LEARNING GUIDE
Information for the student

Descriptive Data

COURSE:	**Ubiquitous and Secure Networks and Services (Redes y servicios ubicuos y seguros)**
SUBJECT:	**Telematics**
ECTS:	**5**
CHARACTER:	**Compulsory (professional itinerary) / Optional (research itinerary)**
TITLE:	**MSc in Systems and Services Engineering for the Information Society (Máster en Ingeniería de Sistemas y Servicios para la Sociedad de la Información)**
COURSE:	**1st course, 1st semester**
SPECIALIZATION:	-

ACADEMIC YEAR	**2010-2011**		
TEACHING PERIOD	**September-January**	**February-June**	
	X		
LANGUAGE	**Spanish**	**English**	**Both**
			X Note (1)

Note (1): The written material, both the bibliography and the written reports produced by the students, will be in English. If there is at least one student in the classroom who cannot speak Spanish, all the oral presentations, made both by the lecturers and the students, will be in English. Otherwise, it is possible that some oral presentations are made in Spanish.

DEPARTMENT:	Departamento de Ingeniería y Arquitecturas Telemáticas (Department of Telematic Engineering and Architectures)

LECTURERS		
NAME (C = Coordinator)	**ROOM**	**e-mail**
Ana-Belén García Hernando (C)	**4323**	abgarcia@diatel.upm.es
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PREVIOUS REQUIRED BACKGROUND TO FOLLOW THE COURSE	
APPROVED COURSES	Any of the following graduates (or students with demonstrable equivalent knowledge) may access this course: • Graduate in Communication Electronics Engineering (Graduado en Ingeniería de Electrónica de Comunicaciones) • Graduate in Telecommunication Systems Engineering (Graduado en Ingeniería de Sistemas de Telecomunicación) • Graduate in Sound and Image Engineering (Graduado en Ingeniería de Sonido e Imagen) • Graduate in Telematic Engineering (Graduado en Ingeniería Telemática)
OTHER REQUIRED LEARNING RESULTS	

Learning Objectives

COMPETENCES AND COURSE ASSIGNED LEVEL		
Code	**COMPETENCE**	**LEVEL**
CGEN.2	Be capable of performing independent learning during their professional career.	L4
CGEN.6	Be capable of projecting, calculating and designing systems and services for the Information Society.	L4
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.	L5
CGEN.9	Be capable of performing research, development and innovation activities in the context of the Information Society.	L5
CESE.5	Be capable of developing systems that offer ubiquitous and secure services.	L5
CEI.2	Be capable of critically interpreting and assessing scientific documents in the area of the Information and Communication Technologies.	L5
CEI.3	Be capable of communicating and disseminating their research results.	L4

Code	COURSE LEARNING RESULTS
LR01	Classify the ubiquitous services and applications according to their technical characteristics.
LR02	Explain the technological characteristics of the architectures, platforms, networks and protocols that offer ubiquitous services and applications.
LR03	Analyze the security threats to be considered in a ubiquitous system, according to both the application/service and the network environment.
LR04	Assess the security methods to neutralize the threats present in a ubiquitous system.
LR05	Design a system that offers a ubiquitous application or service, having a set of specifications and technical requirements as input.
LR06	Implement a ubiquitous system, having its design as input.

Contents and Learning Activities

SPECIFIC CONTENTS		
LECTURE / UNIT	**EPIGRAPH**	**Related indicators**
Unit 1	**1: Introduction to ubiquitous systems**	LR01
	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	
Unit 2	**2: Applications and services**	LR02
	2.1: Types of ubiquitous services: context-aware services, social networks, embedded systems, ambient intelligence.	
	2.2: Applications to offer ubiquitous services	
	2.3: Man-machine interfaces	
	2.4: Quality of service and performance application requirements	
Unit 3	**3: Types of ubiquitous systems: Architectures and platforms**	LR02
	3.1: Wireless Sensor Networks (WSN)	
	3.2: Ad-hoc networks	
	3.3: Personal- and body-area networks	
	3.4: Other networks	
Unit 4	**4: Network technologies**	LR02
	4.1: Network protocols	
	4.2: Communication models	
	4.3: Routing	
	4.4: Quality of Service (QoS)	
	4.5: Energy efficiency	
Unit 5	**5: Ubiquitous systems security**	LR03, LR04
	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	
Unit 6	**6: Project**	LR05, LR06
	6.1: Design, implementation and deployment of an ubiquitous application / service	

