UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: SENSORS AND SENSOR WIRELESS NETWORKS
Code: 59665
Type: ELECTIVE
ECTS credits: 6
Degree: 385 - DEGREE IN TELECOMMUNICATI TECHNOLOGY ENGINEERING
Academic year: 2023-24
Center: 308 - SCHOOL POLYTECHNIC OF CUENCA
Group(s): 30
Year: 4
Duration: First semester
Main language: Spanish
Second language:
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **ESTEFANIA PRIOR CANO** - Group(s): **30**

Building/Office	Department	Phone number	Email	Office hours
2.11	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES		Estefania.PriorCano@uclm.es	The office hours will be available in Secretaría Virtual

2. Pre-Requisites

To have successfully completed the courses of "Fundamentals of Mathematics I", "Fundamentals of Mathematics II", "Fundamentals of Mathematics III", "Programming", "Components and Circuits", "Electronics Devices", "Electronics I", "Electronics II" and " Digital Electronics Systems ". More precisely, students will be required to manage and handle concepts related to integration and derivation, resolution of systems of lineal equations, analysis of electrical circuits in permanent and transitory regimes, basic measurement techniques, semiconductor physics and circuit analysis with diodes, transistors and photonic devices, amplification, A/D conversion, structured programming, basic algorithms, and software debugging.

3. Justification in the curriculum, relation to other subjects and to the profession

This course aims to familiarize students with the different types of sensors in the industry, robotics and home automation (temperature, humidity, presence, strength, etc.). Thus, students are prepared to obtain information on how to study the physical fundamentals of the different sensors, the alternatives of implementation, and the conditioning of the signal that allows its integration in a computer-based system. Moreover, some basic alternatives to comunicate a set of sensors, as well as, to estabish wireless networks of sensor are also covered in this course.

4. Degree competences achieved in this course

Course competences

Code	Description
E26	The ability to construct, use and manage telecommunication networks, services, processes and applications, which are defined as systems for capturing, transporting, representing, processing, storing, managing and presenting multimedia information, from the viewpoint of transmission systems.
E28	The ability to analyse components and its specifications for guided and non-guided communications systems.
G02	Correct, oral and written, communication skills.
G06	Knowledge of basic subjects and technologies, enabling students to learn new methods and technologies, as well as providing great versatility to adapt to new situations
G07	The ability to tackle problems with initiative, making decisions, creativity, and to communicate and transmit knowledge, skills and abilities, including the ethical and professional responsibility of the activity of a Technical Telecommunications Engineer
G08	Knowledge to perform measurements, calculations, assessments, appraisals, surveys, studies, reports, task planning and other similar work in their specific telecommunications field
G13	The ability to look for and understand information, wether technical or commercial in different sources, to relate and structure it to integrate ideas and knowledge. Analysis, synthesis and implementation of ideas and knowledge.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Knowledge and respect of professional ethics and deontology.
Analysis, synthesis and compression of technical documentation and mastery of specific vocabulary.
Synthesis of capacities of several telecommunications engineering areas.
Knowing the fundamental aspects of sensors and wireless sensor networks, as well as their factors of choice and applications.
Correct use of oral and written expression to convey ideas, technologies, results, etc.
Application of telecommunication systems in various fields of engineering.
Use of ICT to achieve the specific objectives set in the subject.

6. Units / Contents

Unit 1: Introduction to instrumentation systems.

Unit 1.1 Measures and errors

Unit 1.2 Sensors
Unit 1.3 Signal conditioning
Unit 1.4 Laboratory 1. Basic circuits

Unit 2: Introduction to sensing software and hardware

Unit 2.1 Acquisition of signals and hardware
Unit 2.2 Analysis and processing of information
Unit 2.3 Presentation of information
Unit 2.4 Sensors conditioning
Unit 2.5 Sensing temperature, pressure, level, distance, etc.
Unit 2.6 Laboratory 2. Acquisition of data
Unit 2.7 Laboratory 3. Sensing
Unit 2.8 Laboratory 4. Communication between digital sensors

Unit 3: Introduction to wireless sensor networks

Unit 3.1 Different topologies
Unit 3.2 Wireless protocols
Unit 3.3 Sensor Networks

ADDITIONAL COMMENTS, REMARKS

Hardware and software tools available at eletronics laboratory will be used to develop the proposed hands-on experiments

