Universidad Zaragoza

Academic Year/course: 2023/24

29514 - Coding and Information Theory

Syllabus Information

Academic year: 2023/24
Subject: 29514 - Coding and Information Theory
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 625 - Bachelor's Degree in Industrial Processes' Data Engineering
ECTS: 6.0
Year: 2
Semester: Second semester
Subject type: Compulsory
Module:

1. General information

The objective of the subject is to present the basic concepts of information theory from a practical point of view.

When we talk about information, what we are talking about is the symbols that support the storage and transmission of such information, not its processing or generation. Based on these concepts, we will delve into the idea of the codes used to transmit such information without error and how to minimize the space used by the information through data compression mechanisms.

Alignment with the SDGs:

- Goal 9 Build resilient infrastructures, promote sustainable industrialization and foster innovation and, in particular with the targets:
- Target 9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in the least developed countries by 2030.

2. Learning results

The student, in order to pass this subject, must demonstrate the following results:

To know the concepts related to information and their applications to coding theory.

3. Syllabus

1. Introduction to information theory
2. Probability entropy and inference
3. Source coding theorem
4. Symbolic codes
5. Data flow codes
6. Dependent random variables
7. Communication over a noisy channel
8. The noisy channel coding theorem
9. Error correction codes and actual channels
10. Hash Codes
11. Binary codes
12. Very good linear codes exist
13. Message Passing
14- Communication over limited noise-free channels
15- Exact marginalization in networks
16- Low density parity check codes
17- Convolutional and turbo codes
18- Cumulative repetition codes
19- Digital source codes

4. Academic activities

Face-to-face activities:

- Theoretical classes: The theoretical concepts of the subject are explained and illustrative practical examples are given to support the theory.
- Practical classes: Problems and case studies will be carried out as a complement to the theoretical concepts studied.

Non-face-to-face activities:

- Study and assimilation of the theory presented in the lectures.
- Understanding and assimilating problems and case studies solved in class.
- Resolution of proposed problems.
- Carrying out of group practices and preparation of reports.
- Preparation of written tests for continuous assessment and final exams.

The subject consists of 6 ECTS credits, which represents 150 hours of student work in the subject.

5. Assessment system

Students must demonstrate that they have achieved the intended learning results by means of the following assessment activities

- Practical work (30%). These assignments include 2 laboratory practicals and a complex design exercise. From each of the practices the student will be asked to submit a report that will serve as a basis for the assessment. To pass the subject, students must obtain a final grade of 5 or higher in the laboratory practicals.
- Theoretical-practical written tests (70%) in which questions and/or problems in the field of engineering of similar complexity to those used during the subject will be posed. The quality and clarity of the strategy of resolution, the concepts used to solve the problems, the absence of errors in the development and in the solutions, and the correct use of terminology and notation will be evaluated. In each of the theoretical-practical written tests , students must obtain a grade equal to or higher than 5 in order to pass.

The student will be able to choose between a split evaluation, carried out in the form of two written tests and the delivery of the practices scripts during the term, or a global test at the end of the term (consisting of one exam per midterm) and the delivery of the practice scripts.