

[GEC301] THERMAL AND FLUID ENGINEERING

GENERAL INFORMATION

Studies	DEGREE IN INDUSTRIAL ELECTRONICS ENGINEERING		Subject	MECHANICAL AND CHEMICAL ENGINEERING OF MATERIALS
Semester	1	Course	2	Mention / Field of specialisation
Character	COMPULSORY		Language	CASTELLANO/EUSKARA
Plan	2022	Modality	Face-to-face	Total hours
Credits	4,5	Hours/week	3.89	70 class hours + 42.5 non-class hours = 112.5 total hours

PROFESSORS

ABETE HUICI, JOSE MANUEL
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REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	(No previous knowledge required)

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GER201 - To know the basic principles of fluid mechanics. Calculation of pipes, channels and fluid systems		x		2
GER202 - To demonstrate knowledge of thermodynamics and heat transmission and its application to solving problems in the field of engineering	x			2,02
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		0,24
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		0,24
Total:				4,5

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

ENAAE LEARNING RESULTS

- ENA103** - Knowledge and comprehension: Awareness of the multidisciplinary context of engineering.
- ENA104** - Analysis in engineering: The ability to analyse complex products, processes and systems in their field of study; choose and apply relevant analytical, calculation and experimental methods in a suitable way; and correctly interpret the results of such analyses.
- ENA105** - Analysis in engineering: The ability to identify, formulate and solve engineering problems in their speciality; choose and apply adequately established analytical, calculation and experimental methods; and acknowledge the importance of social, health and safety, environmental, economic, and industrial restrictions.
- ENA106** - Engineering projects: Ability to project, design and develop complex products (parts, components, finished products, etc.), processes and systems of their speciality, which meet the established requirements, including awareness of the social, health and safety, environmental, economic and industrial aspects, as well as selecting and applying appropriate project methods.
- ENA109** - Research and innovation: Ability to consult and apply codes of good practice and security in their speciality.
- ENA113** - Practical application of engineering: Knowledge of application of materials, equipment and tools, engineering technology and processes, and their limitations in the field of their speciality.
- ENA118** - Preparation of judgements: Ability to manage complex technical or professional activities or projects of their speciality, taking responsibility for decision making.
- ENA119** - Communication and Teamwork: Ability to effectively communicate information, ideas, problems and solutions in the field of engineering and with society in general.
- ENA120** - Communication and Teamwork: Ability to operate effectively in domestic and international contexts, individually and as a team, and to cooperate with both engineers and people from other disciplines.

SECONDARY LEARNING RESULTS

RGE290 [!] *Proponer los objetivos y la planificación de un proyecto que le permita adquirir y/o reforzar los conocimientos de tecnologías propias de su especialidad,- que en ocasiones llegan a la vanguardia del conocimiento- y definir una estrategia de aprendiz*

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	2 h.	1 h.	3 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	

Observation (technical capacity, attitude and participation) 100%	Observation (technical capacity, attitude and participation) Comments: Continuous assessment.
CH - Class hours: 2 h. NCH - Non-class hours: 1 h. TH - Total hours: 3 h.	

RGE291 [!] *Establecer las responsabilidades de los miembros del equipo utilizando técnicas adecuadas para fomentar la eficiencia del equipo para el desarrollo del proyecto en los plazos establecidos (compartir recursos, aportar ideas, habilidades comunicativas)*

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	2 h.	1 h.	3 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Observation (technical capacity, attitude and participation) 100%	100%	Observation (technical capacity, attitude and participation) Comments: Continuous assessment.	
CH - Class hours: 2 h. NCH - Non-class hours: 1 h. TH - Total hours: 3 h.			

RGE293 [!] *Redacta y estructura correctamente la memoria del proyecto, haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje. Para ello, busca y hace uso de las fuentes de información adecuadas.*

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	2 h.	1 h.	3 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%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems Comments: - Continuous assessment. - It may be asked to redo the document.	
CH - Class hours: 2 h. NCH - Non-class hours: 1 h. TH - Total hours: 3 h.			