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E28 G06	0.75	18.75	N	-	Participative lectures in class teaching theoretical concepts
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E28 G06 G07 G08	0.7	17.5	Y	N	Solving theory and practical problems and answers in the class forum. Plagiarism is not allowed according to REE art. 8
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E26 E28 G02 G06 G07 G08 G13	0.7	17.5	Y	N	Laboratory work in small groups. It is assessed with a pre-laboratory report, an in-laboratory report and oral questions during the laboratory session. In the extraordinary call it will be assessed with only one laboratory session covering all the concepts of the ordinary sessions. Plagiarism is not allowed according to REE art. 8
Practicum and practical activities report writing or preparation [OFF-SITE]	Group Work	E26 E28 G02 G06 G07 G08 G13	0.5	12.5	Y	N	Laboratory work in small groups. It is assessed with an in-laboratory report and/or oral questions during the laboratory session. Laboratory number 4 may include a poster session performed externally for scientific disseminattion. In the extraordinary call it will be assessed with only one laboratory session covering all the concepts of the ordinary sessions. Plagiarism is not allowed according to REE art. 8
Writing of reports or projects [OFF-SITE]	Group Work	E26 E28 G02 G06 G07 G08 G13	1	25	Y	N	Development of a theory project about sensor networks in unit 3. It is assessed with a oral talk in class. In the extraordinary call it is assessed with a new and different report and oral talk. Plagiarism is not allowed according to REE art.8
Mid-term test [ON-SITE]	Assessment tests	E28 G02 G06 G07 G08 G13	0.18	4.5	Y	N	Assessment of theory concepts related to units 1 and 2. In the extraordinary call it is assessed similarly. Plagiarism is not allowed according to REE art. 8
Study and Exam Preparation [OFF-SITE]	Self-study	E26 E28 G02 G06 G07 G08 G13	2.1	52.5	N	-	Study and exam preparation by the student herself/himself
Individual tutoring sessions [ON-SITE]	Self-study	E26 E28 G02 G06 G07 G08 G13	0.07	1.75	N	-	Individual tutoring sessions at the student's request
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity
Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Mid-term tests	10.00%	10.00%	Theory exams (units 1 and 3), solving problems, and oral talk related to unit 3.
Laboratory sessions	60.00%	60.00%	Reports on hands-on experiments and practical problems and oral questions within the laboratory session.
Assessment of problem solving and/or case studies	10.00%	10.00%	Solving theory and practical problems and answers in the class forum.
Oral presentations assessment	20.00%	20.00%	Development of a theory project about sensor networks in unit 3. It is assessed with a oral talk in class.
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

No minimum mark for any activity developed during the course will be required, but the weighted average score for all of them should be higher than 5 points (in a scale of 10 points). The marks obtained in a call will not be maintained for subsequent calls.

Laboratory number 4 may include a poster session performed externally for scientific disseminattion. This will include extra marks.

Plagiarism is not allowed according to REE art. 8

Non-continuous evaluation:

By default, all students are evaluated with the continuous evaluation. If a student cannot attend to class or does not want to attend must communicate this to the professor in order to change to non-continuous evaluation. This change must be done as soon as possible and never having completed 50% or more of the continuous evaluation tasks. Having completed 50% or more of the tasks will result in mandatory continuous assessment.

No minimum mark for any activity developed during the course will be required, but the weighted average score for all of them should be higher than 5 points (in a scale of 10 points).

Plagiarism is not allowed according to REE art. 8

Specifications for the resit/retake exam:

In this second opportunity to pass the course, all activities have to be done again and be submitted for their re-assessment on the date set by the Studies Sub-direction.
As in previous evaluation, no minimum mark for any activity will be required, but the weighted average score for all of them will have to be higher than 5 points (in a scale of 10 points).

New project should be done in case of laboratory number 4.
A different research should be done in case of sensor network project.

Specifications for the second resit / retake exam:

In this opportunity to pass the course, all activities have to be done again and be submitted for their re-assessment on the date set by the Studies Sub-direction.
As in previous evaluation, no minimum mark for any activity will be required, but the weighted average score for all of them will have to be higher than 5 points (in a scale of 10 points).

New project should be done in case of laboratory number 4.
A different research should be done in case of sensor network project.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	12.5
Mid-term test [PRESENCIAL][Assessment tests]	4.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	52.5
Individual tutoring sessions [PRESENCIAL][Self-study]	1.75
General comments about the planning: This planning is purely advisory and may be subject to alteration during the course.	
Unit 1 (de 3): Introduction to instrumentation systems.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3.25
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	2
Unit 2 (de 3): Introduction to sensing software and hardware	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	11
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	13
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	15.5
Unit 3 (de 3): Introduction to wireless sensor networks	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1.5
Writing of reports or projects [AUTÓNOMA][Group Work]	25
Global activity	

Activities	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	17.5
Writing of reports or projects [AUTÓNOMA][Group Work]	25
Mid-term test [PRESENCIAL][Assessment tests]	4.5
Class Attendance (theory) [PRESENCIAL][Lectures]	18.75
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	17.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	12.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	52.5
Individual tutoring sessions [PRESENCIAL][Self-study]	1.75
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Morris, Alan S.	Measurement & Instrumentation Principles	Pearson Educación		970-26-0138-X	2001	
PALLAS ARENY, Ramón	Transductores y acondicionadores de señal	Barcelona Marcombo, cop. 1989		8426707645	1989	
Pérez García, M.A., et alt.;	Instrumentación electrónica	Thomson		978-84-9732-166-2	2008	
Lajara Vizcaíno, José Rafael	LabView : entorno gráfico de programación	Marcombo		978-84-267-1696-5	2010	
Larsen, Ronald W.	Labview for Engineers	Prentice Hall		978-0-13-609429-6	2011	