UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: ELECTRONICS II
Code: 59615
Type: CORE COURSE
ECTS credits: 6
Degree: 385 - DEGREE IN TELECOMMUNICATI TECHNOLOGY ENGINEERING
Academic year: 2023-24
Center: 308 - SCHOOL POLYTECHNIC OF CUENCA
Group(s): 30
Year: 2
Duration: C2
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	An updated program of office hours can be found in Virtual Secretary's App.

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 “Fundamentals of Mathematics I”, “Fundamental of Mathematics II”, “Fundamentals of Mathematics III”, “Fundamentals of Physics I”, “Fundamentals of Physics II”, “Components and Circuits” y “Electronics Devices”. More precisely, students are required to undersand and handle basic concepts about derivation and intregration, solving systems of linear equations, spectrial analysis and Fourier Series, electromagnetism and wave propagation, analysis of electrical circuits, design of resonant circuits, physics of semiconductors, analysis of circuits with diodes, transistors and fotonic devices, and finally amplification. Students should also have some basic notions about the software Matlab.

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 three-phase voltages and powers, transformers, single-phase and three-phase rectifiers, isolated and non-isolated dc-dc converters, single-phase and three-phase inverters, and photovoltaic installations. The knowledge gained in this course will hence be required to understand more advanced concepts in upper subjects related to high frequency electronics and medical devices.

4. Degree competences achieved in this course

Course competences

Code	Description
E06	The ability to independently acquire new knowledge and techniques suitable for the design, development or operation of telecommunication systems and services.
E07	The ability to use communication and computer applications (office automation, databases, advanced calculation, project management, visualisation, etc.) to support the development and operation of telecommunication and electronic networks, services and applications.
E08	The ability to use computer tools to search for bibliographic resources or for information related to telecommunications and electronics.
E16	The ability to use different sources of energy, especially photovoltaic solar and thermal energy, as well as the fundamentals of electrical engineering and power electronics.
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
Understanding of single-phase and three-phase alternating current, and its applications
Knowledge of photovoltaic and thermal energy generation devices.
Correct use of oral and written expression to convey ideas, technologies, results, etc.
Compression, analysis and synthesis of technical documentation and mastery of specific vocabulary.
Application of the principles of electrical engineering and power electronics to the conditioning of the signal to be distributed.
Familiarization with the basic principles of power conversion.
Familiarization in the use of commercial circuits, interpreting the information provided by the manufacturers.
Knowledge of the legislation relating to photovoltaic and renewable energy installations.
Realization of assemblies and measurements of circuits in the laboratory.
Use of electromagnetic induction applied to electrical engineering.

Use of ICT to achieve the specific objectives set in the subject.
Use of transformers and converters, rectifiers, amplifiers and generators.
Design of photovoltaic and thermal solar energy installations and their connection to the electricity grid.

6. Units / Contents

Unit 1: Single-phase AC current
- **Unit 1.1** Basic definitions
- **Unit 1.2** Elemental circuits
- **Unit 1.3** Single-phase power
- **Unit 1.4** LAB 1. INTRODUCTION TO SIMULINK

Unit 2: Three-phase AC current
- **Unit 2.1** Three-phase AC voltage
- **Unit 2.2** Load connections
- **Unit 2.3** Three-phase power
- **Unit 2.4** LAB 2. THREE-PHASE CIRCUITS

Unit 3: Transformers
- **Unit 3.1** Introduction
- **Unit 3.2** Theory of operation
- **Unit 3.3** Classification
- **Unit 3.4** Tests
- **Unit 3.5** Performance and regulation
- **Unit 3.6** Measurement transformers
- **Unit 3.7** Autotransformers
- **Unit 3.8** Three-phase transformers

Unit 4: AC-DC Converters. Rectifiers
- **Unit 4.1** Introduction
- **Unit 4.2** Non-controlled rectifiers
- **Unit 4.3** Controlled rectifiers
- **Unit 4.4** LAB 3. RECTIFIERS

