UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: COMBUSTION TECHNOLOGY
Code: 56369
Type: ELECTIVE
ECTS credits: 6
Degree: 421 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING
Academic year: 2022-23
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: https://campusvirtual.uclm.es/login/index.php
Bilingual: N

Lecturer: **ROSARIO BALLESTEROS YAÑEZ** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Politécnico/2-D15	MECÁNICA ADA. E ING. PROYECTOS	926052803	rosario.ballesteros@uclm.es	No limitations to specify time by e-mail

2. Pre-Requisites

The course requires students to have certain previous knowledge in order to achieve the objectives of the course. Among this previous knowledge, the most important ones are those obtained in the course of Thermal Engineering, as well as those related to the principles of thermodynamics and the modes of heat transmission, both taught in the previous course of Technical Thermodynamics. Students should also master aspects related to the resolution of 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

The value of this course is directly related to the student's professional future since most of the mechanical and electrical energy consumed is obtained through thermomechanical transformations, from the chemical energy contained in fuels and through combustion, gasification and/or pyrolysis processes. This subject deepens in the analysis of the different types of combustion processes (self-ignition, localized premixed combustion or diffusion, etc.). This allows understanding 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
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
CEO38	Capacity to manage, analyse and design hydraulic machines, thermal machines and combustion installations and devices.
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.
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

Knowledge of the basic parameters related to the definition and control of combustion processes.

Ability to identify the basic elements of an installation for the production of cold and/or heat, its function, and working conditions.

Knowledge of the differences between the various types of combustion processes.

Additional outcomes

6. Units / Contents

Unit 1: Introduction

Unit 2: Types of combustion

Unit 3: Applications

Unit 4: Pollutant emissions

ADDITIONAL COMMENTS, REMARKS

Theoretical bases of the processes, the substances used, the elements available and the basic principles of operation of the main technologies for the production and use of thermal energy (combustion, gasification and pyrolysis): Unit 1

Biomass energy production systems: Unit 2

Identify the basic elements of an installation for the production of cold and/or heat, their function, and working conditions: Unit 3

Types of boilers, burners, furnaces, kilns, dryers and fireplaces, as well as the energy balance and calculation parameters for their design: Unit 3

Installation of fuel gases, storage, distribution networks and receivers: Units 3 and 4

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 CEO38 CG03 CG04 CG05 CG06 CG07 CT02 CT03	1.2	30	N	-	Participative, combining whiteboard and projector.
Problem solving and/or case studies [ON-SITE]	Combination of methods	CB01 CB02 CB03 CB04 CB05 CEO38 CG03 CG04 CG05 CG06 CG07 CT02 CT03	0.4	10	N	-	On blackboard, participatory
Class Attendance (practical) [ON-SITE]	Combination of methods	CB01 CB02 CB03 CB04 CB05 CEO38 CG03 CG04 CG05 CG06 CG07 CT02 CT03	0.6	15	Y	Y	In the lab
Formative Assessment [ON-SITE]	Assessment tests	CB01 CB02 CB03 CB04 CB05 CEO38 CG03 CG04 CG05 CG06 CG07 CT02 CT03	0.2	5	Y	Y	Recoverable in the extraordinary call
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 CB02 CB03 CB04 CB05 CEO38 CG03 CG04 CG05 CG06 CG07 CT02 CT03	3.6	90	N	-	Includes tutoring
		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
Laboratory sessions	15.00%	15.00%	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.
Final test	70.00%	70.00%	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.
Assessment of problem solving and/or case studies	15.00%	15.00%	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.
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:

Final test, laboratory practicals and problem solving or case studies will be evaluated.
The final exam will have the following characteristics:
First part: evaluation of
theoretical knowledge, including the knowledge imparted in the
practices, and its correct assimilation. Use will be made of
multiple-choice questions and/or short questions to be developed. -
Second part: application of knowledge and concepts to
concepts to the resolution of problems, with the help of a form and a calculator.
a form and calculator. The grade will take into account both the
the numerical result will be taken into account as well as the
procedure and the justification given will be taken into account.

Non-continuous evaluation:

After the final test (70%), the student must take a practical test / solve an additional test to evaluate the student's knowledge in practical equipment (15%), and must solve a list of specific problems to evaluate problem solving (15%).
Final exam:
First part: evaluation of
theoretical knowledge, including the knowledge imparted in the
practices, and its correct assimilation. Use will be made of
multiple-choice questions and/or short questions to be developed. -
Second part: application of knowledge and concepts to
concepts to the resolution of problems and practical cases, with the help of a form and calculator.
a form and calculator. The grade will take into account both the
the numerical result will be taken into account as well as the
procedure and the justification given will be taken into account.

Specifications for the resit/retake exam:

Students who fail the ordinary exam will have to make it up in the extraordinary exam.
This test will have the same characteristics as the ordinary 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**
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	10
Class Attendance (practical) [PRESENCIAL][Combination of methods]	15
Formative Assessment [PRESENCIAL][Assessment tests]	90
Study and Exam Preparation [AUTÓNOMA][Self-study]	5

Global activity

Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	10
Class Attendance (practical) [PRESENCIAL][Combination of methods]	15
Formative Assessment [PRESENCIAL][Assessment tests]	90
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Griffiths, J.F.; Barnard, J.A.	Flame and Combustion	Blackie Academic and professional.			1995	
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			1991	

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