UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: THERMAL ENGINEERING
Code: 56326
Type: CORE COURSE
ECTS credits: 6
Degree: 351 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING
Academic year: 2019-20
Center: 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING
Group(s): 56
Year: 3
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **JAVIER BARBA SALVADOR** - Group(s): **56**

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E'Lhuyar/3	MECÁNICA ADA. E ING. PROYECTOS		javier.barba@uclm.es	

Lecturer: **MARÍA DEL CARMEN MATA MONTES** - Group(s): **56**

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E'Lhuyar/3	MECÁNICA ADA. E ING. PROYECTOS	6042	mariacarmen.mata@uclm.es	Se publicarán página web de la asignatura al comienzo del periodo docente.

Lecturer: **M LUISA RUBIO MESAS** - Group(s): **56**

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Edificio E'lhuyar/Despacho 2.07	MECÁNICA ADA. E ING. PROYECTOS	+34 926 05 26 02	marialuisa.rubio@uclm.es	Martes de 10:00 a 14:00 y Jueves de 9:30 a 11:30 h.

2. Pre-Requisites

Knowledge for solving mathematical problems that may arise in engineering.
Understanding and mastery of basic concepts about the general laws of mechanics and thermodynamics.
Knowledge to understand and apply the principles of basic knowledge of general chemistry

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

This subject considers the acquisition of skills for the design, calculation and dimensioning of thermal systems whose knowledge is considered important for the mechanical engineer, such as those related to thermodynamic processes of thermal machines, reciprocating engines, turbomachines, heat generators and the study of the environmental impact that these facilities are likely to cause.
This knowledge is specific to the training in the mechanical engineering degree, as described in the background of the degree. For the necessary previous basic training, this subject is related to technical thermodynamics and fluid mechanics.

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.
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
D03	Applied knowledge of thermal engineering

5. Objectives or Learning Outcomes

Course learning outcomes

Description

6. Units / Contents

Unit 1: CONCEPTS OF THERMAL ENGINEERING

Unit 2: HEAT EXCHANGERS

Unit 3: THERMAL MACHINES POSITIVE DISPLACEMENT

Unit 4: COMBUSTION AND COMBUSTIBLES

Unit 5: BURNERS, BOILER AND OTHER COMBUSTION EQUIPMENT

Unit 6: THERMAL INSTALLATIONS OF MECHANICAL ENERGY PRODUCTION

Unit 7: THERMAL INSTALLATIONS OF ELECTRIC ENERGY PRODUCTION

Unit 8: REFRIGERATION AND AIR CONDITIONING SYSTEMS

Unit 9: ENVIRONMENTAL IMPACT OF THERMAL INSTALLATIONS

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	R	Description
Class Attendance (theory) [ON-SITE]	Lectures	A05 CB01 CB02 CB03 CB04 CB05 D03	0.96	24	N	-	-	
Individual tutoring sessions [ON-SITE]	Combination of methods	A03 A04 A12 A13 CB01 CB02 CB03 CB04 CB05 D03	0.16	4	N	-	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A05 CB01 CB02 CB03 CB04 CB05 D03	0.48	12	N	-	-	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	A03 A04 A05 A08 A12 A13 A14 CB01 CB02 CB03 CB04 CB05 D03	0.16	4	Y	N	Y	
Progress test [ON-SITE]	Assessment tests	A02 A03 A04 A05 A08 A12 A13 A14 CB01 CB02 CB03 CB04 CB05 D03	0.24	6	Y	N	Y	
Final test [ON-SITE]	Assessment tests	A02 A03 A04 A05 A08 A12 A13 A14 CB01 CB02 CB03 CB04 CB05 D03	0.24	6	Y	Y	Y	
Project or Topic Presentations [ON-SITE]	Combination of methods	A02 A03 A04 A05 A08 A12 A13 CB01 CB02 CB03 CB04 CB05 D03	0.16	4	Y	N	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	A02 A03 A05 A12 A13 CB01 CB02 CB03 CB04 CB05 D03	3.6	90	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
R: Rescheduling training activity

8. Evaluation criteria and Grading System

	Grading System		
Evaluation System	**Face-to-Face**	**Self-Study Student**	**Description**
Oral presentations assessment	20.00%	0.00%	The submitted works will be valued, as well as the attitude shown by the student. It will take into account: approach to the work, use of the terminology, choice of procedure, justification of the process used, results obtained, cleaning and presentation of the document. In addition, the document must comply with the specific regulations for the delivery thereof, which will be available to students on the Moodle platform. In addition to the delivery of works, it will be necessary and essential to make one or several presentations in power point format in class. In the presentation, the presented work will be valued, as well as the attitude shown by the student in the presentation and the ability to answer questions from the teacher and the rest of the students. The specific rules for the delivery of power point documents will be available in Moodle. The evaluation of the works will be done through the presentations, that is, for the work to be considered, it must be defended in class. In the works and the presentations, more than 50% of the maximum qualification that can be obtained in this activity must be obtained. The student who copies all or

