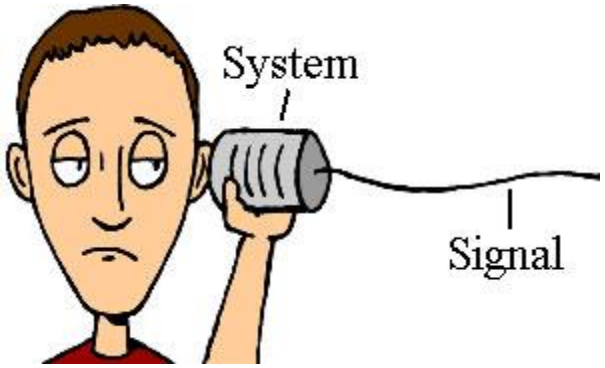
Grading Criteria:

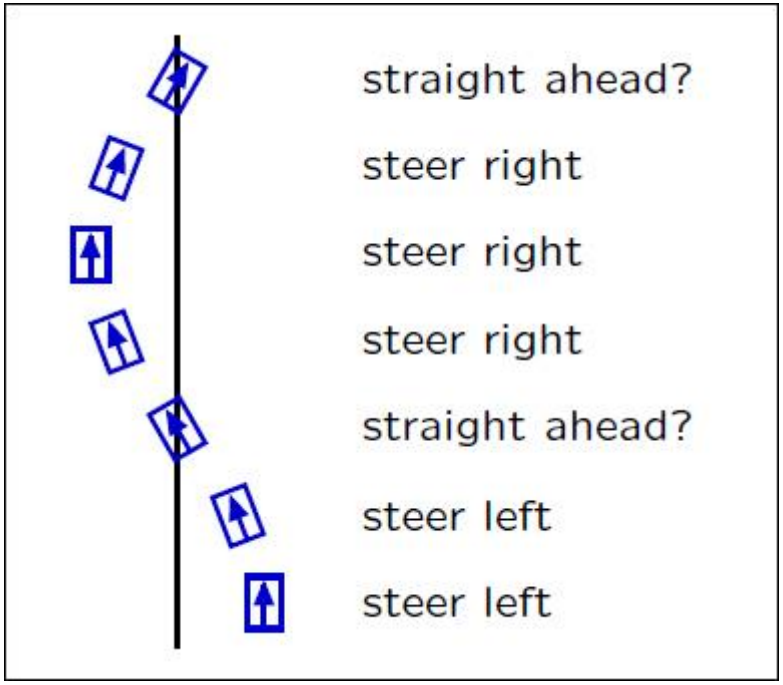
- 15% Quizzes (worst quiz will be cancelled for each student)
- 5% Project
- 20% Midterm Exam I (7^{th} week)
- 20% Midterm Exam II (11^{th} week)
- 40% Final Exam

Textbook	week	Topics to be covered
Chapter 1	1,2,3,4	1. Signals and Systems. Continuous-Time and Discrete-Time Signals. Transformations of the Independent Variable. Exponential and Sinusoidal Signals. The Unit Impulse and Unit Step Functions. Continuous-Time and Discrete-Time Systems. Basic System Properties.
Chapter 2	5,6	2. Linear Time-Invariant Systems. Discrete-Time LTI Systems: The Convolution Sum. Continuous-Time LTI Systems: The Convolution Integral. Properties of Linear Time-Invariant Systems. Causal LTI Systems Described by Differential and Difference Equations. Singularity Functions.
Lecture notes	7	Correlation Analysis Autocorrelation function, cross-correlation function, properties.
Chapter 3	8,9	3. Fourier Series Representation of Periodic Signals. A Historical Perspective. The Response of LTI Systems to Complex Exponentials. Fourier Series Representation of Continuous-Time Periodic Signals. Convergence of the Fourier Series. Properties of Continuous-Time Fourier Series. Fourier Series Representation of Discrete-Time Periodic Signals. Properties of Discrete-Time Fourier Series. Fourier Series and LTI Systems. Filtering. Examples of Continuous-Time Filters Described by Differential Equations. Examples of Discrete-Time Filters Described by Difference Equations.