Unit 5: DC-DC Converters.
- **Unit 5.1** Introduction
- **Unit 5.2** Non-isolated buck converters
- **Unit 5.3** Non-isolated boost converters
- **Unit 5.4** Isolated and non-isolated buck-boost converters
- **Unit 5.5** LAB 4. DC-DC CONVERTERS

Unit 6: DC-AC Converters. Inverters
- **Unit 6.1** Introduction
- **Unit 6.2** Single-phase inverters
- **Unit 6.3** Three-phase inverters
- **Unit 6.4** LAB 5. INVERTERS

Unit 7: Photovoltaic and solar heating Installations
- **Unit 7.1** Solar heating installations
- **Unit 7.1** Isolated photovoltaic installations
- **Unit 7.2** Grid-connected photovoltaic installations

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	E16 G01 G02 G06	0.8	20	N	-	Theory concepts will be covered along several sequential lectures.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E16 G02 G06 G12	0.6	15	Y	N	The instructor will solve some problems on the blackboard, but students will be sometimes asked in class to solve one or several problems on their own. If needed, this activity will be retaken in a global final exam covering all theory concepts of the course.
Study and Exam Preparation [OFF-SITE]	Problem solving and exercises	E16 G02 G06 G12	0.6	15	Y	N	Students will be required to do weekly homework, consisting of solving one or several problems. If needed, this activity could be retaken in a global final examen covering all theory concepts of the course.
Laboratory practice or sessions		E06 E07 E08 E16 G01 G02					Attendance at the hands-on sessions is compulsory and only one class can be lost without compelling justification. Those students who are

[ON-SITE]	Practical or hands-on activities	G06 G12 G13	0.8	20	N	-	unable to attend these hands-on sessions regularly for a justified reason should contact the professor at the beginning of the course.
Practicum and practical activities report writing or preparation [OFF-SITE]	Group Work	E06 E07 E08 E16 G01 G02 G06 G12 G13	0.8	20	Y	N	Students will be required to complete a technical inform for each hands-on activity. This document will include theoretical analysis, simulation and measurement on the analyzed electronic circuits. If needed, every hands-on activity could be retaken in a special timetable, agreed with the instructor. Plagiarism detection in every technical inform will entail a score of 0 points for all students involved in this fraud.
Individual tutoring sessions [ON-SITE]	Other Methodologies	E06 E07 E08 E16 G01 G02 G06 G12 G13	0.04	1	N	-	Resolution of doubts and supervision of individual learning progress of students.
Study and Exam Preparation [OFF-SITE]	Self-study	E06 E07 E08 E16 G01 G02 G06 G12 G13	2.2	55	N	-	Out-of-class study to prepare the course's activities and final exams.
Final test [ON-SITE]	Assessment tests	E06 E07 E08 E16 G01 G02 G06 G12 G13	0.12	3	Y	Y	Theory concepts will be assessed through a single written examination (final exam). If needed, this exam could be retaken. Every fraudulent activity during these exams will entail a score of 0 points.
Final test [ON-SITE]	Assessment tests	E06 E07 E08 E16 G01 G02 G06 G12 G13	0.04	1	Y	Y	Skills associated with the hands-on experiments will also be assessed through a single written examination. If needed, this activity could be retaken in a similar test. Every fraudulent activity in these examinations will entail a score of 0 points.
		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 problem solving and/or case studies	10.00%	0.00%	Assessment of the problems solved by students in class and out of class
Final test	60.00%	70.00%	A final exam assessing all theory concepts
Laboratory sessions	10.00%	10.00%	Assessment of the reports submitted for hands-on experiments
Final test	20.00%	20.00%	Assessment of laboratory 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 requirements:
- A minimum mark on the final written examination about hands-on experiments of 3.5 points (over 10).
- A minimum mark on the final written exam about theory concepts of 3.5 points (over 10).
- A final weighted mark on the course equal or higher than 5 points (over 10).