BRIEF DESCRIPTION OF THE ORGANIZATIVE MODALITIES USED AND EMPLOYED LEARNING METHODS	
THEORY	For each one of the first five units (1 to 5) there will be an introductory session made by a teacher, with the objectives of giving a general technological overview of the topic, providing extra recommended bibliography, ensuring that the students get at least a minimum common ground and establishing the main vocabulary and concepts.
CASE STUDY	The students will be presented with scientific and technological documents and papers related with units 1 to 5. These papers will give a more specific or thorough vision on some topic. After reading the document, the students may be asked to discuss it in groups, to make a brief presentation on their understanding of the topic and / or to write a summary.
LABORATORY	Unit 6 consists on the development of a complete project, for which the students will have to perform the design and the subsequent implementation and deployment of a system, having a set of requirements as input. This will require a considerable amount of time spent in the laboratory, especially for the phases of implementation, deployment, validation and testing of their project(s).
AUTONOMOUS WORK	Each student will have to spend time on reading documents, searching for information, performing the part of the group work they have been assigned with, and in general assessing that they have grasped the main concepts, knowledge and abilities that will allow them to demonstrate their competence for passing the course evaluation.
GROUP WORK	There are two main activities that will require group work: the project related with unit 6, and a research work that will be proposed by the teachers on specific subjects, and that will consist on writing a report and presenting it orally. Students will have to work in groups for reaching a consensus and a common understanding of the work to perform, assigning tasks to each of the members, putting in common their work, integrating their results and preparing the corresponding presentations and written reports.
SUPERVISION	Groups of students will be tutored by the teachers on specific pre-scheduled sessions. This will allow the students to ask questions, raise the problems they have not autonomously been able to solve and receive advice on how to continue or tailor their work for the future.

DIDACTICAL RESOURCES	
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". Paris Kitsos (Editor). Auerbach Publications (April 13, 2009). ISBN-13: 978-1420068399.
	"Interconnecting Smart Objects with IP: The Next Internet". Jean-Philippe Vasseur, Adam Dunkels. Morgan Kaufmann (June 15, 2010). ISBN-13: 978-0123751652.
	Basic papers: 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.
WEB RESOURCES (Institutional Platform)	Moodle platform space of the course: accessible through the following URL: https://www.upm.es/politecnica_virtual/ (using your e-mail address and password as a UPM student).
LABORATORY EQUIPMENT	Personal computers: at least one per student during the laboratory sessions.
	Specific equipment (WSN nodes + development environment).

Course work chronogram

The students will have to complete a total of about 133 hours (5 ECTS) of work for passing the course. This includes all the time that the students have to spend on course-related activities, including not only in-class or in-laboratory time but also 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: 20 hours.
- Autonomous group work: 15 hours.
- Autonomous laboratory work (additional to the time scheduled below): 10 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: 10 hours.
- Critical assessment of technical documents (additional to the time scheduled below): 3 hours.
- Writing work related to the research work group: 10 hours.

The following tables summarize the time foreseen for in-class or in-laboratory work during the course (this time is additional to the items presented above).

