UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: THERMAL ENGINEERING
Type: CORE COURSE
Degree: 344 - CHEMICAL ENGINEERING
Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY
Year: 2
Main language: Spanish
Use of additional languages:
Web site:

Code: 57717
ECTS credits: 6
Academic year: 2022-23
Group(s): 21
Duration: C2
Second language: English
English Friendly: Y
Bilingual: N

Lecturer: **JUSTO LOBATO BAJO** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
Enrique Costa/Desp. 6	INGENIERÍA QUÍMICA	6707	justo.lobato@uclm.es	Monday, tuesday and thursday (16:00 - 17:00 h)

Lecturer: **JOSE VILLASEÑOR CAMACHO** - Group(s): **21**

Building/Office	Department	Phone number	Email	Office hours
ITQUIMA	INGENIERÍA QUÍMICA	6358	jose.villasenor@uclm.es	Monday, wednesday and friday (9:30 to 11:00)

2. Pre-Requisites

Not established

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

This subject is taught in the second year of the Degree that will be taught in the second semester, and together with the subject of Heat Transmission they form the Subject of HEAT ENGINEERING

The objective is to provide students with basic information on Applied Technical Thermodynamics. To do this, concepts such as the thermodynamics of water vapor, energy analysis of combustion systems and energy generation systems using thermal machines and steam and gas turbines will be reviewed. With this information, the student will have a general vision of how to carry out the design of more efficient thermal systems, as well as certain models necessary to obtain qualitative conclusions about the design of thermal power plants for electricity production.

In addition, the fundamentals of industrial refrigeration and the knowledge of refrigeration technology necessary to gain basic experience in the design of refrigeration installations will be provided. And the fundamentals of psychrometrics and air conditioning to gain basic experience in the design of industrial chemical process air conditioning installations.

In this subject, students will study the different behavior of machines that work with vapors (water vapour) from those that work with gases. In this subject they will learn to calculate the enthalpy variations of any transformation that a gas or vapor undergoes.

This subject is related to Thermodynamics, Heat Transmission, Material and Energy Balances and Projects,…

4. Degree competences achieved in this course

Course competences

Code	Description
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.
E07	Knowledge of applied thermodynamics and heat transmission. Basic principles and their application to solving engineering problems.
E31	Ability to manage information sources in chemical engineering. Properly handle the terminology of the profession in Spanish and English in the oral and written records
E32	Knowledge of the fundamentals and techniques of environmental analysis
G01	Capacity for the direction, of the activities object of the engineering projects described in the competence G1.
G02	Knowledge in basic and technological subjects, which enables them to learn new methods and theories, and give them versatility to adapt to new situations.
G03	Ability to solve problems with initiative, decision making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Chemical Engineering.
G04	Knowledge for the realization of measurements, calculations, valuations, appraisals, surveys, studies, reports, work plans and other analogous works.
G05	Ability to handle specifications, regulations and mandatory standards.
G06	Ability to analyze and assess the social and environmental impact of technical solutions.
G10	Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Technical Engineer
G12	Knowledge of Information and Communication Technologies (ICT).
G14	ethical commitment and professional ethics
G17	Synthesis capacity
G18	Capacity for teamwork
G19	Ability to analyze and solve problems

G20	Ability to learn and work autonomously
G21	Ability to apply theoretical knowledge to practice
G22	Creativity and initiative

5. Objectives or Learning Outcomes

Course learning outcomes

Description

To have the ability to analyze the operation of a power plant analyzing and taking into account the different processes that take place such as combustion in the boiler, psychrometry in the condenser, spill processes in the turbine, etc.

To have knowledge about the design of compressors and action turbines and be able to calculate the number of speed and/or pressure staggers.

To have knowledge about the properties of fuels.

To be able to calculate the thermal performance of a thermal machine and the operating coefficient of a refrigeration machine.

