VNIVERSITAT DE VALÈNCIA

Course Guide
34797 Signals and linear systems

COURSE DATA

DATA SUBJECT

Code: 34797
Name: Signals and linear systems
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1402 - Degree in Telecommunications Electronic Engineering	Escola Tècnica Superior d'Enginyeria	2	First quarter, Sin determinar

SUBJECT-MATTER

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	Telecommunication signals, systems and services	COMPULSORY

COORDINATION

MATEO JIMENEZ FERNANDO

SUMMARY

The Signals and Systems subject is the first contact the student with a large number of tools to use in many areas: communications, control, sonar, radar, image processing, etc.. This course will introduce concepts of signal processing with linear systems.

Describe the tools used by engineers to design systems. The knowledge gained will be applied in many fields such as audio processing, voice, image, communications, control, biomedical engineering etc.. Fields to be developed further in other subjects of the degree.

Although sometimes it may seem like a subject with abstract content with a considerable amount of mathematics, it is necessary to consider which is the basis for understanding multiple techniques of signal analysis and both continuous and discrete systems. Not to forget the large number of fields of application will use practical examples of these techniques on real problems in the lab sessions.

The goal is that by the end of the course the student is able to analyze a system and calculate its output LTI well in the temporal domain well in the transformed domain properly using Laplace transforms, Fourier or Z as appropriate.

This is the first time the student comes into contact with discrete signals, base to perform the same treatment by a computer, microcontroller, programmable logic device, digital signal processor, etc., so we will describe the process to obtain signals from discrete sampling of continuous signals detailing what the requirements for the sampling process is adequate.

Finally, we introduce signals that do not follow a deterministic pattern and its main features. These signals will be very useful is the study of communication systems.

In summary, we show that this subject is the basis to study in depth of digital signal processing, control

theory, communications and other disciplines of a Telecommunications Engineer.
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PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

The student must have completed the courses of mathematics and computer science that are taught in first degree course.

COMPETENCES / LEARNING OUTCOMES

1402 - Degree in Telecommunications Electronic Engineering

Ability for self-learning of new knowledge and techniques appropriate for the conception, development and exploitation of telecommunications systems and services.

G3 - Acquisition of the knowledge of the basic and technological subjects that allows students to learn new methods and theories and endows them with the versatility to adapt to new situations.

G4 - Ability to solve problems with initiative, decision-making and creativity, and to communicate and transmit knowledge, abilities and skills, understanding the ethical and professional responsibility of the activity of a telecommunications technical engineer.

DESCRIPTION OF CONTENTS

1.1 Concept of signal. Types and operations.
1.2 Power and energy.
1.3 Systems L.T.I (continuous and discrete)
1.4 Types of systems. Properties.
1.5 Connection of system.

2.1 Conversion A / D and D / A.
2.2 Sampling Theorem.
2.3 Stages in an A / D conversion
2.4 Stages in a D / A conversion

1. Introduction

1.1 Concept of signal. Types and operations.
1.2 Power and energy.

2. Sampling of continuous signals

2.1 Conversion A / D and D / A.
2.2 Sampling Theorem.

3. Systems in the temporal domain.

3.1 Continuous systems: differential equations.
3.2 Discrete systems: difference equations.
3.3 Impulse response.
3.4 Convolution. Properties.
3.5 Signal correlation

4. Systems in the transformed domain.

4.1 Laplace Transform. Definition and use.
4.2 Transform Z. Definition and use.
4.3 Connection between the Laplace transform and Z transform

5. Systems in the frequencial domain.

5.1 Output of sinusoidal inputs in continuous LTI systems.
5.2 Fourier Series.
5.3 Fourier Transform.
5.4 Frequency response.
5.5 Bode plot
5.6 Discret case.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	20,00
Classroom practices	10,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	5,00
Independent study and work	12,00
Preparation of lessons	63,00

Preparation for assessment activities	10,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The training activities are conducted in accordance with the following distribution:

• theoretical activities (B4, TE7, R4).

Description: In the theoretical issues will be developed to provide a global and inclusive, analyzing in detail the key issues and more complex, promoting at all times, student participation.

• Practical activities (B4, TE7, R4).

Description: Complementing the theoretical activities in order to apply the basic concepts and extend them with knowledge and experience they acquire during the course of the work proposed. They include the following types of classroom activities:

• Classes of problems and issues in the classroom
• Regular discussion and resolution of problems and exercises for students previously worked
• Lab.

It will use the platform of e-learning (virtual classroom) from the University of Valencia in support of communication with students. Through it you will have access to learning materials used in class as well as solve problems and exercises.

EVALUATION

Assessment of learning is done by combining different tests: • Objective test, consisting of one or more tests that consist of both theoretical and practical issues and problems (60%) (B4, TE7, R4). • Evaluation of laboratory activities from questionnaires and a practical exam (40%) (B4, TE7, R4). It is mandatory to obtain a minimum of 4 points on each part to perform an average of all marks. In any case, the evaluation system will be subordinate to the Evaluation and Qualification Regulation of the University of Valencia for Masters and Degrees(https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639).

REFERENCES

- Referencia b1: S. S. Soliman, M. A. Rodríguez Hernández, M. Srinath and A. Torres Suárez, Señales y Sistemas Continuos y Discretos. ,2 , última reimpr ed.Madrid etc.: Prentice Hall, 2000, pp. 542. ISBN:8483221543
- Referencia b2: A. V. Oppenheim, S. H. Nawab and A. S. Willsky, Señales y Sistemas. ,2 ed.México etc.: Prentice-Hall Hispanoamericana, 1998, pp. 956. ISBN:970170116X
- Referencia b3: H. P. Hsu, Schaum's Outline of Theory and Problems of Signals and Systems. New York etc.: McGraw-Hill, 1995, pp. 466. ISBN:0070306419

- Referencia c1: S. Haykin and B. van der Veen, Señales y Sistemas. México: Limusa-Wiley, 2001, pp. 742. ISBN:9681859146
- Referencia c2: E. W. Kamen and B. S. Heck, Fundamentals of Signals and Systems : Using the Web and Matlab. ,2nd ed.Upper Saddle River NJ: Prentice Hall, 2000, pp. 722. ISBN:0130172936
- Referencia c3: A. Ambardar, Procesamiento De Señales Analógicas y Digitales. ,2 ed.México etc.: Thomson, 2002, pp. 811. ISBN:970686038X
- Referencia c4: D. K. Lindner, Introducción a Las Señales y Los Sistemas. Bogotá etc.: McGraw-Hill, 2002, pp. 970. ISBN:0256252599