ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

593000424 - Ubiquitous and secure networks and services

DEGREE PROGRAMME

59AG - Eit Digital Track On Internet Technology And Architecture

ACADEMIC YEAR & SEMESTER

2018/19 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	593000424 - Ubiquitous and secure networks and services
No of credits	5 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	59AG - Eit digital track on internet technology and architecture
Centre	59 - Escuela Tecnica Superior de Ingenieria y Sistemas de Telecomunicacion
Academic year	2018-19

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jose Fernan Martinez Ortega (Subject coordinator)	A4407	jf.martinez@upm.es	Sin horario. TBD
Pedro Castillejo Parrilla	A4401	pedro.castillejo@upm.es	Sin horario. TBD

* 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 Eit Digital Track On Internet Technology And Architecture no tiene definidas asignaturas previas recomendadas para esta asignatura.

3.2. Other recommended learning outcomes

- Protocol stacks.

- Knowledge and usage of telecommunication networking, systems and services programming skills.

- Distributed telematic systems.

- Communication networks.

4. Skills and learning outcomes *

4.1. Skills to be learned

CEI.2 - Be capable of critically interpreting and assessing scientific documents in the area of the Information and Communication Technologies

CEI.3 - Be capable of communicating and disseminating their research results.

CESE.5 - Be capable of developing systems that offer ubiquitous and secure services.

CGEN.2 - Be capable of performing independent learning during their professional career.

CGEN.6 - Be capable of projecting, calculating and designing systems and services for the Information Society.

CGEN.8 - Be capable of applying and integrating the acquired knowledge to solve problems in new environments, inside broader and multidisciplinary contexts, in the framework of their expertise area.

CGEN.9 - Be capable of performing research, development and innovation activities in the context of the Information Society.

4.2. Learning outcomes

RA20 - Classify the ubiquitous services and applications according to their technical characteristics.

RA21 - Explain the technological characteristics of the architectures, platforms, networks and protocols that offer ubiquitous services and applications.

RA22 - Analyze the security threats to be considered in a ubiquitous system, according to both the application/service and the network environment.

RA25 - Implement a ubiquitous system, having its design as input.

RA23 - Assess the security methods to neutralize the threats present in a ubiquitous system.

RA24 - Design a system that offers a ubiquitous application or service, having a set of specifications and technical requirements as input.

* 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 is taught during the first semester of the "MSc in Systems and Services Engineering for the Information Society" (Máster en Ingeniería de Sistemas y Servicios para la Sociedad de la Información), being compulsory in the professional itinerary and optional in the research itinerary of the curriculum. In order to be able to follow it it is strongly advisable to have a previous background on the main telematic concepts related to communication networks, protocols and services, since these basic concepts will not be part of its contents.

Its 5 ECTS correspond to a total of around 133 hours of student's work, including both theory- and practical- (i.e. laboratory-) oriented activities. This includes all the activities to be done autonomously, either individually or in groups. The autonomous time that the students are foreseen to spend to pass the course is the following:

- Autonomous personal study: 10 hours.
- Autonomous group work: 15 hours.
- Autonomous laboratory work (additional to the time scheduled below): 20 hours.
- Autonomous group work to design the practical project(s): 10 hours.
- Preparatory work for making the oral presentations: 10 hours.
- Preparatory and writing work related to the practical work reports: 20 hours.
- Critical assessment of technical documents: 3 hours.

5.2. Syllabus

1. Unit 1: Introduction to ubiquitous systems
   1.1. Ubiquitous / pervasive computing
   1.2. Network aspects and deployment in ubiquitous systems
   1.3. Future Internet: Internet of Things, Internet of Services, Internet of People
2. Unit 2: Applications and services
   2.1. Types of ubiquitous applications and services. Examples of use scenarios
   2.2. Context awareness, human-machine interfaces
   2.3. Quality of service and application requirements
   2.4. Main technological challenges
3. Unit 3: Types of ubiquitous systems: Architectures and platforms
   3.1. Wireless Sensor Networks (WSN)
   3.2. Ad-hoc networks
   3.3. Personal- and body-area networks
   3.4. Other networks
4. Unit 4: Network technologies
   4.1. Network-related technological challenges; energy efficiency
   4.2. Link-layer protocols
   4.3. Network-layer protocols; routing
   4.4. Quality of Service (QoS)
   4.5. Communication models
5. Unit 5: Ubiquitous systems security

5.1. Vulnerabilities of ubiquitous networks and services

5.2. Cryptographic mechanisms as the basis of the security

5.3. Intrusion detection

5.4. Security management

6. Unit 6: Practical project

6.1. Design, implementation and deployment of an ubiquitous application / service

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, Units 1 and 2** Duration: 03:00			
2	**Introduction to UML. Introduction to the lab and practical Project.** Duration: 03:00			
3	**Unit 3** Duration: 03:00			
4	**Unit 4. Support to the practical work (introduction to lab environment)** Duration: 03:00			
5	**Unit 5** Duration: 01:30	**Lab work.** Duration: 03:00		
6		**Unit 6: lab work in groups; supervision sessions on demand** Duration: 03:00		**Case studies written reports** Continuous assessment and final examination Duration: 00:00
7				**Case studies presentations.** Continuous assessment and final examination Duration: 03:00
8		**Unit 6: lab work in groups; supervision sessions on demand** Duration: 03:00		
9		**Unit 6: lab work in groups; supervision sessions on demand** Duration: 03:00		
10		**Unit 6: lab work in groups; supervision sessions on demand** Duration: 03:00		
11		**Unit 6: lab work in groups; supervision sessions on demand** Duration: 03:00		

