ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

53001545 - Wireless sensor networks

DEGREE PROGRAMME

05BG - Master Universitario En Electronica Industrial

ACADEMIC YEAR & SEMESTER

2018/19 - Semester 1

PR/CL/001
COORDINATION PROCESS OF
LEARNING ACTIVITIES

ANX-PR/CL/001-01
LEARNING GUIDE

E.T.S. de Ingenieros
Industriales

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	2018-19

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jorge Portilla Berrueco (Subject coordinator)	E3	jorge.portilla@upm.es	Sin horario.
Teresa Riesgo Alcaide	E10	teresa.riesgo@upm.es	Sin horario.

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

PR/CL/001
COORDINATION PROCESS OF
LEARNING ACTIVITIES

ANX-PR/CL/001-01
LEARNING GUIDE

E.T.S. de Ingenieros
Industriales

2.2. Research assistants

Name and surname	Email	Faculty member in charge
Mujica Rojas, Gabriel Noe	gabriel.mujica@upm.es	Portilla Berrueco, Jorge

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

El plan de estudios Master Universitario en Electronica Industrial no tiene definidas asignaturas previas recomendadas para esta asignatura.

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

PR/CL/001
COORDINATION PROCESS OF
LEARNING ACTIVITIES

ANX-PR/CL/001-01
LEARNING GUIDE

E.T.S. de Ingenieros
Industriales

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.

PR/CL/001
COORDINATION PROCESS OF
LEARNING ACTIVITIES

ANX-PR/CL/001-01
LEARNING GUIDE

E.T.S. de Ingenieros
Industriales

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

PR/CL/001
**COORDINATION PROCESS OF
LEARNING ACTIVITIES**

ANX-PR/CL/001-01
LEARNING GUIDE

**E.T.S. de Ingenieros
Industriales**

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	**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		
12				**Presentation of research work** Continuous assessment Duration: 03:00

13				**Presentation of pratical work** Continuous assessment Duration: 03:00
14				
15				
16				
17				**Final exam** Continuous assessment and final examination Duration: 02:00 **Final exam** Final examination Duration: 00:00

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.

PR/CL/001
COORDINATION PROCESS OF
LEARNING ACTIVITIES

ANX-PR/CL/001-01
LEARNING GUIDE

E.T.S. de Ingenieros
Industriales

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
12	Presentation of research work		Face-to-face	03:00	30%	5 / 10	CT01 CT04 CG05 CB06
13	Presentation of pratical work		Face-to-face	03:00	20%	5 / 10	CT01 CT04 CG02 CG05 CG06 CB06 CB07 CB08 CE02 CE03 CB09
17	Final exam		Face-to-face	02:00	50%	5 / 10	

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final exam		Face-to-face	02:00	50%	5 / 10	
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.

PR/CL/001
COORDINATION PROCESS OF
LEARNING ACTIVITIES

ANX-PR/CL/001-01
LEARNING GUIDE

E.T.S. de Ingenieros
Industriales

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

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).