ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

593000417 - Signal Recognition Techniques

DEGREE PROGRAMME

59AF - Master Univ. Ing. Sistemas Y Servicios Para La Sociedad De La Informacion

ACADEMIC YEAR & SEMESTER

2019/20 - Semester 2

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	593000417 - Signal Recognition Techniques
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	59 - Escuela Tecnica Superior de Ingenieria y Sistemas de Telecomunicacion
Academic year	2019-20

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Ruben Fraile Muñoz	A7009	r.fraile@upm.es	Sin horario. Published in the school website
Juana Maria Gutierrez Arriola (Subject coordinator)	A7008	juana.gutierrez.arriola@upm.es	Sin horario. Published in the school website

* 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

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Advanced knowledge of image processing

- Practice with MATLAB for digital signal processing

- Communication and writing skills

- Advanced knowledge of speech signal processing

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.

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.

CESE.1 - To be capable of analyzing and developing processing techniques to enhance audio and video signals.

CESE.2 - To be capable of analyzing and designing audio and image signal recognition algorithms.

CGEN.3 - 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.

CGEN.4 - To be capable of planning, calculating and designing systems and services for the Information Society.

4.2. Learning outcomes

RA21 - Design and evaluate recognition techniques applied to musical signals

RA20 - Analyze and apply common transforms to audio and video signals

RA24 - Select and apply enhancement methods for images

RA25 - Design and evaluate image recognition techniques for biometric identification

RA26 - Design filter banks for audio and video signals and apply them to transforming, coding and recognition

RA22 - Choose the right spectral estimation technique for the application

RA23 - Design and evaluate image recognition techniques for artificial vision

* 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

This subject presents and studies a general recognition system. Students should develop a complete system, they can choose the application of the system.

5.2. Syllabus

1. General description of a recognition system

2. Project definition

3. Acquisition and pre-processing of audio-visual signals

4. Segmentation of audiovisual signals

5. Feature extraction

6. Classification and recognition

7. Music recognition

8. Artificial vision

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	**Course presentation** Duration: 00:30 **Chapter 1 lecture** Duration: 01:00 **Initial survey** Duration: 01:30			
2	**Chapter 2 lecture** Duration: 01:00 **Form groups and define projects** Duration: 02:00			
3	**Chapter 3 lecture** Duration: 01:00	**Practice 1. Applications of recognition techniques** Duration: 02:00		**Practice 1** Continuous assessment Duration: 00:00
4	**Chapter 4 lecture** Duration: 01:00	**Practice 2. Data definition and acquisition** Duration: 02:00		**Practice 2** Continuous assessment Duration: 00:00
5	**Chapter 5 lecture** Duration: 01:00	**Practice 3. Segmentation** Duration: 02:00		**Practice 3** Continuous assessment Duration: 00:00 **Quiz chapters 1-4** Continuous assessment Duration: 02:00
6	**Chapter 6 lecture** Duration: 01:00	**Practice 4. Feature extraction** Duration: 02:00		**Practice 4** Continuous assessment Duration: 00:00
7	**Chapter 7 lecture** Duration: 01:00	**Practice 5. Classification** Duration: 02:00		**Practice 5** Continuous assessment Duration: 00:00

8	**Chapter 8 lecture** Duration: 01:00	**Practice. Project development** Duration: 02:00		
9		**Practice. Project development** Duration: 03:00		
10		**Practice. Project development** Duration: 03:00		**Quiz /Chapters 5-8)** Continuous assessment Duration: 02:00
11		**Practice. Project development** Duration: 03:00		
12		**Practice. Project development** Duration: 03:00		**Project first deliverable** Continuous assessment Duration: 00:00
13		**Practice. Project development** Duration: 03:00		
14		**Practice. Project development** Duration: 03:00		
15		**Practice. Project development** Duration: 03:00		
16				**Project presentation and evaluation** Continuous assessment Duration: 03:00
17				**Quiz: Final exam (only for students that choose this type of assessment)** Final examination Duration: 01:00 **Project presentation: Final exam (only for students that choose this type of assessment)** 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
3	Practice 1		Face-to-face	00:00	4%	/ 10	CB10 CESE.1 CESE.2
4	Practice 2		Face-to-face	00:00	4%	/ 10	CESE.1 CESE.2 CE.1
5	Practice 3		Face-to-face	00:00	4%	/ 10	CESE.1 CESE.2 CE.1
5	Quiz chapters 1-4		No Presential	02:00	15%	/ 10	CB10 CGEN.3 CGEN.4 CE.1
6	Practice 4		Face-to-face	00:00	4%	/ 10	CESE.1 CESE.2
7	Practice 5		Face-to-face	00:00	4%	/ 10	CESE.1 CESE.2
10	Quiz /Chapters 5-8)		No Presential	02:00	15%	/ 10	CB10 CGEN.3 CGEN.4 CE.1
12	Project first deliverable		Face-to-face	00:00	10%	/ 10	CB10 CE.7 CESE.1 CGEN.3 CB7 CESE.2 CGEN.4 CE.1
16	Project presentation and evaluation		Face-to-face	03:00	40%	/ 10	CB10 CE.7 CESE.1 CGEN.3 CB7 CESE.2 CGEN.4 CE.1

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Quiz: Final exam (only for students that choose this type of assessment)		Face-to-face	01:00	25%	/ 10	CB10 CESE.1 CGEN.3 CESE.2 CE.1
17	Project presentation: Final exam (only for students that choose this type of assessment)		Face-to-face	02:00	75%	/ 10	CB10 CE.7 CESE.1 CGEN.3 CB7 CESE.2 CGEN.4 CE.1

7.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

7.2. Assessment criteria

-Default assessment is continuous assessment. Students wishing to be assessed only through final testing must submit a written request in the first five weeks of the term. The request has to be delivered to the Course Coordinator (Room A7008) or in her mailbox that is in the hallway of the ground floor of Block VII (box 10).

-Continuous assessment is defined in the previous table. In addition three conditions are required:

o To get 5 points out of 10.

o To make and deliver all practices.

o To present the final project.

-Evaluation through final exam and extraordinary evaluation:There will be two tests, one Moodle quizz (25% of the mark) and a project presentation (75%).

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Pattern Classification. Second edition. Richard O. Duda, Peter E. Hart, David G. Stork. Ed. Wiley-Interscience. 2001	Bibliography	
Introduction to pattern recognition: a Matlab approach. S. Theodoridis, K. Koutroumbas. Ed. Elservier Academic Press. 2010	Bibliography	
Digital image processing using MATLAB. R.C. Gonzalez, R.E. Woods, S.L. Eddins. Ed. Pearson Prentice Hall. 2004	Bibliography	
Fundamentals of speech recognition. L. Rabiner, B.H. Juang. Ed. Prentice Hall. 1993	Bibliography	
Moodle	Web resource	Slides Practice guides Project guide Papers Forum
Laboratory equipment	Equipment	Personal Computer Matlab Headphones Microphone Digital camera

9. Other information

9.1. Other information about the subject

IMPORTANT NOTE: The Master's program to which this subject belongs has entered its termination phase. For this reason, the only valid section of this Study Guide is "Activities and assessment criteria / Actividades y Criterios de Evaluación", being the rest equal to the last time that the subject was taught.