		Teachir	ng Guide		
	Identifying	Data			2020/21
Subject (*)	Thermodynamics Code			730G05015	
Study programme	Grao en Enxeñaría Naval e Oceánio				
		Desc	riptors		
Cycle	Period	Ye	ear	Туре	Credits
Graduate	1st four-month period	Sec	cond	Obligatory	6
Language	Spanish				·
Teaching method	Hybrid				
Prerequisites					
Department	Ciencias da Navegación e Enxeñari	ía MariñaEn	xeñaría Naval e Ir	ndustrial	
Coordinador	Calvo Diaz, Jose Ramon		E-mail	jose.ramon.calv	o@udc.es
Lecturers	Calvo Diaz, Jose Ramon		E-mail	jose.ramon.calv	o@udc.es
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Web	www.udc.es				
General description	Heat, work, and energy.				
Contingency plan	1. Modifications to the contents				
	1. Modifications to the contents No modifications. 2. Methodologies *Teaching methodologies that are maintained No modifications. *Teaching methodologies that are modified No modifications. 3. Mechanisms for personalized attention to students E-mail, moodle and teams. These will be consulted every dary. 4. Modifications in the evaluation No modifications. *Evaluation observations: The exams will take place online. 5. Modifications to the bibliography or webgraphy No modifications.				

	Study programme competences
Code	Study programme competences
A14	Knowledge of the applied thermodynamics and of the transmission of the heat.
B2	That the students know how to apply its knowledge to its work or vocation in a professional way and possess the competences that tend to
	prove itself by the elaboration and defense of arguments and the resolution of problems in its area of study
В3	That the students have the ability to bring together and to interpret relevant data (normally in its area of study) to emit judgments that
	include a reflection on relevant subjects of social, scientific or ethical kind
B4	That the students can transmit information, ideas, problems and solutions to a public as much specialized as not specialized
B5	That the students developed those skills of learning necessary to start subsequent studies with a high degree of autonomy
B6	Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.



C1	Using the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of its profession and
	for the learning throughout its life.
C4	Recognizing critically the knowledge, the technology and the available information to solve the problems that they must face.

Learning outcomes			
Learning outcomes	Study	y progra	amme
	COI	mpeten	ces
Model and calculate systems and processes related to the employment and generation of energy	A14	B2	C1
		В3	C4
		B4	
		B5	
		В6	

	Contents
Topic	Sub-topic Sub-topic
The following blocks or chapters develop the contents	Introduction
established in the verification memory, which are:	Conservation of energy
	Properties of pure substances
	2nd law
	Practical applications
Introduction to thermodynamics	Thermodynamics and energy
	Systems and control volumes
	Properties
	States
	Processes
	Energy and enthalpy
	Specific heat and thermal capacity
	Phases
	Ideal gases
	Temperature and zeroth law of thermodynamics
	Density
	Pressure
2. Work, energy and the 1st law of thermodynamics	Energy
(conservation of energy)	Energy transfer by heat
	Energy transfer by work
	The first law of thermodynamics for closed systems, energy balance
3. Properties of pure substances	Introduction
	Phase-change processes of pure substances
	Property diagrams
	Property tables
	Properties of incompressible substances
	Properties of ideal gases
	Reference states
4. Conservation of energy and 1st law of thermodynamics	Introduction
	Conservation of mass in control volumes
	Conservation of energy in control volumes
	Examples

5. Thermodynamic cycles and introduction to the 2nd law of	Introduction
thermodynamics	Thermal energy reservoirs
	Thermodynamic cyclic devices: heat engines, refrigerators and heat pumps
	Kelvin-Planck and Clausius statements for the second law of thermodynamics
	Maximum thermal efficiency of thermodynamic cyclic devices
6. Entropy	Clausius inequality
	Entropy
	Entropy tables
	Entropy diagrams
	T-ds relations
	Entropy change of thermal energy reservoirs
	Entropy change of incompressible substances
	Entropy change of ideal gases
	Entropy generation
	Isentropic processes
	Entropy balance for closed systems and control volumes
	Entropy of the universe
	Isentropic efficiency of pumps, compressors, turbines and nozzles

