UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: COMBUSTION TECHNOLOGY
Code: 56369
Type: ELECTIVE
ECTS credits: 6
Degree: 353 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING (CR)
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: **ROSARIO BALLESTEROS YAÑEZ** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
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2. Pre-Requisites

The subject requires that students have certain prior knowledge to achieve the objectives of it. Between these previous acknowledgments highlight, mainly, those obtained by taking the subject of the third year of the Degree in Mechanical Engineering: THERMAL ENGINEERING. In addition to those related to the principles of thermodynamics and modes of heat transmission, both taught in the previous subject of Technical Thermodynamics. Students must also master aspects related to solving mathematical problems in engineering and basic concepts of fluid mechanics and general chemistry.

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

This subject is part of the Mention in Energy Techniques of the Degree in Mechanical Engineering. The learning result that the student acquires by taking subjects from among the seven offered for this mention is specified in the knowledge and training necessary to understand and interpret the operation of energy facilities in general, as well as to manage, modify or design them. The value of this subject is related to the student's professional future. The vast majority of the mechanical and electrical energy consumed is obtained through thermo-mechanical type transformations, starting from the chemical energy contained in the fuels and using combustion, gasification and / or pyrolysis processes. This subject studies deeply different types of combustion processes (self-ignition, localized premixed combustion or diffusion, etc). This allows to understand the operation of different thermal machines, of undoubted practical application for the future graduate

4. Degree competences achieved in this course

Course competences

Code	Description
A04	To be able to transmit information, ideas, problems and solutions to a specialized audience.
A08	Appropriate level of oral and written communication.
A11	Ability to manage engineering project activities described in the previous competency.
F13	
F14	
F15	

5. Objectives or Learning Outcomes

Course learning outcomes

Description
Calculate and design of heat exchangers, boilers and cooling towers
Understand biomass energy production systems
Identify the basic elements of an installation for the production of cold and/or heat, its function and working conditions
Deal with the design of an installation of combustible gases, including the aspects relating to storage containers, distribution networks and recipients

Additional outcomes

6. Units / Contents

Unit 1: Introduction
- **Unit 1.1** Types of combustion
- **Unit 1.2** Combustion thermo-chemistry
- **Unit 1.3** Fuels
- **Unit 1.4** Ignition. Autoignition. Flammability limits
- **Unit 1.5** Premixture combustion

Unit 2: Types of combustion
- **Unit 2.1** Ignition. Autoignition. Flammability limits
- **Unit 2.2** Premixture combustion
- **Unit 2.3** Diffusive combustion

Unit 2.4 Pyrolysis and gasification

Unit 3: Applications

Unit 3.1 Homes

Unit 3.2 Burners

Unit 3.3 Boilers

Unit 3.4 Thermal ovens and dryers

Unit 4: Pollutant emissions

Unit 4.1 Pollution by combustion processes

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		0.8	20	N	-	
Problem solving and/or case studies [ON-SITE]	Combination of methods		0.8	20	N	-	
Class Attendance (practical) [ON-SITE]	Combination of methods		0.4	10	Y	Y	
Other on-site activities [ON-SITE]	Other Methodologies		0.08	2	N	-	
Project or Topic Presentations [ON-SITE]	Group Work		0.24	6	Y	N	
Study and Exam Preparation [OFF-SITE]			3.6	90	N	-	
Final test [ON-SITE]	Assessment tests		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
Theoretical papers assessment	25.00%	0.00%	Seminars will be proposed at the end of each topic that highlight the most important concepts of the same and that will serve to evaluate with the partial knowledge acquired by the student.
Assessment of active participation	5.00%	0.00%	During each class (both theoretical and practical) will be proposed questions that will assess the attention and participation of the students.
Final test	50.00%	100.00%	There will be a final test corresponding to the ordinary call. Said test will be composed of the following sections: · First part: evaluation of theoretical knowledge, including those taught in practices, and their correct assimilation. It will use test questions and / or short questions to develop. · Second part: application of knowledge and concepts to problem solving, with the help of a form and calculator. The qualification will take into account both the numerical result and the resolution procedure and the justification given. To pass the subject is necessary to have a total score (practices + test) equal to or greater than 5 points (out of 10).
Practicum and practical activities reports assessment	20.00%	0.00%	Three practical sessions of assistance and delivery of mandatory memory. The delivery of the same in time and form and the correct answer to the questions asked. In addition, there will be a visit to a company in the energy sector.
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:

First part: evaluation of theoretical knowledge, including those taught in practices, and their correct assimilation. It will use test questions and / or short questions to develop. · Second part: application of knowledge and concepts to problem solving, with the help of a form and calculator. The qualification will take into account both the numerical result and the resolution procedure and the justification.

Non-continuous evaluation:

Evaluation criteria not defined

Specifications for the resit/retake exam:

The students who do not pass the final exam must recover it in the extraordinary call. This test will have the same characteristics as the final exam.

Specifications for the second resit / retake exam:

This test will have the same characteristics as the final exam.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours

Unit 1 (de 4): Introduction

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	7
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	10
Class Attendance (practical) [PRESENCIAL][Combination of methods]	4
Project or Topic Presentations [PRESENCIAL][Group Work]	1
Study and Exam Preparation [AUTÓNOMA][]	30
Final test [PRESENCIAL][Assessment tests]	.5

Unit 2 (de 4): Types of combustion

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	7
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	7
Class Attendance (practical) [PRESENCIAL][Combination of methods]	4
Other on-site activities [PRESENCIAL][Other Methodologies]	.5
Project or Topic Presentations [PRESENCIAL][Group Work]	1
Study and Exam Preparation [AUTÓNOMA][]	30
Final test [PRESENCIAL][Assessment tests]	.5

Unit 3 (de 4): Applications

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	2
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Other on-site activities [PRESENCIAL][Other Methodologies]	1
Project or Topic Presentations [PRESENCIAL][Group Work]	2
Study and Exam Preparation [AUTÓNOMA][]	20
Final test [PRESENCIAL][Assessment tests]	.5

Unit 4 (de 4): Pollutant emissions

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	1
Class Attendance (practical) [PRESENCIAL][Combination of methods]	1
Other on-site activities [PRESENCIAL][Other Methodologies]	.5
Project or Topic Presentations [PRESENCIAL][Group Work]	2
Study and Exam Preparation [AUTÓNOMA][]	10
Final test [PRESENCIAL][Assessment tests]	.5

Global activity

Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	20
Study and Exam Preparation [AUTÓNOMA][]	90
Final test [PRESENCIAL][Assessment tests]	2
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	20
Class Attendance (practical) [PRESENCIAL][Combination of methods]	10
Other on-site activities [PRESENCIAL][Other Methodologies]	2
Project or Topic Presentations [PRESENCIAL][Group Work]	6
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Liñan, A.; Williams, F.A.	Fundamentals aspects of combustion	Oxford Engineering Science Series 34			1993	
Lorenzo Becco, J.L.	Los GLP	Butano SA			1985	
Strahle, W. C.	An introduction to combustion. Combustion Science and Technology Book Series, Volumen 1.	Gordon and Breach Publishers.			1996	
Turns, S	An introduction to combustion. Concepts and applications	McGraw Hill			1997	
Warnatz, J.; Maas, U.; Dibble, R.W.	Combustion	Springer			2006	
	Calderas de vapor	Asinel			1985	
DESANTES, J.M.; LAPUERTA, M	Fundamentos de combustión	Servicio de publicaciones UPV			1991	
Griffiths, J.F.; Barnard, J.A.	Flame and Combustion	Blackie Academic and			1995	

		professional.	
ELVERS, B	Handbook of Fuels	Wiley-VCH	2008
GLASSMAN, I	Combustion	Academic Press	2008
González Olmedo, F.	Transmisión de calor, combustibles, quemadores, ventiladores, hornos industriales	Gráficas Salamanca	2000