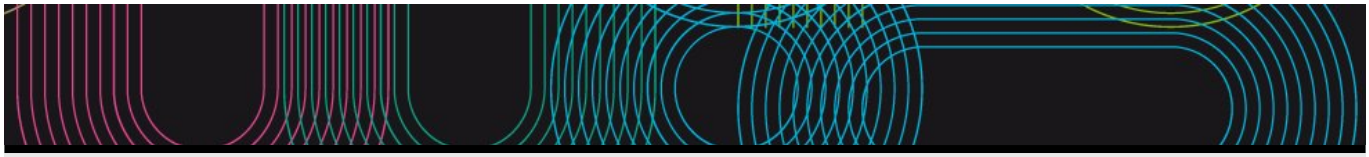

IDENTIFYING DATA				
(*)Termodinámica e transmisión de calor				
Subject	(*)Termodinámica e transmisión de calor			
Code	V12G380V01302			
Study programme	(*)Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish Galician English			
Department				
Coordinator	Santos Navarro, José Manuel			
Lecturers	Diz Montero, Rubén Dopazo Sánchez, José Alberto López Suárez, José Manuel Pequeño Aboy, Horacio Román Espiñeira, Miguel Ángel Sanchez Lucas, Eugenio Santos Navarro, José Manuel Sieres Atienza, Jaime			
E-mail	josanna@uvigo.es			
Web				
General description	Thermodynamics studies the energy, its transformations and the relationships among the properties of substances. Therefore, its knowledge is of primary importance for the analysis, design and construction of any thermal machine or equipment; and, in general, for the industrial applications of thermal engineering. On the other hand, it is interesting to know the mechanisms for energy transfer, mainly due to the existence of a temperature difference, with a focus in the three modes of heat transfer and the mathematical models that allow calculating the heat transfer rate. At the end of the course, students are expected to be able to properly state and solve heat transfer engineering problems.			

Competencies	
Code	
A1	CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, according to specialty, construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of: structures, mechanical equipments, energy facilities, electrical systems and electronic installations and industrial plants, and manufacturing processes and automation.
A13	FB2 Understanding and mastering the basics of the general laws of mechanics, thermodynamics, waves and electromagnetic fields, as well as their application for solving engineering problems.
A20	RI1 Knowledge of applied thermodynamics and heat transfer. Basic principles and their application to solving engineering problems.
B1	CT1 Analysis and synthesis
B2	CT2 Problems resolution.
B3	CT3 Oral and written proficiency in the own language.
B5	CT5 Information Management.
B7	CT7 Ability to organize and plan.
B8	CT8 Decision making.
B9	CS1 Apply knowledge.
B11	CS3 Planning changes to improve overall systems.
B12	CS4 Research skills.
B13	CS5 Adaptability to new situations.
B14	CS6 Creativity.
B15	CP1 Objectification, identification and organization.

B16 CP2 Critical thinking.

Learning aims		
Expected results from this subject	Training and Learning Results	
Know and understand the Laws of Thermodynamics, the modes of heat transfer and the relations to calculate heat transfer rates	A13 A20	B1 B2 B7 B12 B16
Know and understand the basic notions of the physics involved in the different modes of heat transfer	A13 A20	B1 B9 B12 B15
Identify the relevant heat transfer mechanisms involved in any heat transfer engineering application	A1 A13 A20	B1 B2 B3 B7 B8 B9
Analyze thermal systems operation, such as heat pumps, refrigeration systems or power systems. Know the main components of these kinds of systems and the thermodynamic cycles used to model them	A13 A20	B1 B2 B5 B7 B9 B11 B12 B13 B14 B15 B16

Contents
Topic
REVIEW OF THE FIRST And SECOND LAW OF THE THERMODYNAMICS
ENERGETIC And EXERGETIC ANALYSIS OF OPEN SYSTEMS
ANALYSIS OF POWER CYCLES: VAPOUR TURBINE CYCLES
ANALYSIS OF POWER CYCLES: COMBUSTION ENGINES And GAS TURBINES
ANALYSIS OF REFRIGERATION And HEAT PUMP CYCLES
BASIC CONCEPTS And FUNDAMENTALS OF HEAT TRANSFER
HEAT TRANSFER BY CONDUCTION. ONE-DIMENSIONAL, STEADY-STATE HEAT FLOW
HEAT TRANSFER BY CONVECTION: FUNDAMENTALS, CORRELATIONS FOR CONVECTION HEAT TRANSFER COEFFICIENTS
HEAT TRANSFER BY RADIATION. FUNDAMENTALS. THERMAL RADIATION
INDUSTRIAL APPLICATIONS: HEAT EXCHANGERS

