Course guide
230093 - TD - Data Transmission

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 744 - ENTEL - Department of Network Engineering.

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Compulsory subject).

Academic year: 2022  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura

Others: Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

PRIOR SKILLS

The course is highly self-contained, although it is very convenient to have knowledge of probability and stochastic processes. Occasionally, it is also convenient to have knowledge of optimization of functions of multiple variables.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONtributes

Transversal:
07 AAT N2. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.

TEACHING METHODOLOGY

Lectures
Individual work
Mid-term and final exam

LEARNING OBJECTIVES OF THE SUBJECT

The objective of this course is to train the student in the fundamental mechanisms used in data transmission systems, including error control, data compression and cryptographic techniques.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>85,0</td>
<td>56.67</td>
</tr>
<tr>
<td>Hours large group</td>
<td>65,0</td>
<td>43.33</td>
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</tbody>
</table>

Total learning time: 150 h
## CONTENTS

### 1. Introduction. (7h)

**Description:**
- 1.1 General scheme
- 1.2 The concept of information
- 1.3 Source entropy
- 1.4 Channel capacity

**Full-or-part-time:** 13h 48m  
Theory classes: 6h  
Self study: 7h 48m

### 2. Source coding (7h)

**Description:**
- 2.1 Objectives and limits of lossless compression
- 2.2 Types of codes
- 2.3 Kraft's inequality
- 2.4 Source coding algorithms

**Full-or-part-time:** 13h 48m  
Theory classes: 6h  
Self study: 7h 48m

### 3. Channel coding (24h)

**Description:**
- 3.1 Introduction
- 3.2 Block codes
- 3.3 Convolutional codes

**Full-or-part-time:** 46h  
Theory classes: 20h  
Self study: 26h

### 4. Basic cryptography (27 h)

**Description:**
- 4.1 Introduction
- 4.2 Security Services
- 4.3 Classical Cryptography
- 4.4 Modern Secret Key Cryptography
  - 4.4.1 Stream ciphers
  - 4.4.2 Block ciphers
- 4.5 Modern Public Key Cryptography
  - 4.5.2 Diffie-Hellman
  - 4.5.3 RSA
  - 4.5.4 Digital Signature

**Full-or-part-time:** 52h 54m  
Theory classes: 23h  
Self study: 29h 54m
GRADING SYSTEM

The final grade will include continuous assessment (active participation in class and a mid-term exam) and the final exam, according to the following weight:
Final exam: 60%
Continuous assessment: 40%

BIBLIOGRAPHY

Basic:

Complementary: