# 320107 - CAD - Analogue and Digital Communications

**Coordinating unit:** 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 739 - TSC - Department of Signal Theory and Communications  
**Academic year:** 2019  
**Degree:** BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)  
**ECTS credits:** 6  
**Teaching languages:** Catalan

## Teaching staff

**Coordinator:** Josep Sala Alvarez  
**Others:** Josep Sala Alvarez

## Opening hours

**Timetable:** pending lecture hours

## Prior skills

Probability and Stochastic Processes  
Signals and Systems

## Requirements

Probability and Stochastic Processes.  
Signals and Systems

## Degree competences to which the subject contributes

### Specific:

1. **AUD_COMMON:** Ability to analyse and specify the fundamental parameters of a communication system.

2. **AUD_COMMON:** Ability to evaluate the advantages and drawbacks of different technological alternatives for selecting and implementing communication systems (from the perspectives of the signal space, perturbations and noise) and analogue and digital modulation systems.

## Teaching methodology

Theory class.  
Laboratory class.

## Learning objectives of the subject

Introduce the basic concepts for analysis and design of the physical layer in analogue and digital communication systems. Familiarise students with probabilistic models for signals in a communications chain and develop students' abilities to apply these models to resolving practical problems. Use the MATLAB software to develop simple models of the physical layer in communication systems using pseudo-random signals.
320107 - CAD - Analogue and Digital Communications

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>10.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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</tbody>
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Content

**TOPIC 1: Baseband communication systems**

**Learning time:** 58h 20m
- Theory classes: 45h
- Laboratory classes: 13h 20m

**Description:**
- Introduction: the communication chain
- Random signals in communication systems
- Optimal terminal filters

**TOPIC 2: Pass-band communication systems**

**Degree competences to which the content contributes:**

**Description:**
- Pass-band communication systems and low-pass equivalents
- Quadrature modulator and demodulator
- Power density spectrum in transmission
- Pass-band noise: power density spectra in the receiving chain
- Analogue modulations

**TOPIC 3: Digital communications**

**Degree competences to which the content contributes:**

**Description:**
- Equivalent low-pass signal modulation: linear modulations
- Power density spectrum in transmission
- Symbol recovery in the receiver: adapted filter and inter-symbolic interference
- Signal-to-noise relationships in the receiving chain
- Introduction to error protection codes
Qualification system

Mid-semester exam (40 %)
Final Exam (50 %)
Practical exam (10 %)

Reguindance due to unsatisfactory results:
- the computation of the final grade will be carried out for all students with the following formula:
  0.1*NOTA_LAB + MAX( 0.9*NOTA_EX_FINAL, 0.4*NOTA_EX_MIG_QUAD+0.5*NOTA_EX_FINAL )
  (the final exam includes all themes). The “max” operation between the weighted grades and the grade of the final exam
  allows students with low grades in their mid-term exam to have a re-evaluation opportunity.

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation
exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades
obtained during the course for lab practices, works, projects and presentations will be kept.
If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade
after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

Regulations for carrying out activities

It is only allowed to use a ballpen and blank paper sheets during the exam.

Bibliography