6. Units / Contents

Unit 1: Water vapour thermodynamics

Unit 2: Psicrometry

Unit 3: Power and refrigeration thermal devices

Unit 4: Combustion

Unit 5: Isoentropic processes: nozzels and diffusers

Unit 6: Water vapour action turbines 1: theory and calculations

Unit 7: Water vapour action turbines 2: examples

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	CB04 E07 G01 G02 G03 G05 G06	1.2	30	Y	N	
Group tutoring sessions [ON-SITE]	Guided or supervised work	E07 E31 E32 G01 G02 G03 G04 G05 G06 G10 G12 G14 G17 G18 G19 G20 G21 G22	0.1	2.5	N	-	
Final test [ON-SITE]	Assessment tests	E07 E31 E32 G01 G02 G03 G04 G05 G06 G10 G12 G14 G17 G18 G19 G20 G21 G22	0.15	3.75	Y	Y	
Other off-site activity [OFF-SITE]	Self-study	E07 E31 E32 G01 G02 G03 G04 G05 G06 G10 G12 G14 G17 G18 G19 G20 G21 G22	3.6	90	N	-	
Workshops or seminars [ON-SITE]	Project/Problem Based Learning (PBL)	CB03 E07 E31 E32 G01 G02 G03 G04 G05 G06 G10 G12 G14 G17 G18 G19 G20 G21 G22	0.95	23.75	Y	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
Final test	75.00%	75.00%	Partial examination or final examination
Assessment of problem solving and/or case studies	25.00%	25.00%	Partial examination or final examination
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:

To evaluate the THERMAL ENGINEERING subject, the following activity will be carried out, which is detailed below with the corresponding approximate percentage weight in the global evaluation:

1. Exam with two different parts. A part of theoretical questions (test type) and theoretical-practical questions about the contents taught in the subject (50% of the exam grade). Another problem (50% of the exam grade) that may be the analysis of a thermal power plant or refrigeration machine similar to the resolution of problems and/or cases and the design of an action turbine.

To pass the course in each of the exam sections, the average must be equal to or greater than 5.0/10.

Non-continuous evaluation:

To evaluate the THERMAL ENGINEERING subject, the following activity will be carried out, which is detailed below with the corresponding approximate percentage weight in the global evaluation:

1. Exam with two different parts. A part of theoretical questions (test type) and theoretical-practical questions about the contents taught in the subject (50% of the exam grade). Another problem (50% of the exam grade) that may be the analysis of a thermal power plant or refrigeration machine similar to the resolution of problems and/or cases and the design of an action turbine.

To pass the course in each of the exam sections, the average must be equal to or greater than 5.0/10.

Specifications for the resit/retake exam:

Same as in the case of the ordinary call

Specifications for the second resit / retake exam:

Same as in the case of the ordinary call

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Group tutoring sessions [PRESENCIAL][Guided or supervised work]	2.5
Final test [PRESENCIAL][Assessment tests]	3.75
Other off-site activity [AUTÓNOMA][Self-study]	90
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	23.75

Global activity

Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Final test [PRESENCIAL][Assessment tests]	3.75
Workshops or seminars [PRESENCIAL][Project/Problem Based Learning (PBL)]	23.75
Group tutoring sessions [PRESENCIAL][Guided or supervised work]	2.5
Other off-site activity [AUTÓNOMA][Self-study]	90
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Nihal E. Wijeysundera	Engineering thermodynamics with worked examples	World Scientific	Singapure	13978-981-4293-13-6	2011	Libro en inglés donde se abordan la mayoría de los temas vistos en la asignatura junto con ejercicios resueltos y propuestos
Gutiérrez de Rozas J.L.	Turbomáquinas Térmicas. Teoría y Problemas	UNIV. DEL PAIS VASCO			2005	
MATAIX, C.	84-7399-050-1	ACAI			1978	
Morán, M.J. y Shapiro, H.N.	Fundamentos de Termodinámica Técnica (tomos I y II)	REVERTE			1996	
Rolle K.C.	Termodinámica	PEARSON			2006	
Segura José	Termodinámica técnica	REVERTE			1988	
Segura José, Rodríguez Juan	Problemas de Termodinámica Técnica	REVERTE			1993	
de Lucas, Antonio, Villaseñor José, Lobato Justo	Termotecnia básica para ingenieros químicos: bases de termodinámica aplicada	UNIV. DE CASTILLA-LA MANCHA			2004	
de Lucas, Antonio, Villaseñor José, Lobato Justo	Termotecnia básica para ingenieros químicos: Procesos termodinámicos y máquinas	UNIV. DE CASTILLA- LA MANCHA			2007	