12		**Unit 6: lab work in groups; supervision sessions on demand** Duration: 03:00		
13		**Unit 6: lab work in groups; supervision sessions on demand** Duration: 03:00		
14		**Unit 6: lab work in groups; supervision sessions on demand** Duration: 03:00		
15				**Practical project written document** Continuous assessment and final examination Duration: 00:00 **Practical project functioning demonstration** Continuous assessment and final examination Duration: 01:30 **Practical project oral presentation** Continuous assessment and final examination Duration: 01:30
16				
17				

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
6	Case studies written reports		No Presential	00:00	25%	4 / 10	CEI.2 CGEN.2
7	Case studies presentations.		Face-to-face	03:00	5%	4 / 10	CEI.3
15	Practical project written document		No Presential	00:00	25%	4 / 10	CGEN.6 CGEN.8 CGEN.9
15	Practical project functioning demonstration		Face-to-face	01:30	25%	4 / 10	CESE.5
15	Practical project oral presentation		Face-to-face	01:30	20%	4 / 10	CEI.3

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
6	Case studies written reports		No Presential	00:00	25%	4 / 10	CEI.2 CGEN.2
7	Case studies presentations.		Face-to-face	03:00	5%	4 / 10	CEI.3
15	Practical project written document		No Presential	00:00	25%	4 / 10	CGEN.6 CGEN.8 CGEN.9
15	Practical project functioning demonstration		Face-to-face	01:30	25%	4 / 10	CESE.5
15	Practical project oral presentation		Face-to-face	01:30	20%	4 / 10	CEI.3

7.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

7.2. Assessment criteria

The final mark for each student in this course will be a number between 0 and 10 points. The course is passed if the mark is equal or above 5 points.

The course is designed to be passed through continuous evaluation. The practical work performed by the students has a very significant weight in the total course mark, since the total students' work necessary to pass this part of the course is foreseen to be high. This is the reason why, in the case of there being a final exam, it is mandatory to have previously passed the laboratory-related part of the course (i.e. to have attended through the semester, performed the activities and passed the evaluation of Unit 6) in order for the student to be able to access such an exam. The students that pass the course through continuous evaluation (see the deliverables to be produced below) will not be required to do any additional exam.

The following deliverables produced by the students will be subject of evaluation:

- Practical project, done in groups, consisting on the design and the subsequent implementation, deployment, testing and documentation of a system, having a set of requirements as input. The following deliverables will be assessed:
    - The correct functioning of the project(s) in a manner consistent with its specifications.
    - The written documents containing the description of the different phases of the project(s) + an initial contextualization and research section related to the course and the specific project.
    - The oral presentation and demonstration (+ Q&A) of the practical project.
- Reading and critical assessment of scientific and technological papers related to the course. At this respect, two main deliverables will be subject to assessment:
    - Written reports on the reading and critical assessment of the papers.
    - Oral presentation of the summary and conclusions extracted from some of the papers.

The following criteria will be considered when assessing each of the evaluated activities:

- Written documents:
    - Technical correctness, completeness, originality and accuracy.
    - Presentation: correctness, clarity, grammar and format.
- Oral presentations:
    - Execution: clarity, conciseness, correctness, faithfulness of the presentation to the written

document, quality of the auxiliary means (power point slides, use of the blackboard, etc.).
    - Questions: accuracy and correctness when answering to questions.
- Practical work: correct functioning.
    - The service or application correctly functions as specified by the own students' practical work documents describing their project.
    - Questions: accuracy and correctness when answering to questions related to any aspect of their project.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Problem Solving for Wireless Sensor Networks	Bibliography	"Problem Solving for Wireless Sensor Networks". Ana-Belén García-Hernando, José-Fernán Martínez-Ortega, Juan-Manuel López-Navarro, Aggeliki Prayati, Luis Redondo-López (Editors). Springer (June 2, 2010). ISBN-13: 978-1848002029.
Security in RFID and Sensor Networks	Bibliography	"Security in RFID and Sensor Networks". Paris Kitsos (Editor). Auerbach Publications (April 13, 2009). ISBN-13: 978-1420068399.
Interconnecting Smart Objects with IP: The Next Internet	Bibliography	"Interconnecting Smart Objects with IP: The Next Internet". Jean-Philippe Vasseur, Adam Dunkels. Morgan Kaufmann (June 15, 2010). ISBN-13: 978-0123751652.
Basic papers	Bibliography	Most of them will be accessible using the international electronic databases to which the UPM is subscribed. Some of them could be also uploaded to the Moodle space of the course.

Moodle	Web resource	Moodle platform space of the course.
Personal computers	Equipment	Personal computers: at least one per student during the laboratory sessions.
Specific equipment	Equipment	WSN nodes or needed simulation software + development environment.

9. Other information

9.1. Other information about the subject

The information contained in this document is of an orientative nature. Thus, it is subject to change due to errors, omissions or if the circumstances occurring during the course duration advise to do so.