UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: ELECTRONICS I
Code: 59610
Type: CORE COURSE
ECTS credits: 6
Degree: 385 - DEGREE IN TELECOMMUNICATI TECHNOLOGY ENGINEERING
Academic year: 2020-21
Center: 308 - SCHOOL POLYTECHNIC OF CUENCA
Group(s): 30
Year: 2
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

2. Pre-Requisites

According to the UCLM regulation, no prerequiste courses can be established. Nonetheless, it is recommended that students have previously followed and, if possible, passed the courses of "System Analysis", "Components and Circuits", and "Electronics Devices". More precisely, students are required to undersand and handle basic concepts about sampling, hold, and codification of signals, electrical circuit theory, semiconductors and transistors, binary numbers, structured programming, design of algorithms, and software debugging.

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

Electronics plays a key role in many branchs of the Telecommunications engineering. Thus, this course exposes students for the first time to fundamental concepts of digital circuits, including binary numbers, logic gates, and complex digital logic blocks and systems. Nowadays, digital circuits and systems are the basis for many communication and consumer electronic devices. Consequently, the knowledge gained in this course will be required to understand more advanced concepts in upper subjects of the degree program, such as "Digital Electronics Systems", "Audiovisual Equipments in Medicine", "Sensors and Sensor Wireless Networks ", "Electronics Technology", and "Interdisciplinary Applications in Telecommunications".

4. Degree competences achieved in this course

Course competences

Code	Description
E08	The ability to use computer tools to search for bibliographic resources or for information related to telecommunications and electronics.
E14	The ability to analyse and design combinational and sequential circuits, synchronous and asynchronous, and use of microprocessors and integrated circuits.
E15	Knowledge and application of the fundamentals of hardware device description languages.
G01	Knowledge of Information and Communication Technologies (ICT).
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
G12	The ability to work in a multidisciplinary group and in a multilingual environment and to communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics
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

Appropriate type of bistable selection or combinational circuits capacity maximization.
Carrying out calculations to establish the different parameters of a digital electronic system.
Realization of assemblies and measurements of circuits in the laboratory.
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.
Use of hardware description languages to perform programming (combinational and sequential circuits) of a programmable logic device.
Familiarization in the use of commercial circuits, interpreting the information provided by the manufacturers.
Compression, analysis and synthesis of technical documentation and mastery of specific vocabulary.
Application of switching and automation theory to the problem solving of analysis and design of digital circuits.
Distinction of the different applications of digital electronic systems.
Combination of different circuits to obtain new functionalities, in case the integrated circuit that performs the desired logic function is not available.
Comparison between programmable logic devices based on their characteristics.

6. Units / Contents

Unit 1: Introduction to digital systems
- **Unit 1.1** Analog vs digital signals and systems
- **Unit 1.2** Binary digits
- **Unit 1.3** Basic logic operations
- **Unit 1.4** Basic logic functions

Unit 2: Number systems and codes
- **Unit 2.1** Decimal numbers
- **Unit 2.2** Binary numbers
- **Unit 2.3** Hexadecimal numbers
- **Unit 2.4** Octal numbers
- **Unit 2.5** Binary coded decimal
- **Unit 2.6** Error detection codes

Unit 3: Boolean algebra and logic simplification
- **Unit 3.1** Introduction to Boolean algebra
- **Unit 3.2** Logic functions
- **Unit 3.3** Simplification of Boolean expressions

Unit 4: Design of digital circuits
- **Unit 4.1** Gate-level design
- **Unit 4.2** Programmable logic
- **Unit 4.3** Application-specific integrated circuits
- **Unit 4.4** LAB 0. WIRED XOR GATE

Unit 5: Introduction to VHDL
- **Unit 5.1** Introduction
- **Unit 5.2** Basic units of design
- **Unit 5.3** Elements and operators
- **Unit 5.4** Sentences
- **Unit 5.5** LAB. 1. INTRODUCTION TO QUARTUS II

Unit 6: Combinational systems
- **Unit 6.1** Encoders
- **Unit 6.2** Decoders
- **Unit 6.3** Multiplexers
- **Unit 6.4** Demultiplexers
- **Unit 6.5** Arithmetic circuits
- **Unit 6.6** Comparators
- **Unit 6.7** Code converters
- **Unit 6.8** Parity Generators/Checkers
- **Unit 6.9** LAB 2. COMBINATIONAL CIRCUITS

Unit 7: Sequential systems
- **Unit 7.1** Introduction
- **Unit 7.2** Flip-flops
- **Unit 7.3** Counters
- **Unit 7.4** Shift registers
- **Unit 7.5** Finite state machines
- **Unit 7.6** LAB 3. SEQUENTIAL CIRCUITS

ADDITIONAL COMMENTS, REMARKS

Hardware and software tools available at electronics 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	E14 E15 G01 G02 G06	1	25	N	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E14 E15 G02 G06 G12	0.4	10	Y	N	
Study and Exam Preparation [OFF-SITE]	Problem solving and exercises	E14 E15 G02 G06 G12	0.4	10	Y	N	Homework assignments
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E08 E14 E15 G01 G02 G06 G12 G13	0.8	20	N	-	Attendance is mandatory and only one session can be lost. The workers enrolled in the course must inform the instructor before the beginning of the laboratory sessions
Practicum and practical activities report writing or preparation [OFF-SITE]		E08 E14 E15 G01 G02 G06 G12 G13	1	25	Y	Y	Preparation of hands-on experiments before their development, as well as final reports including measures, reflexions and conclusions
Individual tutoring sessions [ON-SITE]		E08 E14 E15 G01 G02 G06 G12 G13	0.04	1	N	-	
Study and Exam Preparation [OFF-		E08 E14 E15 G01 G02 G06	2.2	55	N	-	

