ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

53001545 - Wireless Sensor Networks

DEGREE PROGRAMME

05BG - Master Universitario en Electronica Industrial

ACADEMIC YEAR & SEMESTER

2020/21 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	53001545 - Wireless Sensor Networks
No of credits	3 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	05BG - Master Universitario en Electronica Industrial
Centre	05 - Escuela Tecnica Superior de Ingenieros Industriales
Academic year	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jorge Portilla Berrueco (Subject coordinator)	Electrónica	jorge.portilla@upm.es	Sin horario.
Gabriel Noe Mujica Rojas	Electrónica	gabriel.mujica@upm.es	Sin horario.

* 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

- Sistemas micropocesadores

4. Skills and learning outcomes *

4.1. Skills to be learned

CB06 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CB08 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios

CB09 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades

CE02 - Ser capaz de desarrollar un proyecto de diseño de un sistema electrónico, identificando sus principales retos, en ámbitos de aplicación tales como el aeroespacial, la automoción, la ingeniería médica, las energías renovables o las comunicaciones

CE03 - Optimizar la gestión energética de los sistemas electrónicos mediante la aplicación de técnicas avanzadas de diseño de circuitos y de métodos de control.

CG02 - Saber aplicar e integrar sus conocimientos, la comprensión de estos, su fundamentación científica y sus capacidades de resolución de problemas en entornos nuevos y definidos de forma imprecisa, incluyendo contextos de carácter multidisciplinar tanto investigadores como profesionales altamente especializados.

CG05 - Saber transmitir de un modo claro y sin ambigüedades a un público especializado o no, resultados procedentes de la investigación científica y tecnológica o del ámbito de la innovación más avanzada, así como los fundamentos más relevantes sobre los que se sustentan

CG06 - Haber desarrollado la autonomía suficiente para participar en proyectos de investigación y colaboraciones científicas o tecnológicas dentro de su ámbito temático, en contextos interdisciplinares y, en su caso, con una alta componente de transferencia del conocimiento.

CT01 - Uso de la lengua inglesa

CT04 - Organización y planificación

4.2. Learning outcomes

RA23 - Recopilar, presentar y resumir información contenido en la literatura en el marco de los sistemas embebidos conectados en red

RA21 - Diseñar y planificar despliegues de redes de sensores inalámbricas (WSN)

RA22 - Analizar y clasificar tecnologías de comunicaciones inalámbricas en el marco de la Internet de las Cosas

* 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

The subject Wireless Sensor Networks contains the key technological aspects that are used today in the new Internet of Things paradigm.

Topics form radio communications, processing, power supply, sensing circuits and deployment methodologies, among others, are explained in this subject.

There are several practical aspects as distributed applications, low power budget, low data rate constraints, among others, that are faced in the semester.

5.2. Syllabus

1. Introduction to Wireless Sensor Networks
2. Hardware of the nodes
3. WSN architecture. Topologies
4. Routing protocols, self-organization and node discovery in WSNs
5. Power consumption and power saving systems in WSNs
6. Deployment techniques and commissioning
7. Testbeds and debugging
8. Dependability in WSNs

6. Schedule

6.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	**Introduction** Duration: 02:00			
2	**Hardware of the nodes** Duration: 02:00			
3		**Practice 1: Introduction to hardware nodes** Duration: 02:00		
4		**Practice 2: Introduction to WSN node programming** Duration: 00:00		
5	**Routing protocols, self-organization and node discovery in WSNs** Duration: 02:00			
6	**Power consumption and power saving systems in WSNs** Duration: 02:00			
7	**Deployment techniques and commissioning** Duration: 03:00			
8		**Practice 3: Radio module introduction** Duration: 03:00		
9	**Testbeds and debugging** Duration: 03:00			
10		**Practice 4: Multi-node application** Duration: 03:00		
11		**Practice 6: Deployment** Duration: 03:00		**Practices** Continuous assessment Presential Duration: 00:00
12				**Presentation of research work** Continuous assessment Presential Duration: 03:00 **Class Tests**

				Continuous assessment Presential Duration: 00:20
13				**Presentation of pratical work** Continuous assessment Presential Duration: 03:00
14				
15				
16				
17				**Final exam** Final examination Presential Duration: 00:00

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 schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
11	Practices		Face-to-face	00:00	20%	/ 10	
12	Presentation of research work		Face-to-face	03:00	20%	5 / 10	CT01 CT04 CG05 CB06
12	Class Tests		Face-to-face	00:20	5%	5 / 10	
13	Presentation of pratical work		Face-to-face	03:00	55%	5 / 10	CT01 CT04 CG02 CG05 CG06 CB06 CB07 CE02 CE03 CB09 CB08

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final exam		Face-to-face	00:00	50%	5 / 10	

7.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

7.2. Assessment criteria

The score is based on a theory exam, plus a team work on a wireless sensor network application and a presentation of a research work focused on a specific research area within wireless sensor networks.

Presentiality is conditioned to pandemia situation.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
System Architecture for Wireless Sensor Networks	Bibliography	PhD thesis Jason Lester Hill, U. C. Berkeley, 2003
Ubiquitous Computing: Smart Devices, Environments and Interactions	Bibliography	book, S. Posland, Wiley & sons. 2009
Wireless Sensor Networks. Technology, Protocols and Applications	Bibliography	book, Wiley InterScience (2007).