UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: ELECTRICAL ENGINEERING AND ELECTRONICS
Code: 57722
Type: CORE COURSE
ECTS credits: 6
Degree: 344 - CHEMICAL ENGINEERING
Academic year: 2021-22
Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY
Group(s): 21
Year: 3
Duration: First semester
Main language: Spanish
Second language:
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **MIGUEL ANGEL ARRANZ MONGE** - Group(s): **21**

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Lecturer: **JUAN ANTONIO GONZALEZ SANZ** - Group(s): **21**

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2. Pre-Requisites

It is recommended to have passed the subject of Fundamentals of Physics (first course), although it is not essential.

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

The use of electrical and electronic devices for the measurement and control of processes in the industry is widespread. In this subject we outline the basic principles of operation of motors and electronic circuits, in different levels of complexity, as well as the sensors used for the measurement of physical-chemical properties in the industry. Although the maintenance and design of these systems does not correspond directly to the chemical engineer, it is necessary to have a general idea of its functioning within the common contents to all the engineering areas related to the industry. Once acquired the competencies associated with this subject, we will be able to understand the general logic of operation of electronic circuits and sensors, as well as automated control systems of industrial equipment. In this way, we will obtain an aptitude enough to participate in multidisciplinary meetings between different types of engineers in an industry.

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
E10	Knowledge and use of the principles of circuit theory and electrical machines.
E11	Knowledge of the fundamentals of electronics.
E12	Knowledge about the fundamentals of automatisms and control methods.
G03	Ability to solve problems with initiative, decision making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Chemical Engineering.
G04	Knowledge for the realization of measurements, calculations, valuations, appraisals, surveys, studies, reports, work plans and other analogous works.
G05	Ability to handle specifications, regulations and mandatory standards.
G13	Proper oral and written communication
G14	ethical commitment and professional ethics
G16	Capacity for critical thinking and decision making
G18	Capacity for teamwork
G19	Ability to analyze and solve problems
G20	Ability to learn and work autonomously
G21	Ability to apply theoretical knowledge to practice
G22	Creativity and initiative

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To know the terminology and the essential concepts to be able to maintain interdisciplinary meetings with specialized technicians in electrical and electronic subjects.
To know the different types of sensors present in machines and devices: their characteristics and operating principles.
To know the basics of control theory.
To know the principles of operation of electrical and electronic equipment commonly used in industrial facilities.
To know how to understand the logic of internal operation of electronic devices for domestic and industrial use
To know how to handle the supervision instruments of electrical and electronic equipment. Know how to make small and common circuits with operational amplifiers.

6. Units / Contents

Unit 1: Semiconductor Physics and Electronics fundamentals
- **Unit 1.1** Band theory. Semiconductor. The junction diode
- **Unit 1.2** Bipolar junction transistor
- **Unit 1.3** Field effect transistor

Unit 2: Analogic Electronics
- **Unit 2.1** Operational amplifier
- **Unit 2.2** Application circuits. Differential amplifier.

Unit 3: Resistance and electromagnetic sensors. Generators.

Unit 4: Digital Electronics
- **Unit 4.1** Introduction to the digital logics
- **Unit 4.2** Digital circuits
- **Unit 4.3** Optoelectronics. Digital sensors

Unit 5: Instrumentation control

Unit 6: Introductory electrical and magnetic concepts

Unit 7: Fundamentals of direct current machines (DC)

Unit 8: DC generator and motors

Unit 9: Fundamentals of alternating current machines (AC)

Unit 10: AC generators and motors

Unit 11: Asynchronous (or induction) generators and motors

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	CB01 CB02 CB03 CB04 CB05 E10 E11 E12 G03 G05 G13	1.1	27.5	N	-	Explanation of the theoretical contents of the subject in classroom.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB01 CB02 CB03 CB04 CB05 E11 G04 G13 G16 G19 G20 G21 G22	0.4	10	Y	N	Resolution of exercises and practical cases in classroom, as applications of the theoretical contents of the subject
Group tutoring sessions [ON-SITE]	Lectures	CB01 CB02 CB03 CB04 CB05 E10 E11 E12 G04 G05 G18	0.4	10	Y	N	Theoretical and practical presentations in classroom to support the subject contents.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CB01 CB02 CB03 CB04 CB05 E11 E12 G04 G13 G19 G22	0.3	7.5	Y	N	Realization of practices or experiments in the laboratory, as applications of the theoretical contents of the subject
Progress test [ON-SITE]	Assessment tests	CB01 CB02 CB03 CB04 CB05 E10 E11 E12 G04 G05 G18 G20	0.2	5	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 CB02 CB03 CB04 CB05 E10 E11 E12 G04 G05 G18	3.6	90	N	-	Student's work to prepare the realization of tests, exhibitions, laboratory reports,...
		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
Oral presentations assessment	10.00%	0.00%	In the block of Electric Machinery there is an activity of this type that provides the complement to the examination (30%), for the 50% that this block means in the subject
Assessment of problem solving and/or case studies	5.00%	0.00%	In the Electronics block there will be the option to solve at home problems or cases, and would be 10% of the note of that block (5% in the total of the subject)
Laboratory sessions	5.00%	0.00%	In the Electronics block there will be the option to perform a laboratory practice, which would be 20% of the note of that

