

DEA-GITT-213 Signals and Systems

SEMESTER:	Fall
CREDITS:	6 ECTS (4 hrs. per week. 2h Theory + 2h Lab)
LANGUAGE:	Spanish
DEGREES:	GITT

Course overview

This course is an introduction to signals and time-invariant linear systems. Both analog and discrete signal and systems will be analyzed. This course builds the foundations of the main tools used to analyze real-life systems in following courses such as “Communication Systems” and “Digital Signal Processing”. Mainly, these tools are the Fourier Series, Fourier Transform and the Z-Transform.

Prerequisites

Introduction to electronic circuits and systems. Introduction to calculus.

Course contents

Theory:

1. Introduction to signals. Mathematical description of signals, transformation over the independent variable, energy, power.
2. Continuous systems. Description of continuous systems and examples. Linear Time Invariant (LTI) systems and its importance. Continuous-time convolution.
3. Fourier Series. Analysis of periodic signals and their Fourier Series.
4. Continuous-time Fourier Transform. Analysis of the spectrum of non-periodic signals through the Continuous-time Fourier Transform.
5. Discrete Signals. Mathematical modelling of discrete signals. Sampling process of continuous signal to build discrete-time signals. Nyquist theorem. Reconstruction process of signals in order to build continuous signal from a discretized of them.
6. Discrete systems and Z-transform. Analysis of discrete-time systems throughout the Z-transform operation

Laboratory:

There will be seven 2-hour sessions spread throughout the course.

- P1.** Matlab introduction.
- P2.** Signals and functions.
- P3.** Fourier Series.
- P4.** Filtering.
- P5.** Continuous-time Fourier Transform.
- P6.** Discrete signals.
- P7.** Digital filtering.

Textbook

- Teacher notes on Moodle.
- K. Steiglitz, A Digital Signal Processing Primer. Addison Wesley, Menlo Park, CA. 1996
- DSP First. McClellan, Schafer, Yoder. Prentice-Hall 1998.
- A Digital Signal Processing Primer. K. Steiglitz. Addison-Wesley 1996.
- Concepts in Systems and Signals, J. D. Sherrick. Prentice-Hall 2001.

Grading

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.
- A minimum grade in the final exam of 4 over 10.
- A minimum grade in the overall laboratory of 4 over 10.

The overall grade is obtained as follows:

- Final exam accounts for 40% of the grade.
- Mid-term exam accounts for 30% of the grade.
- Lab reports must be handed in within the following 5 days and they are graded and returned the following week. They account for 30% of the grade.