			part of the work will receive a grade of zero in the activity and will have to examine this content in the final exam. The student who copies the presentation in whole or in part will receive a grade of zero in the activity. The student who, for different reasons, decided not to participate in the group work, or does not exceed it, will have the possibility of exceeding the same contents in the extraordinary final exam.
Laboratory sessions	10.00%	0.00%	The use of the practices and the individual report of the same will be valued. Laboratory and computer lab sessions will be held in small groups. The students will perform different experimental measurements in the laboratory or a series of calculations with some computer program. The work in the laboratory or computer classroom will be valued as well as the report of the practice carried out. This activity will be considered to have passed the activity when the grade obtained from the assessment of the use of the practices and the report thereof is equal to or greater than 5. In case of not meeting the above requirements, students may take an exam of practices together with the extraordinary final exam of the subject, whose value on the final grade will be, in percentage, the same that could be obtained with the realization of the practices. This test must be passed with a minimum grade of 5.
Progress Tests	70.00%	0.00%	It will consist in the realization of progress tests with aspects of theoretical-practical application. Each partial test must be passed at least, with a 5 out of 10. These tests are eliminatory, that is, the student who is passing (with a grade equal to or greater than 5) partial tests will not have to examine the content exceeded in the final exam. The exams that have theoretical part and practical part may be required, in each part, a minimum of 40% of the maximum score that can be obtained in each part to be able to make half with 60% of the other party, in such a way, that finally obtain a minimum grade of 5. Students who do not wish to undergo partial tests must pass the same content in the final exam, so that the weight of the questions related to the topics dealt with will be, as a percentage of the final grade, the same that could have been achieved with the completion of partial tests.
Total:	**100.00%**	**0.00%**	

Evaluation criteria for the final exam:

The subject will be passed with a score equal to or greater than 5. During the exam, the use of programmable calculators will not be allowed.

Specifications for the resit/retake exam:

For those students who have not done, or have not passed any of the partial tests, there will be an overall test that will cover the entire subject. It will consist of a test similar to the progress tests and will also include tests that allow the recovery of the rest of the recoverable activities
Other considerations the same as for the final exam

Specifications for the second resit / retake exam:

Same considerations as for the resit exam

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Individual tutoring sessions [PRESENCIAL][Combination of methods]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	4
Progress test [PRESENCIAL][Assessment tests]	6
Final test [PRESENCIAL][Assessment tests]	6
Project or Topic Presentations [PRESENCIAL][Combination of methods]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	36
Unit 1 (de 9): CONCEPTS OF THERMAL ENGINEERING	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Unit 2 (de 9): HEAT EXCHANGERS	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	12
Unit 3 (de 9): THERMAL MACHINES POSITIVE DISPLACEMENT	
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]	9
Unit 4 (de 9): COMBUSTION AND COMBUSTIBLES	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	6

Unit 5 (de 9): BURNERS, BOILER AND OTHER COMBUSTION EQUIPMENT	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	6
Unit 6 (de 9): THERMAL INSTALLATIONS OF MECHANICAL ENERGY PRODUCTION	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	6
Unit 7 (de 9): THERMAL INSTALLATIONS OF ELECTRIC ENERGY PRODUCTION	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	6
Unit 8 (de 9): REFRIGERATION AND AIR CONDITIONING SYSTEMS	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Unit 9 (de 9): ENVIRONMENTAL IMPACT OF THERMAL INSTALLATIONS	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Global activity	
Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	24
Individual tutoring sessions [PRESENCIAL][Combination of methods]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	12
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	4
Progress test [PRESENCIAL][Assessment tests]	6
Final test [PRESENCIAL][Assessment tests]	6
Project or Topic Presentations [PRESENCIAL][Combination of methods]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
C.R. Ferguson	Internal combustion engines.	John Wiley & Sons			2004	
Carnicer Royo, E.	Aire acondicionado	Paraninfo		84-283-2048-9	2004	
Carreras	Motores de combustión interna, fundamentos	UPC			1996	
Holman, J. P.Jack Philip	Heat transfer	McGraw-Hill		978-0-07-352936-3	2010	
J.Agüera Soriano	Termodinámica lógica y motores térmicos.	Ciencia 3			2002	
Lapuerta, Magín	Frío industrial y aire acondicionado : Mot-010	Universidad de Castilla-La Mancha		84-608-0464-X	2009	
Levenspiel, Octave	Flujo de fluidos e intercambio de calor	Reverte		84-291-7968-2	1998	
M.J:Moran; H.N.Shapiro	Fundamentos de Termodinámica Técnica	Reverté			2004	
Magin Lapuerta, Octavio Armas	Frio industrial y aire acondionado	Servicio de publicaciones ETSII Ciudad Real			2010	
Magín Lapuerta y J.J. Hernández	Tecnologías de la Combustión	UCLM			1998	
Mataix, Claudio	Turbomáquinas hidráulicas: turbinas hidraulicas, bombas, ven	Universidad Pontificia de Comillas		978-84-8468-252-3	2009	
Payri González, Francisco	Motores alternativos	Universidad Politécnica de Valencia		978-84-8363-381-6	2009	
Payri González, Francisco	Motores alternativos	Universidad Politécnica de Valencia		978-84-8363-381-6	2009	
Rodríguez Rodríguez, Ernesto	Los refrigerantes en las instalaciones frigoríficas	Thomson-Paraninfo		84-283-2890-0	2005	
Sánchez Lencero, Tomás	Turbomáquinas térmicas	Sintesis		84-9756-185-6	2004	
	Ejercicios resueltos de motores a reacción y turbinas de gas	Universitat Politècnica,		978-84-8363-950-4	2013	
	Ejercicios resueltos de máquinas	Universitat				

térmicas /	Politécnica,	978-84-8363-591-9	2010	