Data Transmission and Security

Code: 44731
ECTS Credits: 6

Degree	Type	Year	Semester
4318303 Reseach and Innovation in Computer Based Science and Engineering	OT	0	1

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Prerequisites

There are no formal prerequisites.

Objectives and Contextualisation

The main goal is to learn different advanced methods of information processing and transmission, with an emphasis on code theory and error correction techniques, data compression technologies, and security and privacy techniques in communications.

Learning Outcomes

- CA06 (Competence) Graduates will be able to design reliable, efficient and secure data transmission and storage systems, using error-correcting codes, compression and security techniques.
- CA06 (Competence) Graduates will be able to design reliable, efficient and secure data transmission and storage systems, using error-correcting codes, compression and security techniques.
- CA07 (Competence) Graduates will know how to plan and develop research projects in the field of information processing.
- CA07 (Competence) Graduates will know how to plan and develop research projects in the field of information processing.
- KA09 (Knowledge) Graduates will be able to describe different error correction systems used in optical and distributed storage devices and in steganography.
- KA10 (Knowledge) Graduates will be able to describe different methods for compressing still images, video, satellite images and other types of data.
- KA11 (Knowledge) Graduates will be able to describe different security mechanisms used for network communications, opportunistic networks and anonymous networks.

- SA11 (Skill) Apply different encryption methods for error correction in the field of storage and steganography.
- SA12 (Skill) Apply different data compression algorithms.
- SA13 (Skill) Use different security mechanisms in communications.

Content

The specific contents of the course will be:

- Introduction to data transmission research

- Error correcting codes designed for various types of media:

- optical storage devices (QR, Blu-ray, DVD),

- distributed storage (big data)

- steganography

- Compression methods:

- image and video

- satellite scenes

- GPU video for video games

- Security and privacy in communications:

- general principles of network security

- security in opportunistic networks

- security in anonymous networks

Methodology

The methodology of this course is designed to expose the students to some of the most important concepts in the areas of error correction, data compression and communication security.

It will be based on the "learn by doing" concept. Students will be given materials (including research articles and other technical documentaiton) to be worked during class and at home, and they will be expected to prepare interventions and deliverables based on them.

Active discussion of these materials, as well as the professors' and other students' interventions will be an important part of this methodology.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Teacher-directed sessions	45	1.8	CA06, CA07, KA09, KA10, KA11, SA11, SA12, SA13, CA06
Type: Supervised			
Presential activities	15	0.6	CA06, CA07, KA09, KA10, KA11, SA11, SA12, SA13, CA06
Type: Autonomous			
Homework and class preparation	35	1.4	CA06, CA07, KA09, KA10, KA11, SA11, SA12, SA13, CA06
Preparation of synthesis test	15	0.6	CA06, CA07, KA09, KA10, KA11, SA11, SA12, SA13, CA06
Preparation of written assignments	25	1	CA06, CA07, KA09, KA10, KA11, SA11, SA12, SA13, CA06
Study for synthesis test	15	0.6	CA06, CA07, KA09, KA10, KA11, SA11, SA12, SA13, CA06

Assessment

The evaluation of this subject will be based on two main aspects.

First, 70% of the final mark will be based on the student's assignments (including in-class interventions and written assignments), as well as their active and productive interactions with the other students and their assignments.

Second, 30% of the final mark will be decided by a written synthesis test to be taken in one of the final sessions.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assignments (oral and written)	70%	0	0	CA06, CA07, KA09, KA10, KA11, SA11, SA12, SA13
Synthesis test	30%	0	0	CA06, CA07, KA09, KA10, KA11, SA11, SA12, SA13

Bibliography

Will be extended at the beginning of the course.

- Salomon, David. Data compression: the complete reference. Springer Science & Business Media, 2004.
- R.B. Ash. Information Theory. John Wiley and Sons Inc, 1965.
- Kaeo, Merike. *Designing network security*. Cisco Press, 2004.
- W. Cary Huffman and Vera Pless, *Fundamentals of Error-Correcting Codes*, Cambridge University Press, 2003.

Software

Will be provided at the beginning of the course.