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: 2020-21
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: **RAUL ALCARAZ MARTINEZ** - Group(s): **30**

Building/Office	Department	Phone number	Email	Office hours
E. Politécnica Cuenca (0.03)	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	926054053	raul.alcaraz@uclm.es	This information will be published before the course starts

Lecturer: **RAQUEL CERVIGON ABAD** - Group(s): **30**

Building/Office	Department	Phone number	Email	Office hours
E. Politécnica Cuenca (0.05)	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	926054049	raquel.cervigon@uclm.es	This information will be published before the course starts

Lecturer: **CESAR SANCHEZ MELENDEZ** - Group(s): **30**

Building/Office	Department	Phone number	Email	Office hours
0.05	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	926053743	cesar.sanchez@uclm.es	This information will be published before the course starts

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

Application of telecommunication systems in various fields of engineering.

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.
Use of ICT to achieve the specific objectives set in the subject.
Knowledge and respect of professional ethics and deontology.
Analysis, synthesis and compression of technical documentation and mastery of specific vocabulary.

6. Units / Contents

Unit 1: Introduction to instrumentation system.
- **Unit 1.1** Measures and errors.
- **Unit 1.2** Sensors.
- **Unit 1.3** Conditioning.

Unit 2: Introduction to Labview.
- **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** Practice 1. Basic circuits with Labview.
- **Unit 2.5** Practice 2. Acquisition of data in Labview.

Unit 3: Temperature measurements.
- **Unit 3.1** Sensors for temperature measurements.
- **Unit 3.2** Conditioning of temperature sensors.
- **Unit 3.3** Practice 3. Temperature measurements with Labview.

Unit 4: Pressure measurements.
- **Unit 4.1** Pressure, potentiometric, piezoelectric, capacitive, inductive and strain gauge sensors.
- **Unit 4.2** Level sensors. Selection criteria.
- **Unit 4.3** Pressure measurements with Labview.

Unit 5: Proximity sensors
- **Unit 5.1** Inductive, capacitive, ultrasonic, optoelectronic, magnetic and safety sensors.
- **Unit 5.2** Practice 5. Proximity sensors

Unit 6: Digital sensors.
- **Unit 6.1** Practice 6. Communication between digital sensors.

Unit 7: Introduction to wireless sensor networks.
- **Unit 7.1** Different topologies.
- **Unit 7.2** Wireless protocols.
- **Unit 7.3** Practice 7. 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	-	
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. In the second case, Labview will be used.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E26 E28 G02 G06 G07 G08 G13	0.7	17.5	N	-	
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	
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 sensors networks
Progress test [ON-SITE]	Assessment tests	E28 G02 G06 G07 G08 G13	0.18	4.5	Y	N	Assessment of theory concepts
Study and Exam Preparation [OFF-SITE]	Self-study	E26 E28 G02 G06 G07 G08 G13	2.1	52.5	N	-	
Individual tutoring sessions [ON-SITE]	Self-study	E26 E28 G02 G06 G07 G08 G13	0.07	1.75	N	-	
		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
Progress Tests	40.00%	40.00%	Theory exams and projects.
Laboratory sessions	60.00%	60.00%	Reports on hands-on experiments and practical problems

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 will have to be higher than 5 points (in a scale of 10 points).

Non-continuous evaluation:

No minimum mark for any activity developed during the course 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).

Specifications for the resit/retake exam:

In this second opportunity to pass the course, all activities could be submitted for their re-assessment. 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).

The students failing the course will have another opportunity to improve the grade on mid-term examen. In this case, only one test will be held on the date established by the Center

Specifications for the second resit / retake exam:

Students will have to take two exams, one covering theory concepts and another assessing laboratory skills. The grading scheme will award 40% of the final mark on the course for theory exam and 60% for laboratory test. For both examinations a minimum mark of 4 points (on a scale of 10 points) will be required. Moreover, the final averaged mark will have to be equal or higher than 5 points (on a scale of 10 points).

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
Writing of reports or projects [AUTÓNOMA][Group Work]	25
Progress 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 7): Introduction to instrumentation system.

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 7): Introduction to Labview.

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	3

Unit 3 (de 7): Temperature measurements.

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	4

Unit 4 (de 7): Pressure measurements.

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	3.5

Unit 5 (de 7): Proximity sensors

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	2

Unit 6 (de 7): Digital sensors.

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	2

Unit 7 (de 7): 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
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	1

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
Progress 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	