

COURSE GUIDE

2025/26

Faculty

345 - Faculty of Engineering - Bilbao

Cycle

.

Degree

GTELEC30 - Bachelor's Degree in Telecommunications Engineering

Year

First year

COURSE

27382 - Treatment of Signals

Credits, ECTS: 6

COURSE DESCRIPTION

"Signal Processing" is one of the basic subjects from the first year in the Bachelors degree on Telecommunications Technology Engineering. It is part of the block named Basic Training. In this subject the student will learn the mathematical tools for the analysis of signals and systems continuous and discrete both in the time and frequency domain. This is an applied subject that shows in the laboratory sessions where the student will work with practical signals and systems found in telecommunications engineering.

This subject extends and formalizes some of the tools introduced in the subject circuit analysis, and serves as foundation for more advanced subjects like Communications Theory, Communication Systems or Multimedia Signal Processing.

To succesfully complete "Signal Processing" it is convenient to master computations with complex numbers and to have a basic mastery of calculus of a single variable, which are both covered in the subject Calculus I.

COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

This subject works the following transversal competences:
Capacity to solve problems with drive, decision making and to communicate and transmit knowledge, habilities and dexterities understanding the ethic and professional responsibilty of the Technical Engineer in Telecommunications.

Capacity to work in multidisciplinary teams in a multilingual environment and to comunicaty, both in oral and written form, knowledge, procedures, results and ideas related to telecommunications and electronics.

And the following competence from the basic module:
Understand and master the fundamental concepts of linear systems and their corresponding functions and transforms.

This main competences would yield the following learning results:

Use the formal time-domain representations of continuous and discrete time signals and systems, and understand the dynamics of linear systems in the time domain.

Represent signals and understand the dynamics of linear systems in the frequency domain.

Use the A/D and D/A conversion.

Individually solve and explain the proposed problems/homework.

Solve practical telecommunications engineering applications with real-live signals in cooperative laboratory sessions.

Theoretical and Practical Contents

- 1st topic. Continuous and discrete signals in the time-domain
- 2nd topic. Continuous and discrete systems in the time-domain
- 3rd topic. Continuous signals and systems in the frequency-domain
- 4th topic. Discrete signals and systems in the frequency-domain
- 5th topic. Sampling

- And the following lab sessions (weekly)
- Session 1 Handling signals in matlab
 - Session 2 Plotting continuous and discrete signal
 - Session 3 Audio signals and wav files
 - Session 4 Frequency domain continuous and discrete
 - Session 5 The voice signal
 - Session 6 ECG and the waveform generator
 - Session 7 Linear filtering
 - Session 8 Applications of linear filtering
 - Session 9 Waveform distortion in linear filtering
 - Session 10 Spectral analysis

TEACHING METHODS

In the lectures the teacher presents the necessary theoretical background for topics 1-4, and solves problems in the classroom. The teacher facilitates the autonomous learning of the student by presenting short questions and additional problems to be solved by the student.

During the lab sessions the teacher and students will solve practical problems using the Matlab environment, and the students will work in groups. The teacher encourages group work, and the capacity for analysis and synthesis through additional work related to each of the lab sessions.

The seminars will consists in two evaluation sessions for the lab sessions as well as for the completion of the theoretical aspects of topic 5.

In the event that sanitary conditions prevent a face-to-face teaching activity and / or evaluation, an online modality of which the students will be informed promptly will be activated.

TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	22,5	10	7,5	20					
Horas de Actividad No Presencial del Alumno/a	33,75	15	11,25	30					

Legend: M: Lecture-based S: Seminar GA: Applied classroom-based groups
GL: Applied laboratory-based groups GO: Applied computer-based groups GCL: Applied clinical-based groups
TA: Workshop TI: Industrial workshop GCA: Applied fieldwork groups

Evaluation methods

- Continuous evaluation
- End-of-course evaluation

Evaluation tools and percentages of final mark

- Written test, open questions 65%
- Exercises, cases or problem sets 35%

ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

Ordinary call: orientations and resignation

The evaluation of the theoretical/practical contents is independent of the evaluation of the laboratory. You need to obtain a minimum grade of 5 on each part to pass the subject. In case you pass any of the parts the grade will be maintained in later calls.

*Evaluation of the theoretical/practical contents (Lectures and problems). Weight 65%

a) Part 1: once topics 1 and 2 are finished there will be a mid-term with short questions and problems. Weight 40%

b) In the ordinary call there will be two written exams:

*Part 2: Exam for topics 3, 4 and 5 with short questions and problems. Weight 60%.

*Recovery exam for topics 1 and 2 for students that did not pass Part 1.

To pass the theoretical/practical contents the minimum grade is 5 (Part 1 40% and Part 2 60%) and you need a minimum grade of 5 in each part.

*Evaluation of the Laboratory. Weight 35%

- L1) Evaluation exam for lab sessions 1 to 6: 40% of the grade for the laboratory. Tentative date: week 8 of the course.
- L2) Evaluation exam for lab sessions 7 to 10: 60% of the grade for the laboratory. It will be done during week 15 of the course.

The evaluation exams will be done during the lab sessions. To pass the laboratory the minimum grade is 5, with a minimum grade of 4 in the exam L2.

*Resignation to continuous evaluation

Students can resign to the continuous evaluation until week 13 (included) of the course. To resign the student will hand a signed resignation document to any of the members of the teaching staff of the course.

Students who resign will have in the ordinary call an exam worth 100% of the theoretical/practical contents, and another exam for 100% of the laboratory grade.

*Impossibility of doing the continuous evaluation

In those special cases part of the "normative for the management of the graduate studies" will communicate this to the teaching staff at the begging of the course. Both parties will find the best evaluation form that best fits the specificities of the student.

*Resignation to the ordinary call
Students who do not attend the laboratory exam L2 and the ordinary exam, will be assumed to have resigned the ordinary call.

EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the extraordinary exam, both the theoretical/practical content and the laboratory part will be assessed. It will consist of an exam of questions and problems of topics 1-5, and a laboratory exam. In order to pass the a grade higher than 5 in both parts is required.

MANDATORY MATERIALS

The necessary materials to complete the subject will be available in eGela and comprise:

- Lecture notes (topics 1-5).
- Problem book (topics 1-5).
- Short questions booklet.
- Lab session guides (sessions 1-10) and a template the lab homework exercises.

BIBLIOGRAPHY

Basic bibliography

Notes and problem book created by the teaching staff and available in eGela.

Detailed bibliography

Proakis JG, Manolakis DG. Digital signal processing (4th edition).

Oppenheim AV, Willsky AS. Signals and systems (2nd edition).

Oppenheim AV. Discrete-time signal processing (3rd edition).

Burrus CS. Computer based exercises for signal processing using Matlab 5.

Journals

Web sites of interest

OBSERVATIONS