Degree competences to which the subject contributes

Specific:
CE1. Ability to apply information theory methods, adaptive modulation and channel coding, as well as advanced techniques of digital signal processing to communication and audiovisual systems.

Teaching methodology

Lectures, application classes, individual project work and exercises.

Learning objectives of the subject

Understand from both the theoretical and practical point of view the construction of Polar Codes.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 62h 30m</th>
<th>Hours large group: 20h 32.00%</th>
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<tbody>
<tr>
<td></td>
<td>Self study: 42h 30m 68.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Description</th>
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</table>
| **Introduction and preliminaries.**                        | 6h 15m            | **Specific objectives:**  
- Discrete Memoryless source and channel coding theorems.  
- Mutual information and the Bhattacharyya parameter. |
| **Channel Polarization and Polar Codes overview.**        | 12h 30m           | **Description:**  
- Channel Polarization.  
- Encoding.  
- Decoding. |
| **Source and channel Polarization.**                      | 18h 45m           | **Description:**  
- Polarization Theorem.  
- Entropy versus Bhattacharyya parameter.  
- Block error probability.  
- Achieving capacity of symmetric DMC. |
| **The wiretap channel.**                                  | 6h 15m            | **Description:**  
- Capacity of the wiretap channel.  
- Polar codes for degraded wiretap channels. |
Performance evaluation of polar codes.

**Description:**
- MATLAB implementation of Polar Codes.
- Performance evaluation.
- Student Implementation assignment.
- Questions /problems session.

**Learning time:** 18h 45m
- Theory classes: 6h
- Self study: 12h 45m

**Qualification system**

Individual project work (60%) and exercises (40%).

**Regulations for carrying out activities**

There is no final exam.

**Bibliography**

**Basic:**


**Complementary:**