



POLITÉCNICA

INTERNATIONAL  
CAMPUS OF  
EXCELLENCE

COORDINATION PROCESS OF  
LEARNING ACTIVITIES  
PR/CL/001



E.T.S. de Ingeniería y Sistemas  
de Telecomunicación

# ANX-PR/CL/001-01

## LEARNING GUIDE

### SUBJECT

**593000426 - Signal processing techniques for communications**

### DEGREE PROGRAMME

59AG - Eit Digital Track On Internet Technology And Architecture

### ACADEMIC YEAR & SEMESTER

2018/19 - Semester 2

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## 1. Description

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### 1.1. Subject details

<b>Name of the subject</b>	593000426 - Signal processing techniques for communications
<b>No of credits</b>	5 ECTS
<b>Type</b>	Optional
<b>Academic year of the programme</b>	First year
<b>Semester of tuition</b>	Semester 2
<b>Tuition period</b>	February-June
<b>Tuition languages</b>	English
<b>Degree programme</b>	59AG - Eit digital track on internet technology and architecture
<b>Centre</b>	59 - Escuela Tecnica Superior de Ingeniería y Sistemas de Telecomunicación
<b>Academic year</b>	2018-19

## 2. Faculty

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### 2.1. Faculty members with subject teaching role

<b>Name and surname</b>	<b>Office/Room</b>	<b>Email</b>	<b>Tutoring hours *</b>
Juan Anton Moreno Garcia-Loygorri	D8418	juan.moreno.garcia-loygorri@upm.es	M - 08:00 - 08:15
Cesar Benavente Peces	7007	cesar.benavente@upm.es	Sin horario.
Cesar Briso Rodriguez (Subject coordinator)	D8416	cesar.briso@upm.es	M - 12:30 - 14:30 Th - 12:30 - 14:30

\* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

## 3. Prior knowledge recommended to take the subject

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### 3.1. Recommended (passed) subjects

El plan de estudios Eit Digital Track On Internet Technology And Architecture no tiene definidas asignaturas previas recomendadas para esta asignatura.

### 3.2. Other recommended learning outcomes

- Grado en Ingeniería Electrónica de Comunicaciones ; Grado en Ingeniería de Sistemas de Telecomunicación ;Grado en

## 4. Skills and learning outcomes \*

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### 4.1. Skills to be learned

CB10 - To have the learning abilities to continue studying in a mostly self-guided or autonomous manner

CB6 - To have knowledge that provides the basis or the opportunity of being original to develop and/or to apply ideas, usually in a research context

CE1 - To be capable of analyzing, interpreting and applying standards related to the ICT.

CE7 - To be capable of proposing, organizing and executing research works in the framework of the Information Society engineering..

CES11 - To be capable of characterizing, designing and deploying wireless communications systems and services

CESI4 - To be capable of developing systems which are based on programmable devices

CGEN3 - To be capable of elaborating, planning strategically, leading, coordinating and managing, both technically and economically, projects in the framework of the Information Society engineering, according to ethical, quality and environmental criteria

CGEN4 - To be capable of planning, calculating and designing systems and services for the Information Society

## 4.2. Learning outcomes

RA10 - Analyze and characterize mobile communication channels

RA9 - Use propagation models to calculate radio coverage of a transmitter

RA7 - Design wireless communication systems

RA1 - RA9 - Improvement of the public presentation skills of a research work and defense of conclusions

RA19 - Apply new technologies with different systems for solving particular problems in the domain of services and protocols engineering

RA4 - Evaluate communication standards typically used in the deployment of wireless systems

\* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

## 5. Brief description of the subject and syllabus

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### 5.1. Brief description of the subject

Modern communication systems require the use of advanced signal processing techniques for the implementation of functions such as modulation / demodulation, channel compensation, suppression of interferences, etc.

In order to perform these functions, advanced signal processing techniques combined with radio software systems are used to implement these techniques easily.

The subject is focused on the study of the most advanced techniques of signal processing and its application to modern software radio systems. It is based mainly on the use of the MATLAB / SIMULINK program and radio software systems of National Instruments.

## 5.2. Syllabus

1. INTRODCUTION
2. APLICATION OF MULTIRATE SYSTEMS
3. MIMO SYSTEMS
4. SOFTWARE DESING RADIO
5. CHANNEL EQUALIZATION
6. LABORATORY

## 6. Schedule

### 6.1. Subject schedule\*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Other face-to-face activities	Assessment activities
1	<b>CLASE DE TEORIA</b> Duration: 02:00			
2	<b>THEORY</b> Duration: 02:00	<b>Practical work 0 : Signal Generation</b> Duration: 02:00		
3	<b>Theory</b> Duration: 02:00	<b>Practical work 1. Spectrum analysis with FFT.</b> Duration: 02:00		
4	<b>Theory</b> Duration: 02:00	<b>Practical work 2. Modulation and demodulation</b> Duration: 02:00		
5	<b>Theory</b> Duration: 02:00	<b>Laboratory</b> Duration: 02:00		<b>Test</b>  Continuous assessment Duration: 00:30  <b>Laboratory</b>  Continuous assessment Duration: 00:00
6	<b>Theory</b> Duration: 02:00	<b>Practical work 4. Digital Modulation</b> Duration: 02:00		
7	<b>THEORY</b> Duration: 02:00	<b>Practical work 5.</b> Duration: 02:00		
8	<b>Theory</b> Duration: 02:00	<b>Practical work 6</b> Duration: 02:00		
9	<b>Theory</b> Duration: 02:00	<b>Practical work 7</b> Duration: 02:00		
10	<b>Theory</b> Duration: 02:00	<b>Practical work 8</b> Duration: 02:00		<b>Test</b>  Continuous assessment Duration: 00:00  <b>Laboratory</b>  Continuous assessment Duration: 00:00

11	<b>Theory</b> Duration: 02:00	<b>Practical work 9</b> Duration: 02:00		
12	<b>Theory</b> Duration: 02:00	<b>Practical work 10</b> Duration: 02:00		
13	<b>Theory</b> Duration: 02:00	<b>Practical work 11</b> Duration: 02:00		
14	<b>Theory</b> Duration: 02:00			
15	<b>Theory</b> Duration: 02:00			
16	<b>Theory</b> Duration: 02:00			
17			<b>Preparatory class for final examination</b> Duration: 03:00	<b>Final Examination</b>  Final examination Duration: 02:00

The independent study hours are training activities during which students should spend time on individual study or individual assignments.

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

\* The subject schedule is based on a previous theoretical planning of the subject plan and might go through experience some unexpected changes along throughout the academic year.



## 7. Activities and assessment criteria

### 7.1. Assessment activities

#### 7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
5	Test		Face-to-face	00:30	25%	5 / 10	CB10 CE1 CE7 CESI1 CESI4 CGEN3 CGEN4
5	Laboratory		Face-to-face	00:00	25%	5 / 10	CB10 CB6 CE1 CE7 CESI1 CESI4 CGEN3 CGEN4
10	Test		Face-to-face	00:00	25%	5 / 10	CB10 CB6 CE1 CE7 CESI1 CESI4 CGEN3 CGEN4
10	Laboratory		Face-to-face	00:00	25%	5 / 10	CB10 CB6 CE1 CE7 CESI1 CESI4 CGEN3 CGEN4

#### 7.1.2. Final examination



Laboratory	Others	Computers MATlab software Radio software devices Signal generator
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## 9. Other information

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### 9.1. Other information about the subject

The final focus of the subject is eminently practical. Many practices are carried out based on radio software systems.