UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: ENGINEERING THERMODYNAMICS
Code: 56321
Type: CORE COURSE
ECTS credits: 6
Degree: 418 - UNDERGRAD. IN INDUSTRIAL ELECTRONICS AND AUTOMAT. ENGINEERING
Academic year: 2023-24
Center: 303 - E.DE INGENIERÍA INDUSTRIAL Y AEROESPOACIAL DE TOLEDO
Group(s): 41
Year: 2
Duration: C2
Main language: Spanish
Second language:
Use of additional languages:
English Friendly: Y
Web site: http://campusvirtual.uclm.es/
Bilingual: N

Lecturer: **OCTAVIO ARMAS VERGEL** - Group(s): **41**

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Lecturer: **MARIA ARANTZAZU GOMEZ ESTEBAN** - Group(s): **41**

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2. Pre-Requisites

The course requires students to have certain knowledge to achieve its objectives. Among said knowledge, in the mathematical field, those related to differential calculus, integral, differential equations and partial derivatives stand out. Students must also master basic concepts of physics and general chemistry.

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

This is a compulsory subject, which belongs to the training module common to the industrial branch and covers the competence related to the application of the principles of technical thermodynamics and heat transfer to the resolution of basic engineering problems.

4. Degree competences achieved in this course

Course competences

Code	Description
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
CEC01	Knowledge of applied thermodynamics and heat transfer. Basic principles and their application to solving engineering problems.
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.
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 phenomena governing heat transfer by conduction, convection and radiation. Application of this knowledge to solving practical problems involving one or more forms of heat transfer, as well as to the design and calculation of equipment in which heat transfer is a factor to be considered (heat exchangers, piping, insulation, thermal comfort, etc.).

Knowledge of he basic principles of thermodynamics and their practical application in machines used for energy transformations, as well as the behaviour of gases, with particular attention to their use in thermal machines and the changes in the properties, especially thermal, of the systems when they interact with each othe

6. Units / Contents

Unit 1: Basic concepts of thermodynamics.
Unit 2: Principles of Thermodynamics for closed systems.
Unit 3: Principles of Thermodynamics for open systems..
Unit 4: Thermodynamic study of pure substances.
Unit 5: Thermodynamic cycles.
Unit 6: Introduction to heat transfer.
Unit 7: Conduction heat transfer.
Unit 8: Convective heat transfer.
Unit 9: Radiation heat transfer.

ADDITIONAL COMMENTS, REMARKS

The course will be divided into two blocks:

- Block I: Thermodynamics (Units 1, 2, 3, 4 and 5)

- Block II: Heat transmission (Units 6, 7, 8 and 9)

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	CB02 CB03 CB04 CB05 CEC01 CG03 CG04 CT02 CT03	1.2	30	N	-	The teacher will explain those aspects of the theoretical development of each topic that he considers necessary so that the student can later work independently. She will also present practical examples.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB02 CB03 CB04 CB05 CEC01 CG03 CG04 CT02 CT03	0.6	15	N	-	Classes of exercises in the classroom. The teacher, after solving some typical problems,she will solve those problems from the collection of proposals that the students can ask to her.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB02 CB03 CB04 CB05 CEC01 CG03 CG04 CT02 CT03	0.4	10	Y	Y	Laboratory practices and computer programs will be carried out. Attendance and delivery of the report is mandatory. The minimum grade for this part to be compensable will be 2 points (out of 10). Tests will be carried out in Moodle on the theoretical-practical content of the subject.
Formative Assessment [ON-SITE]	Assessment tests	CB02 CB03 CB04 CB05 CEC01 CG03 CG04 CT02 CT03	0.2	5	Y	Y	Tests and excercises that will be able to evaluate the content of the subject. The minimum mark in the evaluation tests to compensate with the rest of the evaluable activities will be 4 points (with respect to 10).
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB04 CB05 CEC01 CG03 CG04 CT02 CT03	3.6	90	N	-	Autonomous personal study of theory and problems where the student uses the knowledge learned in the face-to-face classes in the classroom.
		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	30.00%	30.00%	Attendance at practices and the presentation of the memory are mandatory to evaluate this activity. The minimum grade for this part to be compensable will be 2 points (with respect to 10).
Final test	70.00%	70.00%	Final exam of theory and problems of the content of the two blocks of the subject. The minimum grade for these blocks to be compensable will be 4 points (out of 10). If the student has passed the partial test, in the final test they will only be evaluated on the content of the Heat Transmission block.
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 final grade in continuous evaluation will be:
35% partial test (as long as the mark is equal to or greater than 4) + 35% final test (as long as the mark is equal to or greater than 4) + 30% of the laboratory/computer practices.

Non-continuous evaluation:

It will consist of a final test where the contents of the Thermodynamics and Heat Transmission blocks are evaluated, following the specifications indicated in the continuous evaluation system.

If the student has not carried out the practices, or has not passed the evaluation of the memories, an exam of laboratory practices will be carried out. The minimum mark to compensate for this part will be 4 points (out of 10).

The course is considered approved if the final grade is greater than or equal to 5 (out of 10 points).

Specifications for the resit/retake exam:

The grades obtained in each of the tests that have been passed in the ordinary call will be kept.

The evaluation criteria will be the same as in the continuous evaluation of the ordinary call. In the case of not having passed the part of the laboratory practices in the ordinary call, an exam will be carried out on the contents of this part. The minimum mark to compensate for this part will be 4 points (out of 10).

Specifications for the second resit / retake exam:

In the final test, the same evaluation criteria will be applied as in the non-continuous ordinary call.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	31.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Formative Assessment [PRESENCIAL][Assessment tests]	3.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90

Global activity

Activities	**hours**
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Formative Assessment [PRESENCIAL][Assessment tests]	3.5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Class Attendance (theory) [PRESENCIAL][Lectures]	31.5
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
Hernández, J.J.; Rodríguez, J.; Sanz, J	Transmisión de calor para ingenieros			978-84-8427-737-8	2010	Bibliografía básica para el Bloque II: Transmisión de calor
M.J. Moran, H.N. Shapiro, D.D. Boettner, M.B. Bailey	Fundamentals of Engineering Thermodynamics				2018	Bibliografía básica para el Bloque I: Termodinámica
T.L. Bergman, A.S. Lavine, F.P. Incropera, D.P. Dewitt.	Principles of Heat and Mass Transfer	Prentice hall			2017	Bibliografía básica para el Bloque II: Transmisión de calor
Lapuerta, M.; Hernández, J.J.; Ballesteros. R.	Termodinámica			84-699-3109-1	2002	Bibliografía básica para el Bloque I: Termodinámica
A. Bejan	Advanced Engineering Thermodynamics	Wiley			2016	Bibliografía de apoyo para el Bloque I: Termodinámica
J. Agüera Soriano	Termodinámica lógica y motores térmicos	Ciencia 3 SL			1999	Bibliografía de apoyo para el Bloque I: Termodinámica
J. Agüera Soriano	Problemas resueltos de termodinámica lógica y motores térmicos	Ciencia 3 SL			1999	Bibliografía de apoyo para el Bloque I: Termodinámica