Chapter 4	10	4. The Continuous-Time Fourier Transform. Representation of Aperiodic Signals: The Continuous-Time Fourier Transform. The Fourier Transform for Periodic Signals. Properties of the Continuous-Time Fourier Transform. The Convolution Property. The Multiplication Property. Tables of Fourier Properties and Basic Fourier Transform Pairs. Systems Characterized by Linear Constant-Coefficient Differential Equations.
Chapter 5	11	5. The Discrete-Time Fourier Transform. Representation of Aperiodic Signals: The Discrete-Time Fourier Transform. The Fourier Transform for Periodic Signals. Properties of the Discrete-Time Fourier Transform. The Convolution Property. The Multiplication Property. Tables of Fourier Transform Properties and Basic Fourier Transform Pairs. Duality. Systems Characterized by Linear Constant-Coefficient Difference Equations.
Chapter 9	12-13	9. The Laplace Transform. The Laplace Transform. The Region of Convergence for Laplace Transforms. Properties of the Laplace Transform. Some Laplace Transform Pairs. Analysis and Characterization of LTI Systems Using the Laplace Transform. System Function Algebra and Block Diagram Representations. The Unilateral Laplace Transform.
	14	General Review for the Final Exam

What is signals and systems about?





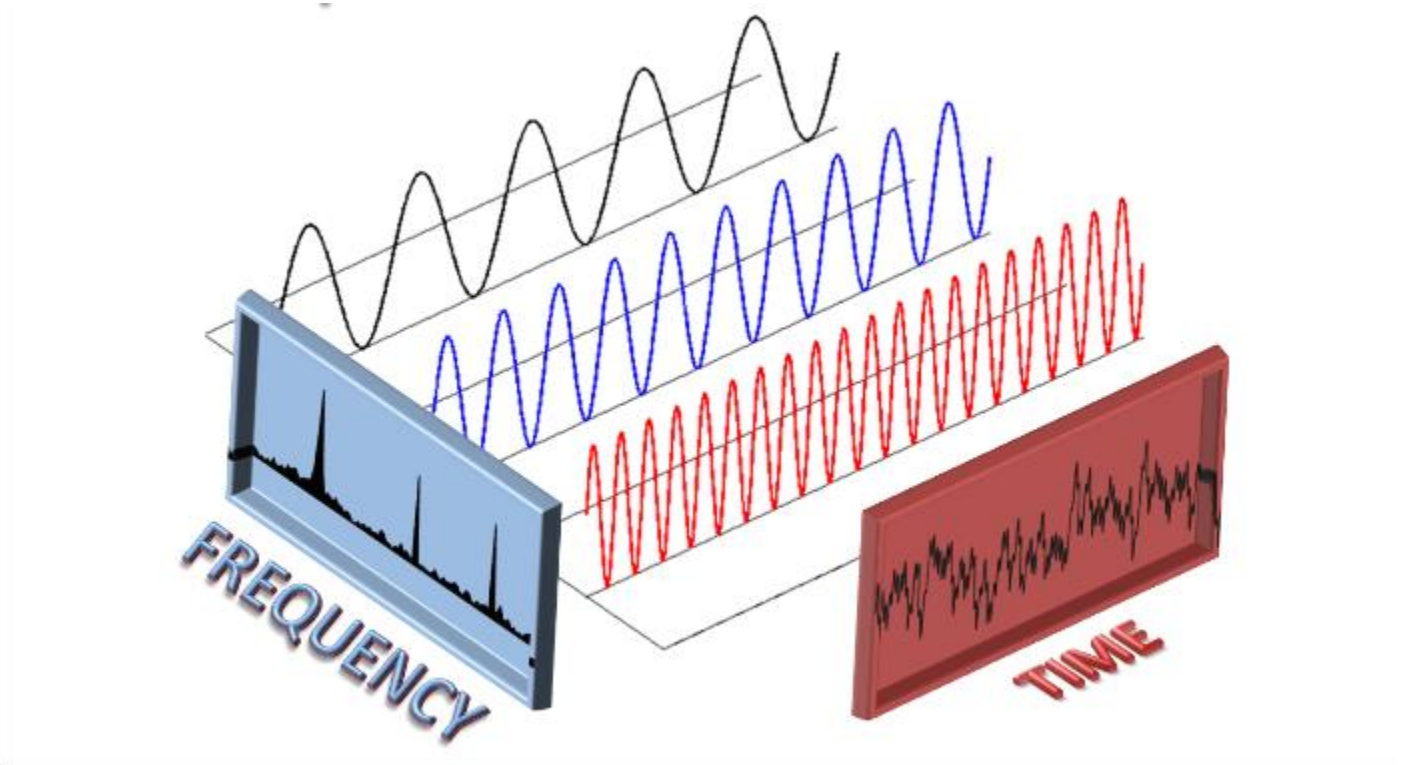
What is signals and systems about?

