[GFC004] THERMODYNAMICS

GENERAL INFORMATION

Studies	ENGINEERING PHYSICS APPLIED TO INDUSTRY			**Subject**	Physics
Semester	2	**Course**	2	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2022	**Modality**	Face-to-face	**Language**	ENGLISH
Credits	3	**Hours/week**	0	**Total hours**	45 class hours + 30 non-class hours = **75 total hours**

PROFESSORS

BLANCO AGUILERA, RICARDO

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
GENERAL PHYSICS I	*(No previous knowledge required)*
GENERAL PHYSICS II	
CHEMISTRY	

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GFR107 - Understanding the principles of thermodynamics and applying them to modelling and solving basic problems through the use of mathematics	x			2,7
G-RTR1 - To develop interdisciplinary projects specific to their specialty and of gradual complexity, - becoming aware of respect for human rights and fundamental rights, and analyzing and assessing the impact of the proposed solutions on the SDGs - to acquire and/or apply basic, advanced and /or avant-garde, demonstrating the ability to work in multidisciplinary teams and/or undertake further studies with a high degree of autonomy		x		0,16
G-RTR2 - To express information, ideas and the arguments that support them in an orderly, clear and coherent manner, orally and in writing, based on quality information, self-made or obtained from different sources, using inclusive and non-discriminatory language		x		0,14
			Total:	3

KC: Knowledge or Content / SK: Skills / AB: Abilities

SECONDARY LEARNING RESULTS

RGF290 **[!]** ***Muestra las habilidades para trabajar en grupo y resuelve los problemas planteados utilizando las herramientas adecuadas en cada caso.***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	1,2 h.	,8 h.	2 h.

EVALUATION SYSTEM	W
Self-assessment	25%
Co-assessment	25%
Observation (technical capacity, attitude and participation)	50%

MAKE-UP MECHANISMS

(No mechanisms)

CH - Class hours: 1,2 h.
NCH - Non-class hours: ,8 h.
TH - Total hours: 2 h.

RGF291 **[!]** ***Utiliza la metodología adecuada para encontrar las soluciones a los problemas y para desarrollar los proyectos: Examina bien los problemas, y busca información significativa para hacerle frente y propone las soluciones.***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	1,2 h.	,8 h.	2 h.

EVALUATION SYSTEM	W

MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)*

CH - Class hours: 1,2 h.
NCH - Non-class hours: ,8 h.
TH - Total hours: 2 h.

RGF292 **[!]** ***Comunica, busca y estructura correctamente la información de manera escrita: Redacta una memoria de proyecto clara y concisa siguiendo los criterios establecidos en la quía para la redacción de la memoria de proyectos y utilizando herramienta informá***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	1,2 h.	,8 h.	2 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	*(No mechanisms)*

CH - Class hours: 1,2 h.
NCH - Non-class hours: ,8 h.
TH - Total hours: 2 h.

RGF293 **[!]** ***Comunica, busca y estructura correctamente la información de manera oral: Realiza una presentación oral y defensa del proyecto clara y concisa, utilizando adecuadamente los aspectos recogidos en la guía de comunicación oral y las herramientas informá***

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	,9 h.	,6 h.	1,5 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	100%	*(No mechanisms)*

CH - Class hours: ,9 h.
NCH - Non-class hours: ,6 h.
TH - Total hours: 1,5 h.

RGF218 **[!]** ***Comprende los principios de la Termodinámica y lo aplica a la modelización y resolución de los problemas básicos mediante el uso de las matemáticas.***

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	10,5 h.	27 h.	37,5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	30 h.		30 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	40%	Individual written and/or oral tests or individual coding/programming tests
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	20%	
Individual written and/or oral tests or individual coding/programming tests	40%	

CH - Class hours: 40,5 h.
NCH - Non-class hours: 27 h.
TH - Total hours: 67,5 h.

CONTENTS

0. Previous Concepts

0.1 Thermal and thermodynamic equilibrium

0.2 Ideal gases and thermodynamic potentials

0.3 First and second law of thermodynamics: Work and heat, entropy

1. Thermophysical properties of pure substances and materials

1.1 Phase change processes and P-v-T diagrams of pure substances

1.2 Property tables

1.3 Compressibility factor and real gases modelling

2. Engineering Applications

2.1 Thermodynamic analysis of open systems

i) Mass conservation principle

ii) The first law of thermodynamics in open systems

iii) The second law of thermodynamics and entropy in open systems

iv) Engineering applications: Turbines, compressors and pumps, nozzles and diffusers, heat exchangers, valves, combustion chambers and boilers, condensers

2.2 Thermo-fluidic power and refrigeration cycles

i) Gas Power Cycles: Brayton Cyle

ii) Vapour Power Cycles: Rankine Cycle, Combined Cycle, Cogeneration

iii) Refrigeration Cycles and Heat Pumps

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	https://labur.eus/COra9
Moodle Platform	
Programmes	