

Academic Year of Degree: 2025/26

23972 - Digital Data Transmission

Teaching Guide Information

Academic Course: 2025/26

Academic Center: 337 - Engineering School

Study: 3379 - Bachelor's degree in Telecommunications Network Engineering

Subject: 23972 - Digital Data Transmission

Credits: 5.0

Course: 3

Teaching languages:

Theory: Group 1: English

Practice: Group 101: English

Group 102: English

Group 103: English

Group 104: Pending

Seminar: Group 101: English

Group 102: English

Group 103: English

Group 104: Pending

Teachers: Alfonso Martinez Vicente, Josep Font Segura

Teaching Period: First term

Presentation

Digital Data Transmission, together with the subjects Signals and Systems I and II and Information Theory and Coding, provide students with a basis for modeling and describing the transmission and storage of information with signals. More specifically, this subject delves into the mathematical, conceptual and practical aspects of communication theory.

Associated skills | General learning outcomes

Transverse skills

Instrumental

1. Abstraction capacity to understand and analyze communication systems.
2. Ability to express ideas and concepts accurately orally and in writing.
3. Ability to translate ideas and concepts into a mathematical model and to describe the solutions, either with a rigorous demonstration or with a computer simulation.

Interpersonal

4. Ability to work as a team to solve problems and deepen theoretical contents.

5. Ability to communicate ideas accurately, both orally and in writing.

Systemic

6. Ability to work autonomously to solve a problem.

7. Ability to work systematically, checking and interpreting solutions.

Specific skills

1. Know and apply the basic concepts of communication theory covered in the course.

2. Solve the problems related to communication theory presented in the course.

3. Identify and justify the application of the appropriate mathematical model to analyze a problem and find the solution of it.

In terms of specific skills for the degree, this subject develops CE7, "abstractly model the different elements of a telecommunication system using information theory concepts and methods."

Learning outcomes | Specific learning outcomes

At the end of the course, and regarding the course contents, the student shall be able to:

1. Describe several channel codes for the Gaussian channel and relate their performance, both with formulas and with simulations, with the concept of mutual information.

In addition to this basic knowledge, at the end of the course, the student should be able to:

1. Express with correctness, precision and rigor mathematical ideas and concepts;

2. Use the appropriate software to describe and study the techniques of the course.

The learning outcomes associated to the specific skill CE7 are the following:

RA.CE7.1 Analyze and design simple information compression and coding systems.

RA.CE7.2 Analyze and design communication systems applying information theory.

Contents

We will cover the following items in the course:

1. Gaussian channel: signal space and noise characterization.

2. Mutual information: coding and modulation.

3. Channel codes: description and performance.

Evaluation and grading system

The subject offers two assessment methods: continuous assessment (CA) and problem-based assessment (PA). By default, the assessment is continuous. Each student can choose their assessment method before the end of week 2 of the course.

Continuous Assessment (CA) includes the following evaluative activities:

Final Exam (E; 65% of the final grade*): It contains theoretical questions and/or exercises on all the topics of the term. It is the only recoverable activity in the course. In case of recovery, E will be the grade of the resit exam.

Seminars (S; 20% of the final grade): The grade evaluates student participation, interaction with professors, and solutions submitted at the end of the session.

Reports (R; 15% of the final grade). Individual submissions that assess the understanding of concepts, the use of mathematical tools, and written expression.

Theory Questions (K; 5% of the final grade): During theory sessions, some questions will be posed to be answered individually using Kahoot.

*To pass the course, the final exam grade must be at least 5. The final grade (FG) for continuous assessment is calculated using the following formula:

IF $E \geq 5$, $FG = 0.60 * E + 0.20 * S + 0.15 * R + 0.05 * K$

IF $E < 5$, $FG = E$

Problem-based Assessment (PA) includes two evaluative activities:

Midterm Exam (P; 20% of the final grade): It contains problems drawn from a collection published at the beginning of the course on Aula Global. It is held in November and is not recoverable.

Final Exam (E; 80% of the final grade): It contains problems drawn from a collection published at the beginning of the course on Aula Global. It is recoverable; in case of recovery, E will be the grade of the recovery exam.

With problem-based assessment, the highest possible grade is 6.25. The final grade (FG) for problem-based assessment is calculated using the following formula:

$$FG = 0.625 * (0.20 * P + 0.80 * E)$$

Both seminar reports and exams separately assess mathematical content (C, out of 10) and written expression or use of language (L, out of 3). The grade for each written activity will be calculated with the formula $C * (0.7 + 0.1 * L)$.

Academic integrity violations (cheating, plagiarism) will be addressed in accordance with the regulations of the School and the [University](#).