	Planning			
Methodologies / tests	Competencies	Ordinary class	Student?s personal	Total hours
		hours	work hours	
ICT practicals	A14 B2 B3 B4 B5 B6	20	20	40
	C1 C4			
Guest lecture / keynote speech	A14 B2 B3 B4 B5 B6	30	30	60
	C1 C4			
Problem solving	A14 B2 B3 B4 B5 B6	20	20	40
	C4 C1			
Mixed objective/subjective test	A14 B2 B3 B4 B5 B6	0	9	9
	C1 C4			
Personalized attention		1	0	1

	Methodologies
Methodologies	Description
ICT practicals	Classes using software
Guest lecture /	Classes
keynote speech	
Problem solving	Classes about problem solving
Mixed	Exam/s
objective/subjective	
test	

	Personalized attention
Methodologies	Description
Mixed	Attention will be provided by personalized attention, e-mail and Teams.
objective/subjective	
test	Academic dispense is allowed. Students who request it must contact teacher to realize additional homework.
Problem solving	
ICT practicals	

		Assessment	
Methodologies	Competencies	Description	Qualification
Mixed	A14 B2 B3 B4 B5 B6	Exam/s.	70
objective/subjective	C1 C4		
test			
ICT practicals	A14 B2 B3 B4 B5 B6	Students may deliver some exercises.	30
	C1 C4		
Others			

Assessment comments

Students

who request academic dispense must realize other activities proposed by the

teacher. The qualification is the same as the practice.

The evaluation criteria of the 2nd opportunity are the same as those of the 1st opportunity except that, in case of partial exams, the mark obtained in these will not be taken into account in the 2nd opportunity.

In order to pass it is necessary to obtain at least 4 in the final exam and 5 in the global score.

	Sources of information
Basic	- Y. A. Çengel; M. A. Boles. (). Thermodynamics. McGraw-Hill
	- M. Moran y H. N Shapiro (). Fundamentos de Termodinámica Técnica. John Willey & Dyamp; amp; amp; Sons
	- J. Mª Sáiz Jabardo (). Introducción a la Termodinámica.
	- Y. A. Cengel (). Ecuaciones Diferenciales para Ingeniería y Ciencias. McGraw-Hill
Complementary	

Recommendations
Subjects that it is recommended to have taken before
CALCULUS/730G01101
PHYSICS I/730G01102
DIFFERENTIAL EQUATIONS/730G01110
MECHANICS/730G01118
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
FLUID MECHANICS/730G01119
Industrial Heat Transfer/730G03020
Fluid and Thermal Machines/730G03023
Other comments
Other comments Other comments

To help achieve a

sustained immediate environment and meet the objective of action number 5:

"Healthy and sustainable environmental and social teaching and

research" of the "Green Campus Ferrol Action Plan":

delivery of the documentary works that are made in this matter:

Will be requested in virtual format and / or computer support

It will be done through Moodle, in digital format without the need to print

them

If it is necessary to make them on paper:

.anbsp;

Plastics will not be used

Double-sided prints will be made.

Recycled paper will be used.

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Printing of drafts will be avoided.

A sustainable use of resources and the prevention of negative impacts on the

natural environment must be made

The importance of ethical principles related to the values ??of sustainability in personal and professional

behaviors must be taken into account

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Gender perspective is incorporated into the teaching of this subject

(non-sexist language will be used, bibliography of authors of both sexes will

be used, intervention in class of students will be encouraged ...)

Work will be done to identify and modify prejudices and sexist attitudes, and

the environment will be influenced to modify them and promote values ??of respect and equality.

Discrimination situations must be detected and actions and measures will be

proposed to correct them.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.