GENERAL INFORMATION

Data of the subject	
Subject name	Signals and Systems
Subject code	DEA-GITT-213
Mainprogram	Bachelor's Degree in Engineering in Telecommunication Technologies
Involved programs	Grado en Ingeniería en Tecnologías de Telecomunicación [Second year] Grado en Ingeniería en Tecnologías de Telecom. y Grado en Análisis de Negocios/Business Analytics [Second year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Obligatoria (Grado)
Department	Department of Electronics, Control and Communications
Coordinator	Javier Matanza Domingo
Schedule	Appointment via email
Office hours	Appointment via email

Teacher Information	
Teacher	
Name	Javier Matanza Domingo
Department	Department of Electronics, Control and Communications
Office	Alberto Aguilera 25
EMail	jmatanza@iit.comillas.edu
Phone	2724
Teacher	
Name	Luis Cucala García
Department	Department of Electronics, Control and Communications
EMail	lcucala@icai.comillas.edu
Teacher	
Name	Lucas Francisco Novales Peleato
Department	Department of Electronics, Control and Communications
EMail	lfnovales@comillas.edu

DESCRIPTION OF THE SUBJECT

Contextualization of the subject
Prerequisites

Complex numbers.

Course contents

Contents
Block 1. Signals and Continuous Systems
Chapter 1. Signals
1.1 General characteristics of signals. 1.2 Transformation over the independent variable. 1.3 Elemental signals. 1.4 Exercises.
Chapter 2. Continuous Systems
2.1 Introduction. 2.2 Classification of Continuous Systems. 2.3 Linear and Time-Invariant Systems. 2.4 Exercises.
Chapter 3. Fourier Series
3.1 Introduction. 3.2 Fourier Series. 3.3 Filtering. 3.4 Exercises.
Chapter 4. Continuous Fourier Transform
4.1 Introduction and formal definition 4.2 Fourier Transform properties. 4.3 Linear systems with periodic input: The frequency response. 4.4 Exercises.
Block 2: Discrete Signals and Systems
Chapter 5. Discrete Signals and Sampling
5.1 Discrete Signals. 5.2 Transformation over the independent variable. 5.3 Elementary discrete signals. 5.4 Sampling of continuous signals. 5.5 Exercises.
Chapter 6. Discrete Systems
6.1 Introduction.

6.2 Linear and Time-Invariant discrete systems.

6.3 Convolution in LTI systems. Impulsive response.

6.4 Series response in LTI systems.

6.5 Exercises.

Chapter 7. Fourier Analysis of Discrete Sequences.

7.1 Fourier Transform of discrete sequences.

7.2 The Discrete Fourier Transform (DFT).

7.3 Exercises.

Laboratory Sessions

Laboratory Sessions

1. Introduction to Matlab

2. Signals and Functions

3. Fourier Series (2 sessions)

4. SW Filtering

5. Continuous Fourier Transform

6. Short-Time Continuous Fourier Tarnsform.

7. Signal processing project. (3 sessions)

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Examinations: • Inter-semester exam (30%) • Final Exam (40%) To pass the subject, the student must obtain at **least 5 points out of 10 in the final exam** of the subject.	• Understanding of concepts. • Application of concepts to the resolution of practical problems. • Analysis and interpretation of the results obtained in the resolution of problems. • Presentation and written communication.	70
Realization of laboratory practices • Attendance at practices • Delivery of the results report within the established period. To pass the subject, the student must obtain at least an a**verage of 5 points out of 10 in the laboratory practices**.	• Compression of concepts. • Application of concepts to the resolution of practical problems. • Mastery in solving problems with the help of the computer and specific software. • Analysis and interpretation of the results obtained in laboratory practices. • Group work capacity. • Presentation and written communication.	20
	• Understanding of concepts. • Application of concepts to answer theoretical-practical questions related to the	

Short in-class tests	topics. • Analysis and interpretation of the results of the workshops carried out in class. • Application of concepts to the resolution of practical problems. • Analysis and interpretation of the results obtained in the resolution of problems.	10

Grading

- Final grade = 20% laboratory grade + 30% inter-semester exam grade + 10% partial tests + 40% of the final exam.
- To pass the subject, in the ordinary call, it is necessary that the final grade of the subject is greater than or equal to 5 and that the following two conditions are met:
  - Average laboratory grade is greater than or equal to 5.
  - Average grade of the final exam is greater than or equal to 5.