Unit 1			
Week 01			
Activity	**Hours**	**Place**	**Methodology**
▪ Introduction to the course + introductory session to Unit 1	2	Classroom	Theory
▪ Additional reading	1	Classroom	Case study

Unit 2			
Week 02			
Activity	**Hours**	**Place**	**Methodology**
▪ introductory session to Unit 2	2	Classroom	Theory
▪ Additional reading	1	Classroom	Case study

Unit 3			
Week 03			
Activity	**Hours**	**Place**	**Methodology**
▪ introductory session to Unit 3	2	Classroom	Theory
▪ Additional reading	1	Classroom	Case study

Unit 3 (cont) + supervision			
Week 04			
Activity	**Hours**	**Place**	**Methodology**
▪ introductory session to Unit 3 (cont)	1	Classroom	Theory
▪ Additional reading	1	Classroom	Case study
▪ Supervision session for introducing the group research work topics and methodology	1	Classroom	Supervision

Unit 4			
Week 05			
Activity	**Hours**	**Place**	**Methodology**
▪ introductory session to Unit 4	2	Classroom	Theory
▪ Additional reading	1	Classroom	Case study

Unit 5 + supervision			
Week 06			
Activity	**Hours**	**Place**	**Methodology**
▪ introductory session to Unit 5	1	Classroom	Theory
▪ Additional reading	1	Classroom	Case study
▪ Supervision session related to the groups' research work	1	Classroom	Supervision

Unit 6 + supervision			
Weeks 07 – 13			
Activity	**Hours**	**Place**	**Methodology**
▪ Work in the laboratory, in groups, especially to perform the implementation, deployment, validation and testing of their project(s). This time also includes the time spent on the design of the project(s) done in presence of the lecturer (additional autonomous time is supposed to be spent by the students on the design, see above).	17	Laboratory	Laboratory, Group work
▪ Supervision sessions related to the groups' research work	3, in different weeks	Laboratory	Supervision
▪ Laboratory evaluation of the first part of the laboratory work	1, around the middle of this period	Laboratory	Evaluation

Final evaluation activities			
Weeks 14 – 15			
Activity	**Hours**	**Place**	**Methodology**
▪ Oral presentation (+ questions & answers) of the research work done by the groups throughout the semester	3	Classroom	Evaluation
▪ Laboratory evaluation: in-site demonstration of the correctness of the laboratory project(s) done by the groups. Questions & answers.	3	Laboratory	Evaluation

Course assessment and evaluation system

EVALUATION

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:

- Research work, done in groups, on a subject related to the course. Two deliverables will be assessed:
  - The written report developed by the students group.
  - The oral presentation + the answers to the questions asked by other students and the lecturers during and after the presentation.
- Practical work, 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. Two deliverables will be assessed:
  - The written documents containing the description of the different phases of the project(s).
  - The correct functioning of the project(s) in the presence of the lecturers + the answers to the questions asked by them.
- Critical assessment of scientific and technological papers. In this case, the students will be asked to read documents and papers related to the course, selected either by the lecturers, by the students themselves, or produced by their own classmates, and to produce a critical assessment, either in a written form or oral form, on their content.

The following table summarizes the weights (out of a total of 10 points) for each evaluated activity.

CUMULATIVE ASSESSMENT

Evaluated activity	Unit	Week	Place	Assessment weight
▪ Research work: written document.	1-5		Others	2
▪ Research work: oral presentation.	1-5		Classroom	1.5
▪ Practical work: written documents.	6		Others	3
▪ Practical work: correct functioning.	6		Laboratory	3
▪ Critical assessment of documents.	1-5		Classroom & Others	0.5

QUALIFICATION CRITERIA
The following criteria will be considered when assessing each of the evaluated activities: Research work: written document: • Technical correctness, completeness, originality and accuracy. • Presentation: correctness, clarity, grammar, format. Research work: oral presentation. • 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: written documents. • Technical correctness, completeness and accuracy. If a formal language is used for some part (e.g. the design phase of the project), it has to be correctly used. • Presentation: correctness, clarity, grammar, format. 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. Critical assessment of documents. • The student is able to understand the technical content contained within the document and to critically assess it, establishing connections to other knowledge or related papers previously read.