Planning			
	Class hours	Hours outside the classroom	Total hours
Master Session	32.5	65	97.5
Laboratory practises	6	9	15
Troubleshooting and / or exercises	10	30	40
Short answer tests	0	0	0
Troubleshooting and / or exercises	0	0	0

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

Methodologies

	Description
Master Session	Lecturer□s introduction of the contents of the matter object of study
Laboratory practises	Real processes experimentations in the laboratory which complement the contents covered in the course. PRACTICAL CONTENTS (at least 4 of the 6 following laboratory practices will be done): 1) Application of the First Law of Thermodynamics: experimental determination of isothermal and adiabatic processes. 2) Evaluating thermodynamic properties of pure substances by means of computer software. 3) Experimental study of a vapor cycle. 4) Experimental study of a vapor compression refrigeration cycle and heat pump cycle. 5) Experimental determination of thermal conductivity. 6) Evaluating heat transfer by radiation: the Stefan-Boltzmann law.
Troubleshooting and / or exercises	Resolution of problems and/or exercises related with the course that the student will carry out in the classroom and/or laboratory. Examples of direct application of the contents studied as well as practical examples will be solved. The methodology will be focused on explaining how to solve the problems rather than on determining the final numerical solution.

Personalized attention

Methodologies	Description
Master Session	Students□ questions or doubts about any of the course contents will be solved during the instructor□s office hours.
Laboratory practises	Students□ questions or doubts about any of the course contents will be solved during the instructor□s office hours.
Troubleshooting and / or exercises	Students□ questions or doubts about any of the course contents will be solved during the instructor□s office hours.

Assessment

	Description	Qualification
Short answer tests	Short answer tests during the course	25
Troubleshooting and / or exercises	Final exam to evaluate the whole contents of the course	75

Other comments on the Evaluation

Sources of information

Moran M.J., Shapiro H.N., Munson B.R. y DeWitt D.P., **Introduction to Thermal Systems Engineering: Thermodynamics, Fluid Mechanics and Heat Transfer**, 2003,

Çengel Y.A., **Introduction to Thermodynamics and Heat Transfer**, 2008,

Çengel, Yunus A., **Heat and mass transfer: a practical approach**, 2006,

Moran M.J. y Shapiro H.N., **Fundamentos de Termodinámica Técnica**, 1993,

Çengel, Yunus y Boles, Michael, **Termodinámica**, 7ª Edición - 2011,

Mills A.F., **Transferencia de calor**,

Çengel Y.A., y Ghajar A.J., **Transferencia de Calor y Masa. fundamentos y aplicaciones**, 2011,

Kreith J. y Bohn M.S, **Principios de Transferencia de Calor**, 2001,

Merle C. Porter y Craig W. Somerton, **Termodinámica para ingenieros**, 2004,

Incropera F.P. y DeWitt D.P, **Introduction to Heat Transfer**, 2002,

Recommendations

Subjects that it is recommended to have taken before

(*)Física: Física II/V12G340V01202
(*)Matemáticas: Cálculo I/V12G340V01104
(*)Matemáticas: Cálculo II e ecuacións diferenciais/V12G340V01204

Other comments

In order to take this course it is highly recommended that students have completed the course □Física II□ or that they have the equivalent background in thermodynamics.

A minimum number of points in the final exam is not required to take into account the points obtained for the short answers test during the course (Continuous Evaluation).

Those students that have renounced to be evaluated during the course (Continuous Evaluation) using the official procedure established by the Center, will be evaluated only by the final exam. In this case, the final exam will represent the 100% of the final grade.

The points obtained during the course (Continuous Evaluation) will have validity in the first (at the end of the term) and second (in July) calls.