SUBJECT TEACHING GUIDE

G287 - Signals and Systems

Degree in Telecommunication Technologies Engineering

Academic year 2019-2020

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering			Type and Year	Core. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Linear Circuits and Systems Basic Training Module				
Course unit title and code	G287 - Signals and Systems				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web	https://moodle.unican.es/course/view.php?id=3092				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES
Name of lecturer	MARTA DOMINGO GRACIA
E-mail	marta.domingo@unican.es
Office	Edificio Ing. de Telecomunicación Prof. José Luis García García. Planta: - 2. DESPACHO (S210)
Other lecturers	LUIS VALLE LOPEZ JESUS RAMON PEREZ LOPEZ

3.1 LEARNING OUTCOMES
- Be able to identify signal and systems attending to their nature
- Understand the relationship between discrete-time and continuous-time domains
- Identify and use basic properties of signals and systems
- Analyze and characterize Linear Time Invariant systems and their properties
- Be able to represent signals as linear combinations of delayed impulses and to develop the convolution-sum representation for discrete-time linear time-invariant systems and the convolution integral representation for continuous LTI systems.
- Represent signals as weighted sums or integrals of complex exponentials
- Apply Fourier representation to LTI systems and their properties.
- To know the Sampling Theorem and its implications in the reconstruction of signals.
- To represent signals using the Laplace and z transforms. Analyze and characterize LTI systems using Laplace and z transforms.
- Apply Laplace and z transforms to solve differential and difference equations with initial conditions.

4. OBJECTIVES
Identify signals as functions carrying information and a system as a process in which signals are transformed. Be able to analyze signals and systems in both the time and frequency domains.

6. COURSE ORGANIZATION	
CONTENTS	
1	Introduction to signals and systems. Continuous-time and discrete-time signals. Transformations of the independent variable of a signal. Basic signals: the unit step and the unit impulse. Basic properties of systems.
2	Lineal time-invariant systems. Unit impulse response and convolution sum and convolution integral. Properties of LTI systems. Other representations of LTI systems.
3	Fourier Analysis. Fourier Series representation of continuous-time periodic signals (FS). Fourier series representation of discrete-time periodic signals (DTFS). Representation of continuous-time aperiodic signals, the continuous-time Fourier transform (FT). Representation of discrete-time aperiodic signals, the discrete-time Fourier transform (DTFT). Fourier representation properties. The Fourier transform for periodic signals.
4	Applications of Fourier analysis: Frequency response of LTI systems. Sampling and reconstruction of signals from their samples. Amplitude modulation with a Complex Exponential carrier and with a Sinusoidal carrier. Demodulation for Sinusoidal AM, synchronous demodulation.
5	The Laplace transform. The region of convergence for Laplace transform. Fourier transform and Laplace transform relationship. LTI systems analysis characterized by linear constant-coefficient differential equations. The unilateral Laplace transform its use in solving differential equations.
6	The z-transform. Fourier transform and z-transform relationship. The region of convergence for the z-transform. The inverse z-transform. Analysis and characterization of discrete-time LTI systems using z-transforms. LTI systems characterized by linear constant-coefficient differential equations.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Final Exam	Written exam	Yes	Yes	60,00
Intermediate evaluation. Blocks 1-2.	Others	No	No	30,00
Matlab simulation.	Laboratory evaluation	No	No	10,00
TOTAL				100,00

Observations

The global grade will be calculated as follows:
TE= 0.6*(Final exam grade)+ 0.3*(Intermediate Evaluation grade)
Global grade = 0.9*TE+ 0.1*(Matlab simulation grade)

If the final examination grade is lower than 4.5, the final grade will be the one obtained in the final examination.
The Matlab simulation grade will be kept until the September exam.

In the September examination the global grade will be:
Global grade= 0.9* (September Exam Grade) + 0.1*(Matlab simulation grade) if September Examination Grade > 4.5.
Global grade= September Exam Grade if September examination grade < 4.5

Observations for part-time students

The same rules will apply for part-time and full-time students.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Alan V. Oppenheim, Alan S. Willsky, S. Hamid, "Signals and Systems" 2ed, Prentice-Hall

Simon Haykin, Barry Van Veen, "Signals and Systems", 2ed, Wiley