Applications

- Communication: upconversion, downconversion…using modulation property
- Digital signal processing: A/D and D/A conversion using sampling property…
- Control theory: useful to study stability and other properties of control systems…

What is signals and systems about?

- Tools to analyze signals and systems (Fourier series, transform, Laplace)
- Study Properties of these tools
- Applications where these tools can be used…



What is signals and systems about?

- Calculus
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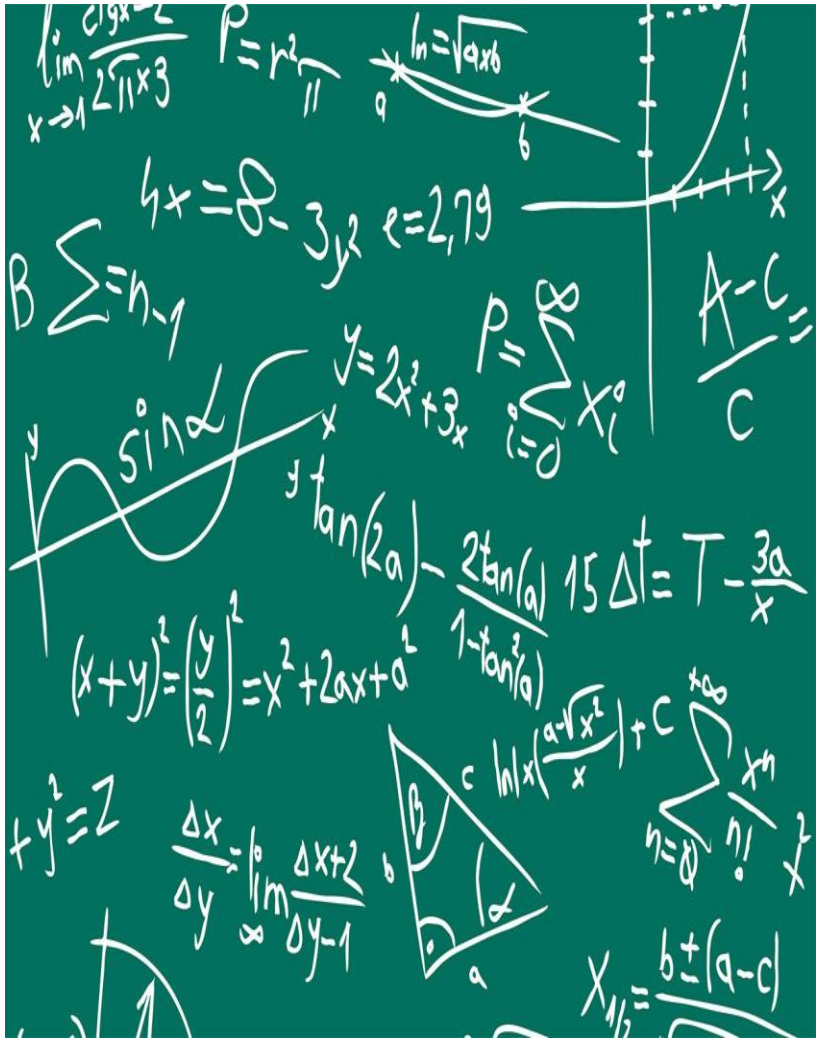
- Calculus (functions, Differentiation, integration, power series, sequences, Taylor expansions, complex analysis, vectors, Complex numbers, and trigonometry)



Is the course difficult?

- Yes if no Calculus
- Very simple if calculus ok