Non-continuous evaluation:

Those students unable to follow regularly the course will have to contact by email with the instructor. Moreover, every student will be able to choose a non-continuous evaluation whenever she/he has participated in activities awarded with less than 50% of the semester score and regular lessons have not yet finished. Nonetheless, in no case those activities submitted for assessment during previous weeks will not be re-evaluated.

To pass the course, students will have to satisfy the same requirements as before, i.e.:
- A minimum mark on the final written examination about hands-on experiments of 3.5 points (over 10).
- A minimum mark on the final written examination about theory concepts of 3.5 points (over 10).
- A final weighted mark on the course equal or higher than 5 points (over 10).

Specifications for the resit/retake exam:

In this second opportunity to pass the course, 100% of the semester score could be achieved. Thus, three assessment activities will be conducted, i.e.:
- A single final written exam covering all theory concepts. In test will allow student to globally retake the final written examen for theory, assessment of active participation and assessment of problem solving and/or case studies. This examination will be awarded with 70% of the semester score.
- A final written examination on hands-on activities. This test will be awarded with 20% of the semester score.

- New submission of the technical informs for all or some hands-on experiments proposed along the course. These activities will be re-worked in a special timetable agreed with the instructor. These informs will be awarded with 10% of the semester score.

To pass the course, students will have to satisfy the next requirements:
- A minimum mark on the final written examination about the hands-on experiments of 3.5 points (over 10).
- A minimum mark on the final written exam about theory concepts of 3.5 points (over 10).
- A final weighted mark on the course equal or higher than 5 points (over 10).

Finally, in case of failing the course, global score for theory or laboratory (if it was passed) will be maintained for the next offering, unless the student voluntarily decides to retake the corresponding set of assessment activities.

Specifications for the second resit / retake exam:

If students passed laboratory or theory activities in the preceding course, only an exam covering hands-on experiments or theory concepts will have to be tackled (unless the student voluntarily decides to retake both assessment activities). 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 3.5 points (over 10) will be required to pass the course. Moreover, the final weighted average mark will have to be equal or higher than 5 points (over 10).

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	55
Final test [PRESENCIAL][Assessment tests]	3
Final test [PRESENCIAL][Assessment tests]	1

General comments about the planning: All theory and laboratory activities will be sequentially conducted along the semester. Moreover, a detailed schedule of the course containing deadlines for all assessment activities will be published in the learning platform (Campus Virtual) before the course starts.

Unit 1 (de 7): Single-phase AC current

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

Unit 2 (de 7): Three-phase AC current

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
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	3.5

Unit 3 (de 7): Transformers

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

Unit 4 (de 7): AC-DC Converters. Rectifiers

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	3
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	4.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	4.5

Unit 5 (de 7): DC-DC Converters.

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
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
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	7.5

Unit 6 (de 7): DC-AC Converters. Inverters

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
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]	4.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	4.5

Unit 7 (de 7): Photovoltaic and solar heating Installations

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3.5
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	3.5

Global activity

Activities	hours
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	20

Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	20
Final test [PRESENCIAL][Assessment tests]	3
Final test [PRESENCIAL][Assessment tests]	1
Class Attendance (theory) [PRESENCIAL][Lectures]	20
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Study and Exam Preparation [AUTÓNOMA][Problem solving and exercises]	15
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	55
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Thomas L. Floyd	Electric Circuits Fundamentals	Prentice Hall		9780132197106	2007	
Andres Barrado	Problemas de electrónica de potencia	Pearson Prentice Hall		978-84-205-4652-0	2007	
Díaz Corcobado, Tomás	Instalaciones solares fotovoltaicas	McGraw-Hill Interamericana de España		978-84-481-7169-8	2010	
Hart, Daniel W.	Power Electronics	McGraw-Hill		9780073380674	2008	
Miguel Pareja	Radiación solar y su aprovechamiento energético	Marcombo		978-84-26-7155-93	2010	
Ned Mohan, Tore M Undeland y William P Robbins	Power Electronics: Converters, Applications, and Design	John Wiley & Sons		9780471226932	2002	