



IDENTIFYING DATA

Thermal Technology I

Subject	Thermal Technology I			
Code	V04M141V01112			
Study programme	(*)Máster Universitario en Enxeñaría Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Cerdeira Pérez, Fernando			
Lecturers	Cerdeira Pérez, Fernando			
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General description	In this subject pretends that the student purchase the essential knowledges that allow him comprise the operation of the thermal machines and the processes that take place in his interior, as well as that know the types of machines and installations more important and his components. His knowledge results basic for the analysis of the operation, design and construction of the thermal machines and of the thermal teams associated to the same, and in general the industrial applications of the thermal engineering.			

Skills

Code	
A1	Knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context.
A2	That the students can apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
C7	CET7. Apply their knowledge and solve problems in new or unfamiliar environments within broader contexts and multidisciplinary environments.
C17	CTI6. Knowledge and capabilities to understand, analyze, operate and manage the different sources of energy.

Learning outcomes

Expected results from this subject	Training and Learning Results
(*)	A1 A2 C7 C17

Contents

Topic	
Installations with cycle of steam and of gas.	Introduction to the thermal head offices. Main components. Cycles Rankine, Brayton and combined. Thermal balance. Thermal performance.
Study of the humid air.	Introduction. Variables psycrometrics. Diagrams psycrometrics. Cooling towers.
Industrial fuels and his combustion.	Classification of the fuels. Properties of the fuels. Types of combustion.

Burners and boilers.	Definitions. Types of burners. Classification of boilers. Energetic balance. Performance.
Processes of spill.	Nozzles and diffusers.
Machines and thermal engines.	Generalities and fundamental processes. Classification. Components of the engines. Thermodynamic analysis. Characteristic parameters.
Pumping of heat.	Definitions. Cycle of Carnot reverse. Cycle of mechanical compression. Bomb of heat. Refrigeration by absorption.
Application of the renewable energies.	Thermal solar energy. Geothermal energy. Biomass and residual fuels.
Heat exchangers.	Introduction. Types of exchangers. Analysis of exchangers of heat. - Method DTLM - Method NTU
-- Laboratory practices.	- Study of the flame propagation. - Higrometric study of the air. - Study of the heat exchangers. - Study of the engines of 2T. - Study of the engines of 4T. - Study of heat pump. - Energetic balance of a boiler. - Visit to a boilers room.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	20	38
Problem solving	12.5	24.5	37
Practices through ICT	4	4	8
Laboratory practical	15	5	20
Autonomous problem solving	0	20	20
Problem and/or exercise solving	2	0	2
Essay	0	15	15
Objective questions exam	2	8	10

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Exhibition by part of the professor of the contents of the matter object of study.
Problem solving	Resolution of problems and/or exercises related with the subject that the student will make in classroom and/or laboratory. They will resolve problems of character "type" and/or practical examples.
Practices through ICT	Simulation of processes related with the content of the matter using specific software.
Laboratory practical	Experimentation of real processes in laboratory that complement the contents of the matter.
Autonomous problem solving	Resolution of problems and/or exercises related with the subject that the student will make out of the classroom.

Personalized assistance

Methodologies	Description
Lecturing	The doubts will resolve in the schedule of tutorials of face-to-face form or through the remote campus, if it proceeds.
Problem solving	The doubts will resolve in the schedule of tutorials of face-to-face form or through the remote campus, if it proceeds.

Assessment

Description		Qualification	Training and Learning Results	
Problem and/or exercise solving	Examination (writing, oral,...) consistent in the resolution of problems and/or relative questions to the contents of the matter developed so much in the sessions of theory as of practices. The examination will carry out in the dates fixed by the educational organisation of the centre, and will allow to reach the maximum note (10 points).	60	A1 A2	C7 C17
Essay	Individual works and/or in consistent group in the utilisation of specific software, resolution of practical cases,... Related with the contents of the matter. The realisation of these tasks will allow to reach until a maximum of 20% of the note.	20	A1 A2	C7 C17
Objective questions exam	During the course, the students will have to make different questionnaires composed by theoretical objective questions and/or of resolution of exercises related with the contents.	20	A1 A2	C7 C17

Other comments on the Evaluation

The continuous evaluation (EC, 40%) will be evaluated through the work and of objective proofs; those that have renounced officially to the EC will have to make a specific questionnaire (SQ) at the earliest opportunity of the course call.

In the second opportunity (July call), the students that have made the EC will be able to choose between keeping the EC mark or make the SQ of the second opportunity.

The End of Degree call will be fully evaluated by means of an exam (100%), that is, the EC of the previous course will not be taken into account.

A numerical rating system of 0 to 10 points will be used according to current legislation (RD 1125/2003, September 5, BOE September 18).

It is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).

The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

Sources of information

Basic Bibliography

Agüera Soriano, José, **Termodinámica lógica y motores térmicos**, Ciencia 3, D.L.,

Çengel Y.A.; Boles M.A., **Termodinámica**, McGraw-Hill-Interamericana,

Moran M.J.; Shapiro H.N., **Fundamentos de termodinámica técnica**, Editorial reverté, S.A.,

Incropera, Frank P., **Fundamentos de transferencia de calor**, Prentice Hall,

Complementary Bibliography

Múñoz Domínguez, M.; Rovira de Antonio, A.J., **Ingeniería Térmica**, UNED,

Potter M.C.; Somerton C.W., **Termodinámica para ingenieros**, McGraw-Hill/Interamericana de España, D.L.,

Recommendations