UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course:	THERMAL ENGINEERING	**Code:**	56326
Type:	CORE COURSE	**ECTS credits:**	6
Degree:	353 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING (CR)	**Academic year:**	2022-23
Center:	602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL	**Group(s):**	20
Year:	3	**Duration:**	C2
Main language:	Spanish	**Second language:**	English
Use of additional languages:		**English Friendly:**	N
Web site:		**Bilingual:**	N

Lecturer: **ANGEL RAMOS DIEZMA** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Politécnico/2C14	MECÁNICA ADA. E ING. PROYECTOS	926051978	Angel.Ramos@uclm.es	

2. Pre-Requisites

The subject requires that students have certain prior knowledge to achieve the objectives of it. Among these previous acknowledgments, we can highlight, mainly, 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. Consequently, it is recommended that students have consolidated the knowledge taught in Fluid Physics, Physics and Chemistry.

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

It is a compulsory subject that responds to a competence of the Specific Technology (Mechanical) module, such as Applied Knowledge of Thermal Engineering. This competence is included in the Ministerial Order CIN / 351/2009, of 9 February, which establishes the requirements for the verification of the official university qualifications that qualify for the exercise of the profession of Industrial Technical Engineer. In relation to other subjects of the Degree, there are electives in the fourth year (both in the Energy Techniques mention and in the mention of Machines), corresponding to the module of Optatividad, which need the knowledge that is taught in the subject Thermal Engineering. Between these they emphasize Thermal Machines (both mentions), Technologies of the Generation and Management of the Energy (mention Techniques Energetics) and Technology of the Combustion (mention Techniques Energetics). In addition, in the Master in Industrial Engineering, already implemented in the E.T.S. of Industrial Engineers of Ciudad Real, the Industrial Cold subject is taught, which also requires the knowledge acquired in this subject.

Finally, the value that the Thermal Engineering course has in the student's future professional is undoubted. The vast majority of the mechanical and electrical energy consumed is obtained through thermo-mechanical type transformations, based on the chemical energy contained in fuels, whether solid, liquid or gaseous, and using a combustion process. In addition, in the program of the subject also addresses this energy transformation in another direction, including the processes that occur refrigeration and air conditioning facilities. It also describes the characteristics of the equipment in which these transformations take place, of undoubted practical application for the student.

4. Degree competences achieved in this course

Course competences

Code	Description
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A03	To have the capability to gather and interpret relevant data (normally within the area of study) to make judgements that include a reflection on themes of a social, scientific or ethical nature.
A04	To be able to transmit information, ideas, problems and solutions to a specialized audience.
A05	To have developed the learning skills necessary to undertake subsequent studies with a greater degree of autonomy.
A08	Appropriate level of oral and written communication.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
A13	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Mechanical Engineering.
A14	Knowledge to undertake measurements, calculations, evaluations, appraisals, studies, give expert opinions, reports, work plans and similar tasks.
D03	Applied knowledge of thermal engineering

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Know the theoretical bases of processes, the substances used, elements available and basic principles of the functioning of the main technologies for the production and exploitation of thermal energy

Additional outcomes

6. Units / Contents

Unit 1: Basic concepts in thermal engineering

Unit 2: Heat exchangers

Unit 3: Positive displacement thermal machines

Unit 4: Thermal energy production using fuels

Unit 5: Equipment for the use of thermal energy

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		1.2	30	N	-	
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities		0.4	10	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study		3.6	90	N	-	
Formative Assessment [ON-SITE]	Assessment tests		0.2	5	Y	Y	
Problem solving and/or case studies [ON-SITE]	Combination of methods		0.6	15	N	-	
		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
Practicum and practical activities reports assessment	30.00%	30.00%	Three practical assistance sessions and mandatory memory delivery. It will be valued the delivery of the same in time and form and the correct answer to the questions raised
Final test	0.00%	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. To pass the subject it is necessary to have a total score (practices + test) equal to or greater than 5 points (out of 10).
Mid-term tests	70.00%	0.00%	
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 same as the final exam

Specifications for the second resit / retake exam:

The same 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
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Formative Assessment [PRESENCIAL][Assessment tests]	5
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	10

Global activity

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

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
DESANTES, J.M.; LAPUERTA, M	Fundamentos de combustión	Serv. Publ. UPV			1991	
ELVERS, B	Handbook of Fuels	Wiley-VCH			2008	
FERGUSON, C.R.: KIRKPATRICK, A.T	Internal Combustion Engines: Applied Thermoscience	John Wiley & Sons			2004	
GLASSMAN, I	Combustion	Academic Press			2008	
GOSSE, J	Technical Guide to Thermal Processes	Cambridge University Press			1986	
GUPTA, J.P	Working with Heat Exchangers. Questions and answers	Hemisphere			1990	
HERNÁNDEZ, J.J., RODRÍGUEZ, J., SANZ, J	Trasmisión de Calor para Ingenieros	Ediciones de la Universidad de Castilla-La Mancha			2010	
KREITH, F.	The CRC Handbook of Thermal Engineering	Springer-Verlag			2000	
LAPUERTA, M. ARMAS, O	Frío Industrial y Aire Acondicionado	Servicio de Publicaciones de la E.T.S.I. Industriales de Ciudad Real			2010	
LAPUERTA, M., HERNANDEZ, J.J	Tecnologías de la combustión	Ed. Universidad de Castilla-La Mancha			1998	