



IDENTIFYING DATA

Thermal engineering I

Subject	Thermal engineering I			
Code	V12G380V01501			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Pazo Prieto, José Antonio Cerdeira Pérez, Fernando			
Lecturers	Cerdeira Pérez, Fernando Pazo Prieto, José Antonio			
E-mail	nano@uvigo.es jpazo@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	(*)Nesta materia preténdese que o alumno adquira os coñecementos esenciais que lle permitan comprender o funcionamento das máquinas térmicas e os procesos que teñen lugar no seu interior, así como que coñeza os tipos de máquinas e instalacións máis importantes e os seus compoñentes. O seu coñecemento resulta básico para a análise do funcionamento, deseño e construción das máquinas térmicas e dos equipos térmicos asociados ás mesmas, e en xeral as aplicacións industriais da enxeñería térmica.			

Skills

Code			
B1	CG1 Skills for writing, signing and developing projects in the field of industrial engineering, whose purpose, specializing in Mechanics, 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.		
C21	CE21 Knowledge applied to thermal engineering.		
D1	CT1 Analysis and synthesis		
D2	CT2 Problems resolution.		
D6	CT6 Application of computer science in the field of study.		
D8	CT8 Decision making.		
D10	CT10 Self learning and work.		
D14	CT14 Creativity.		
D16	CT16 Critical thinking.		
D17	CT17 Working as a team.		

Learning outcomes

Expected results from this subject	Training and Learning Results		
(*)	B1	C21	D1 D2 D10
(*)	B1	C21	D1 D2 D6 D10 D16 D17

(*)		C21	D1 D2 D6 D10 D14 D16
(*)	B1	C21	D1 D2 D6 D8 D10 D14 D16 D17
New	B1	C21	D1 D2 D8 D10 D17

Contents

Topic

Installations of power with cycle of steam.	Introduction. Main components. Cycle Rankine. Thermal balance.
Installations of power with cycles of gas.	Introduction. Main components. Cycle Brayton. Thermal balance. Cycle Combined of gas-steam.
Pumping of heat.	Definitions. Cycle of Carnot reverse. Cycle of mechanical compression. Bomb of heat. Refrigeration by absorption. Refrigerants.
Study of the humid air.	Introduction. Variables pscrometrics. Diagrams pscrometric. Cooling tower.
Fuels employed in engines and thermal installations.	Classification. Properties.
Foundations of the combustion.	Introduction. Types of combustion.
Boilers and Burners.	Classification. Definitions. Types. Energetic balance.
Compressors.	Previous concepts. Reciprocating compressors. Rotary compressors.
Processes of spill.	Nozzles and diffusers.
Machines and thermal engines.	Classification. Basic concepts.
Engines of internal combustion.	Real cycles and theorists. Main components. Parameters characteristics. Characteristic curves. Auxiliary systems: refrigeration and lubrication.
Heat Exchangers.	Introduction. Classification Thermal balance. Distribution of temperature Analysis of exchangers - Method DTLM - Method NTU

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	38	50	88
Problem solving	20	40	60
Practices through ICT	4	4	8
Laboratory practical	10	10	20
Mentored work	0	15	15
Autonomous problem solving	0	25	25
Problem and/or exercise solving	3	0	3
Objective questions exam	2	4	6

*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.
Mentored work	Activity directed to develop exercises or projects under the guidelines and supervision of the professor. His development can be linked with autonomous activities of the student, practices of laboratory,.... Activity in group or individual. The work developed can finally be exposed publicly in the classroom.
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
Autonomous problem solving	The students will be able to resolve the doubts of the matter and of the distinct bulletins of problems in the schedule of tutorials fixed by the professors of the matter.

Assessment					
	Description	Qualification	Training and Learning Results		
Problem and/or exercise solving	Examination (writing, oral,...) Consistent in the resolution of problems and/or of relative questions to the theory and/or to the practices of laboratory. It will allow to reach the maximum note (10 points).	60	B1	C21	D1 D2 D8 D10 D14 D16
Objective questions exam	During the development of 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 developed.	40		C21	D1 D2 D6 D8 D10 D14 D16 D17

Other comments on the Evaluation

Those students that make the tasks that commissions the educational along the course will be able to reach to the final examination with an income of points compensable purchased by continuous evaluation. The points reached will be valid in the two announcements of examination of the course. The final examination can be differentiated for the students that followed the continuous evaluation along the course concerning those that did not follow it. In both two cases the maximum note of the course will be of ten points. In the announcement End of Career the note may proceed of the evaluation of the examination in 100%, will not take into account the note of practices of the previous course.

Ethic Commitment: 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.,

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

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

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

Complementary Bibliography

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

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

Çengel Y.A.; Ghajar, A.J., **Transferencia de calor y masa**, McGraw-Hill/Interamericana de España, D.L.,

Kohan, Anthony L., **Manual de calderas**, McGraw-Hill,

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics I/V12G380V01102

Physics: Physics II/V12G380V01202

Chemistry: Chemistry/V12G380V01205

Thermodynamics and heat transfer/V12G380V01302

Other comments

To enrol in this subject is necessary to have surpassed or be enrolled of all the subjects of the inferior courses.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of the uncertain and unpredictable evolution of the sanitary alert caused by the COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance by the students and the teachers through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===

* Educational Methodologies that modify

The classes of theory and problems will give of virtual or mixed form keeping the same contents with help of the remote campus and of the available means.

The classes of laboratory will give of virtual or mixed form with help of document cameras, videos, specific computer programs and other means that consider adapted for the correct acquisition of the competitions.

* Mechanism no face-to-face of attention to the students (*tutorías)

The tutorials will attend so much through the email as with the help of the virtual rooms of the teaching or other systems that consider timely.

* Modifications (if they proceed) of the contents to give

The contents keep.

* Additional bibliography to facilitate the car-learning

The bibliography keeps .

* Other modifications

=== ADAPTATION OF THE EVALUATION ===

* Test already made

Conserve his weights.

* Pending proofs that keep

All the proofs of evaluation are supported by the same weights, happening to make telematic in function of the available means facilitated to the faculty.

* Additional information