Re-take

- In the case of failing the final exam but having passed the laboratory, there will be a final exam of extraordinary call. The final mark will be calculated as: 65% of the final exam and 35% of the saved laboratory mark.
- In the case of failing the laboratory but having passed the final exam, a practical work will be proposed to the student or a theoretical exam with laboratory contents will be proposed. The weight for the final grade will be the same as in the ordinary call.
- In the case of failing both the laboratory and the final exam, a final exam will be taken in an extraordinary call and a practical work will be proposed to the student or a theoretical exam with laboratory contents will be proposed. The weight for the final grade will be the same as in the ordinary call.
- In any case in which the final exam in the ordinary call has been suspended, it will be necessary to pass the final exam in the extraordinary call to pass the subject.

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
Reading and studying the theoretical concepts developed in class.	After each session	
Working on the proposed problems	Weekly	
Working on the lab reports	After the lab session has been finished	7 days after the session.

BIBLIOGRAPHY AND RESOURCES

Basic References

Class notes provided by professors.

Complementary Bibliography

- Alan V. Oppenheim. Signals and Systems. Prentice Hall 2003
- McClellan, Schafer, Yoder. DSP First. Prentice-Hall 1998.
- J. D. Sherrick. Concepts in Systems and Signals, Prentice-Hall 2001.
- John G. Proakis. Digital Communications. McGraw-Hill 2001.
- K. Steiglitz. A Digital Signal Processing Primer. Addison-Wesley 1996.

Scheduling Señales y Sistemas 2023 / 2024

Week	h/s	Theory/Problem solving class	Laboratory Session	Laboratory Hours	Evaluation Eval. Chapters	Evaluation Hours	Theory Hours	Problem solving hours	h/s	Theory study Content	Theory study Hours	Problem-solving Content	Problem-solving Hours	Laboratory work Activity	Laboratory work Hours
1	4	Introduction, theory and problems of Chapter 1					2	2	8	Chapter 1	4	Tema 0	4		0
2	4	Theory and problems of Chapter 1	Lab 0 Intro	2			1	1	8	Chapter 1	2	Chapter 1	2	Lab preparation and report	4
3	4	Theory and problems of Chapter 2	Lab 1 P&E	2			1	1	8	Chapter 2	2	Chapter 2	2	Lab preparation and report	4
4	4	Theory and problems of Chapter 2			Test 1	2	1	1	8	Chapter 2	2	Chapter 2	6		0
5	4	Theory and problems of Chapter 3	Lab 2 DSF	2			1	1	8	Chapter 3	2	Chapter 3	2	Lab preparation and report	4
6	4	Problems of chpater 3						4	8	Chapter 3	0	Chapter 3	8		0
7	4	Inter-semestral evaluation			Inter-semestral	4			8	Chapter 4	0		8		0
8	4	Theory and problems of Chapter 4	Lab 2 DSF	2			1	1	8	Chapter 4	2	Chapter 4	2	Lab preparation and report	4
9	4	Theory and problems of Chapter 4	Lab 3 Filtrado SW	2			1	1	8	Chapter 5	2	Chapter 5	2		4
10	4	Theory and problems of Chapter 5	Lab 4 TdF	2			1	1	8	Chapter 5	2	Chapter 5	2	Lab preparation and report	4
11	4	Theory and problems of Chapter 5	Lab 5 SELCALL	2			1	1	8	Chapter 6	2	Chapter 6	2	Lab preparation and report	4
12	4	Theory and problems of Chapter 6	Lab 6 Proy.	2			1	1	8	Chapter 6	2	Chapter 6	2	Lab preparation and report	4
13	4	Theory and problems of Chapter 6	Lab 6 Proy.	2			1	1	8	Chapter 7	2	Chapter 7	2	Lab preparation and report	4
14	4	Theory and problems of Chapter 7	Lab 6 Proy.	2			2		8	Chapter 7	4	Chapter 7	0	Lab preparation and report	4
15	4	Theory and problems of Chapter 7					2	2	8	Chapter 7	4	Chapter 7	4		0