			block (10% in the total of the subject)
Progress Tests	80.00%	100.00%	The subject is divided in two blocks evaluated through partial exams (or progress tests). These tests will evaluate both the theoretical contents developed in the lectures, and the practical lessons focused on learning the resolution of exercises. The number, type and proportion of the questions that make up these partial exams will depend on the Electric Machinery or Electronics block. Each teacher would detail this point and the minimum assessment requirements on the first day of its 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:

The course is divided into two blocks: Electronics and Electric Machinery
The blocks are evaluated by means of progress tests (one exam per block, the second being held on the same date as the ordinary official call). Each test (maximum score 8 points) consists of practical exercises and theoretical questions. The number, type and proportion of the questions that make up the aforementioned exams will depend on each block. On the first day of class, each teacher will detail this point and, in addition, the minimum assessment requirements to pass their exam. Only once the exam is passed, the grade of the additional activities will be added (maximum of 2 points).
At last, the final grade of the ordinary evaluation will be the average of the grades of both blocks.
In the event that any block is suspended, the note that will appear in the certificate will be only the arithmetic average of the exams, with a maximum of 4 points.

Non-continuous evaluation:

In this case, a final exam is proposed consisting of two parts (related to the course blocks), each with theoretical and practical questions. In the same way, the final grade of the ordinary final exam (and of the subject) will be the average of both parts, provided that they have obtained grades equal to or greater than five.

Specifications for the resit/retake exam:

Students who have not passed the full course in the ordinary call must sit in addition to a final exam (extraordinary call). This test consists of two parts (related to the course blocks), each with theoretical and practical questions.
In this exam, the student can keep the grades of the blocks previously passed, and must attend to those parts where the minimum grade was not exceeded in the previous exams. The rules, design and evaluation criteria of the extraordinary exam will be the same as in the ordinary call.

Specifications for the second resit / retake exam:

The same criteria will be applied as in the ordinary call (non-continuous evaluation).

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	7.5
Unit 1 (de 11): Semiconductor Physics and Electronics fundamentals	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	10
Unit 2 (de 11): Analogic Electronics	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	11
Unit 3 (de 11): Resistance and electromagnetic sensors. Generators.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	10
Unit 4 (de 11): Digital Electronics	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	12
Unit 5 (de 11): Instrumentation control	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Progress test [PRESENCIAL][Assessment tests]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	2
Unit 6 (de 11): Introductory electrical and magnetic concepts	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	7
Unit 7 (de 11): Fundamentals of direct current machines (DC)	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Lectures]	2

Study and Exam Preparation [AUTÓNOMA][Self-study]	7
Unit 8 (de 11): DC generator and motors	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	7
Unit 9 (de 11): Fundamentals of alternating current machines (AC)	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	7
Unit 10 (de 11): AC generators and motors	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	7
Unit 11 (de 11): Asynchronous (or induction) generators and motors	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Group tutoring sessions [PRESENCIAL][Lectures]	2
Progress test [PRESENCIAL][Assessment tests]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	10
Global activity	
Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	27.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Group tutoring sessions [PRESENCIAL][Lectures]	10
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	7.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Progress test [PRESENCIAL][Assessment tests]	5
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Chapman, Stephen J.	Máquinas eléctricas / Stephen J. Chapman ; traducción, Carla	McGraw-Hill		970-10-4947-0	2005	
Creus Solé, Antonio	Instrumentación industrial	Marcombo		84-267-1361-0	2005	
Fraile Mora, Jesús	Máquinas eléctricas	McGraw-Hill		978-84-481-6112-5	2008	
Fraile Mora, Jesús	Problemas de máquinas eléctricas	McGraw-Hill		978-84-481-4240-7	2010	
Hambley, Allan R.	Electrónica	Prentice Hall		978-84-205-2999-8	2008	
Hayes, Thomas C.	Student manual for the Art of Electronics	Cambridge University Press		978-0-521-37709-6	2008	
Horowitz, Paul	The art of electronics	University Press		978-0-521-37095-0	2008	
M.A. Pérez García	Instumentación electrónica	Thomson		978-84-9732-166-2	2004	
Ortega Gómez, Guillermo	Problemas resueltos de máquinas eléctricas	Thomson-Paraninfo		978-84-9732-523-3	2008	
Pallás Areny, Ramón	Sensores y acondicionadores de señal	Marcombo Boixareu		84-267-1344-0	2003	
Scherz, Paul	Practical electronics for inventors	MacGraw-Hill,		978-0-07-177133-7	2013	