SITE] Other on-site activities [ON-SITE]	Assessment tests	G12 G13 E08 E14 E15 G01 G02 G06 G12 G13	0.12	3	Y	Y	Theory concepts will be assessed through a written examination (final exam)
Other on-site activities [ON-SITE]	Assessment tests	E08 E14 E15 G01 G02 G06 G12 G13	0.04	1	Y	Y	Hands-on experiments will also be assessed through one or several written and/or oral examinations
		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
Assessment of active participation	5.00%	0.00%	In-class activities
Laboratory sessions	15.00%	15.00%	Assessment of the reports submitted for hands-on experiments
Test	60.00%	70.00%	A final exam assessing all theory concepts
Assessment of problem solving and/or case studies	5.00%	0.00%	Homework assignments
Test	15.00%	15.00%	Assessment of hands-on skills by written and/or oral examinations
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 course, students will have to satisfy the next three requirements:

- All laboratory tasks will have to be submitted and the oral or written examination will have to be taken. No minimum mark will be required for any hands-on experiment, but the weighted average score for all of them will have to be higher than 4 points (on a scale of 10 points). A minimum mark on the oral or written examination of 4 points (on a scale of 10 points) will be required.

- A degree on the final exam higher than 4 points (on a scale of 10 points) will be required.

- A final mark on the course higher than 5 points (on a scale of 10 points) will be required.

Non-continuous evaluation:

Those students unable to follow regularly the course will have to contact with the instructor within the first month. To pass the course, students will have to satisfy the next three requirements:

- All laboratory tasks will have to be submitted and the oral or written examination will have to be taken. No minimum mark will be required for any hands-on experiment, but the weighted average score for all of them will have to be higher than 4 points (on a scale of 10 points). A minimum mark on the oral or written examination of 4 points (on a scale of 10 points) will be required.

- A degree on the final exam higher than 4 points (on a scale of 10 points) will be required.

- A final mark on the course higher than 5 points (on a scale of 10 points) will be required.

Specifications for the resit/retake exam:

The second oportunity to pass the course activities will follow the next criteria:

- In continuous assessment, 'assessment of active participation' and 'assessment of problem solving and/or cases studies' will be considered within the final exam assessing all theory concepts.

- The final exam asessing all theory concepts will be awarded with 70% of the final mark on the course.

- Only one hands-on experiment will have to be conducted to improve the mark on 'Laboratory sessions'. This activity will be awarded with 15% of the final mark on the course.

- The laboratory examination will be awarded with 15% of the final mark on the course.

To pass the course, students have to satisfy the next three requirements:

- The proposed laboratory experiment will have be submitted and the oral or written examination will have to be taken. For both activities, a minimum mark of 4 points (on a scale of 10 points) will be required.

- A degree on the final exam higher than 4 points (on a scale of 10 points) will be required.

- A final mark on the course higher than 5 points (on a scale of 10 points) will be required.

In the case of failing the course, the average mark on the laboratory activities (if it is equal or higher than 4 points) will be maintained for the next offering, unless the student voluntarily decides to retake this set of activities.

Specifications for the second resit / retake exam:

If students passed the laboratory activities in the preceding course, only a exam covering all theory concepts will have to be tackled. Otherwise, students will have to take two exams, one covering theory concepts and another assessing laboratory skills. The grading scheme will award 70% of the final mark on the

course for theory exam and 30% for laboratory test. For both examinations a minimum mark of 4 points (on a scale of 10 points) will be required. Moreover, the final weighted average 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][]	25
Individual tutoring sessions [PRESENCIAL][]	1
Study and Exam Preparation [AUTÓNOMA][]	55
Other on-site activities [PRESENCIAL][Assessment tests]	3
Other on-site activities [PRESENCIAL][Assessment tests]	1

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 digital systems

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1

Unit 2 (de 7): Number systems and codes

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	.5
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	.5

Unit 3 (de 7): Boolean algebra and logic simplification

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	.5
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	.5

Unit 4 (de 7): Design of digital circuits

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	1
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	1.5

Unit 5 (de 7): Introduction to VHDL

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1.5
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	1.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	3.5

Unit 6 (de 7): Combinational systems

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2.5
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	2.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	7.5

Unit 7 (de 7): Sequential systems

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	9
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	7.5

Global activity

Activities	hours
Other on-site activities [PRESENCIAL][Assessment tests]	3
Other on-site activities [PRESENCIAL][Assessment tests]	1
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	10
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	20
Practicum and practical activities report writing or preparation [AUTÓNOMA][]	25
Class Attendance (theory) [PRESENCIAL][Lectures]	25
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Study and Exam Preparation [AUTÓNOMA][]	55
Individual tutoring sessions [PRESENCIAL][]	1
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Pedroni, Volnei A.	Digital Electronics and Design With VHDL	Morgan Kaufmann Publishers		9780123742704	2008	
Floyd, Thomas L.	Digital Fundamentals. A Systems Approach	Pearson		9781292027241	2014	

Brown Sephen and Vranesi, Zvonko	Fundamental of Digital Logic with VHDL Design	McGraw-Hill	9780073529530	2009
Perry, Douglas L.	VHDL: Programming by Example	McGraw-Hill	9780071409544	2002
Del Villar, Ignacio, Arregui, Francisco J., and Goicoechea, Javier	Solved problems in digital electronics	Paraninfo	9788426726308	2018
Wakerly, John F.	Digital Design: Principles & Practices	Pretince Hall	9788131713662	2014