ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

593000409 - Signal processing in communications

DEGREE PROGRAMME

59AF - Master Univ. Ing. Sistemas y Servicios para la Sociedad de la Informacion

ACADEMIC YEAR & SEMESTER

2017/18 - Semester 2

Index

Learning guide

1. Description

1.1. Subjet details

Name of the subject	593000409 - Signal processing in communications
No of credits	5 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	59AF - Master Univ. Ing. Sistemas y Servicios para la Sociedad de la Informacion
Centre	Escuela Tecnica Superior de Ingenieria y Sistemas de Telecomunicacion
Academic year	2017-18

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
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
Juan Anton Moreno Garcia-Loygorri	D8418	juan.moreno.garcia-loygorri@upm.es	M - 08:00 - 08:15

* 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

3.1. Recommended (passed) subjects

El plan de estudios Master Univ. Ing. Sistemas y Servicios para la Sociedad de la Informacion 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 *

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

CB7 - To be capable of applying the students' acquired knowledge, as well as their problem solving abilities, to new or not well-known environments in broader (or multidisciplinary) contexts that are in the framework of their expertise area.

CE.1 - To be capable of analyzing, interpreting and applying standards related to the ICT.

CE.7 - To be capable of proposing, organizing and executing research works in the framework of the Information Society engineering.

CESI.1 - To be capable of characterizing, designing and deploying wireless communications systems and services.

CESI.4 - 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

RA45 - Apply new technologies with different systems for solving particular problems in the domain of services and protocols engineering

RA31 - Shape the hardware architecture of a digital system

RA17 - Develop data acquisition applications and test beds using real-time technologies

RA37 - Analizing wireless communications subsystems

RA39 - Designing software defined radio communication systems

RA8 - Analyze and characterize mobile communication channels

RA2 - 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

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. ARRAY PROCESSING
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	**CLASE DE TEORIA** Duration: 02:00			
2	**THEORY** Duration: 02:00	**Practical work 0 : Signal Generation** Duration: 02:00		
3	**Theory** Duration: 02:00	**Practical work 1. Spectrum analysis with FFT.** Duration: 02:00		
4	**Theory** Duration: 02:00	**Practical work 2. Modulation and demodulation** Duration: 02:00		
5	**Theory** Duration: 02:00	**Laboratory** Duration: 02:00		**Test** Continuous assessment Duration: 00:30 **Laboratory** Continuous assessment Duration: 00:00
6	**Theory** Duration: 02:00	**Practical work 4. Digital Modulation** Duration: 02:00		
7	**THEORY** Duration: 02:00	**Practical work 5.** Duration: 02:00		
8	**Theory** Duration: 02:00	**Practical work 6** Duration: 02:00		
9	**Theory** Duration: 02:00	**Practical work 7** Duration: 02:00		
10	**Theory** Duration: 02:00	**Practical work 8** Duration: 02:00		**Test** Continuous assessment Duration: 00:00 **Laboratory** Continuous assessment Duration: 00:00

11	**Theory** Duration: 02:00	**Practical work 9** Duration: 02:00		
12	**Theory** Duration: 02:00	**Practical work 10** Duration: 02:00		
13	**Theory** Duration: 02:00	**Practical work 11** Duration: 02:00		
14	**Theory** Duration: 02:00			
15	**Theory** Duration: 02:00			
16	**Theory** Duration: 02:00			
17			**Preparatory class for final examination** Duration: 03:00	**Final Examination** 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 theorical planning of the subject plan and might go to 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	CB6 CE.7 CGEN3 CESI.1 CE.1
5	Laboratory		Face-to-face	00:00	25%	5 / 10	CB10 CGEN4 CESI.1 CESI.4
10	Test		Face-to-face	00:00	25%	5 / 10	CB7 CE.7 CGEN4
10	Laboratory		Face-to-face	00:00	25%	5 / 10	CB10 CGEN4 CESI.1 CE.1

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final Examination		Face-to-face	02:00	100%	5 / 10	CB6 CB7 CB10 CE.7 CGEN3 CGEN4 CESI.1 CESI.4 CE.1

7.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

7.2. Assessment criteria

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Subjet material	Web resource	Notes of the subject. Exercises. Scripts of laboratory practices. Self-assessment questionnaires Links to external resources of interest. Additional documentation
Laboratory	Others	Computers MAtlab software Radio software devices Signal generator

9. Other information

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.