UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: SIGNAL PROCESSING
Code: 56517
Type: ELECTIVE
ECTS credits: 6
Degree: 417 - UNDERGRAD. IN INDUSTRIAL ELECTRONICS AND AUTOMAT. ENGINEERING
Academic year: 2023-24
Center: 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL
Group(s): 20
Year: 4
Duration: First semester
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **RAFAEL MORALES HERRERA** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
E.T.S. Ingenieros Industriales de Albacete / Despacho 1.D.5	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES		rafael.morales@uclm.es	

2. Pre-Requisites

Mathematical background: algebra, calculus, statistics, differential equations and complex variable.

Signals and systems background: It is recommended to have previously studied Automatic Control and Discrete Control subjects in order to have some knowledge on continuous and discrete signals and systems, Laplace, Fourier and Z transforms, frequency domain and system stability.

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

Main objective of the degree is training competitive industrial engineers with the ability to design and develop: industrial products, machines, mechanisms, vehicles, structures and thermomechanical and hydraulic facilities (among others); and with the ability to collaborate with professionals of affine technologies within multidisciplinary teams, providing the engineer with the aptitude to take technological decisions according to cost, quality, safety, efficiency and environment criteria.

Industrial Engineers are professionals that use the knowledge from science, mathematics and engineering techniques to perform their professional activity within fields such as control, instrumentation and process and machine automation, as well as the design, construction, management and maintenance of industrial products.

Within the aforementioned knowledge, signal processing provides the student with abilities in instrumentation and conditioning of noisy signals, frequently found in telecommunication, control and process automation systems. Hence, it is a multidisciplinary application tool of a great practical interest for these professionals.

4. Degree competences achieved in this course

Course competences

Code	Description
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CEO18	Ability to design and programme discrete signal acquisition and conditioning systems.
CG03	Knowledge of basic and technological subjects to facilitate learning of new methods and theories, and provide versatility to adapt to new situations.
CG04	Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of industrial engineering.
CG05	Knowledge required to carry out measurements, calculations, valuations, appraisals, valuations, surveys, studies, reports, work plans and other similar work.
CG06	Ability to handle specifications, regulations and mandatory standards.
CG07	Ability to analyse and assess the social and environmental impact of technical solutions.
CG08	Ability to apply quality principles and methods.
CG09	Organisational and planning skills in the field of companies and other institutions and organisations.
CG10	Capacity to work in a multilingual and multidisciplinary environment.
CT02	Knowledge and application of information and communication technology.
CT03	Ability to communicate correctly in both spoken and written form.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Ability to design filters for noisy signal conditioning.

Knowledge of discrete signal acquisition and the effects of sampling continuous signals.

Knowledge of discrete time signals and their frequency characteristics.

Additional outcomes

6. Units / Contents

Unit 1: Signals and Systems

Unit 2: Fourier Analysis

Unit 3: Sampling

Unit 4: Z-Transform

Unit 5: Discrete Fourier Transform

Unit 6: Fast Fourier Transform

Unit 7: FIR filter design

Unit 8: IIR filter design

Unit 9: Digital Signal Processors

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	CEO18 CG03 CG04 CG05 CG07	1.2	30	N	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB03 CEO18 CG04	0.52	13	N	-	
Computer room practice [ON-SITE]	Practical or hands-on activities	CB01 CEO18 CG03 CG04 CT02	0.6	15	Y	Y	
Practicum and practical activities report writing or preparation [OFF-SITE]	Practical or hands-on activities	CB03 CB04 CB05 CG03 CG04 CG06 CG10 CT02 CT03	1.8	45	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 CB02 CB05 CEO18 CG03 CG04 CG05 CG06 CG07 CG08 CG09 CG10 CT02	1.8	45	N	-	
Final test [ON-SITE]	Assessment tests	CB02 CEO18 CG03 CG04	0.08	2	Y	Y	
		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
Final test	50.00%	50.00%	It will consist of theorical questions and problems on the concepts studied in the subject
Assessment of activities done in the computer labs	50.00%	50.00%	
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:

To pass the subject, the student must:

* attend all the practical activities and deliver the reports for each activity, which must be evaluated as satisfactory.
* pass the final exam with a mark of 5.0 or superior.

The subject mark will be the weighted mean of the evaluation activities according to the above table.

Non-continuous evaluation:

Evaluation criteria not defined

Specifications for the resit/retake exam:

The student must re-write the activity reports that were evaluated as unsatisfactory in the previous evaluation.

The student must retake the final exam if it was failed in the previous evaluation.

The subject mark will be the weighted mean of the evaluation activities according to the above table.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours **hours**

Class Attendance (theory) [PRESENCIAL][Lectures]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	13
Computer room practice [PRESENCIAL][Practical or hands-on activities]	15
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	45
Study and Exam Preparation [AUTÓNOMA][Self-study]	45
Final test [PRESENCIAL][Assessment tests]	2

Global activity

Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	13
Computer room practice [PRESENCIAL][Practical or hands-on activities]	15
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	45
Study and Exam Preparation [AUTÓNOMA][Self-study]	45
Final test [PRESENCIAL][Assessment tests]	2
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
M.H. Hayes	Schaum's Outlines: Digital Signal Processing	McGraw-Hill		978-0071635097	2012	Libro de texto recomendado
H.P. Hsu	Schaum's Outlines: Signals and Systems	McGraw-Hill		978-0071829465	2011	Repaso de señales continuas
A.V. Oppenheim, R.W. Schafer y J.R. Buck	Tratamiento de Señales en Tiempo Discreto	Pearson		978-8483227183	2012	
P. Prandelli y M. Vetterli	Signal Processing for Communications	EPFL Press		978-1420070460	2008	
J.G. Proakis y D.G. Manolakis	Tratamiento Digital de Señales. Principios, Algoritmos y Aplicaciones	Prentice Hall		978-8483223475	2009	