RGE294 [!] *Realiza una presentación oral del proyecto con argumentos elaborados por sí mismos y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.*

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	2 h.	1 h.	3 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%	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	

Comments: - Continuous assessment.

CH - Class hours: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 h.

RGE201 [!] *Analiza sistemas hidraulicos básicos y aplica los principios de la mecánica de fluidos a procesos de bombeo, turbinas hidráulicas y eólicas*

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.	8 h.	10 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	15 h.		15 h.
Carrying out exercises and solving problems individually and/or in teams	7 h.	7 h.	14 h.
Carrying out work experience in real environments and writing the corresponding report	7 h.	4 h.	11 h.

EVALUATION SYSTEM

	<i>W</i>
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	4%
Individual written and/or oral tests or individual coding/programming tests	89%
Prototype / Product	7%

Comments: - Control point: minimum grade 5. - PBL project grade: 30% product, 20% technical content of the report and 50% individual technical defense.

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests
Prototype / Product
Comments: - Students with less than a 5 at the control point must retake the exam. - Final mark of the control point: Retake (75 %) + Control point (25 %). - In the project / PBL there will not be any retake of the individual defense.

CH - Class hours: 31 h.
NCH - Non-class hours: 19 h.
TH - Total hours: 50 h.

RGE202 [!] *Aplica los principios termodinámicos a motores térmicos y turbinas de vapor*

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.	8 h.	10 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	14 h.		14 h.
Carrying out exercises and solving problems individually and/or in teams	8 h.	7,5 h.	15,5 h.

EVALUATION SYSTEM

	<i>W</i>
Individual written and/or oral tests or individual coding/programming tests	100%

Comments: - Control point: minimum grade 5. - Courseworks: minimum grade 5.

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests
Comments: - Students with less than a 5 at the control point must retake the exam. - Final mark of the control point: Retake (75 %) + Control point (25 %). - For the courseworks, their correction will be asked. The maximum mark for the corrected courseworks will be 5.0.

CH - Class hours: 24 h.
NCH - Non-class hours: 15,5 h.
TH - Total hours: 39,5 h.

RGE203 [!] *Aplica los mecanismos de transferencia de calor en el análisis del comportamiento térmico de los sistemas electrónicos. Dimensiona el radiador utilizado en circuitos de potencia lineales*

LEARNING ACTIVITIES		CH	NCH	TH
Carrying out work experience in real environments and writing the corresponding report		7 h.	4 h.	11 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	20%	Prototype / Product		
Individual written and/or oral tests or individual coding/programming tests	50%	Comments: - In the project / PBL there will not be any retake of the individual defense.		
Prototype / Product	30%			
Comments: - PBL project grade: 30% product, 20% technical content of the report and 50% individual technical defense.				
CH - Class hours: 7 h.				
NCH - Non-class hours: 4 h.				
TH - Total hours: 11 h.				

CONTENTS

- 1 FLUIDS
 - 1.1 Fluid mechanics
 - 1.2 Pumps
 - 1.3 Hydraulic turbines
 - 1.4 Wind generators
 - 1.5 Modeling of hydraulic systems

- 2 THERMAL ENGINEERING
 - 2.1 Ideal temperature and gases
 - 2.2 Heat and first principle of thermodynamics
 - 2.3 Second principle of temperature
 - 2.4 Steam turbines
 - 2.5 Heat transfer and calculation of radiator
 - 2.6 Modeling of thermal systems

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Moodle Platform	A heat transfer textbook, John H. Lienhard IV and John H. Lienhard V, third edition, Cambridge MA, Phlogiston Press, 2004
Class presentations	Heat Transfer A Practical Approach, Cengel, Yunus A and Cengel, Yunus, McGraw Hill Professional, 2003.
Slides of the subject	Fundamentals of heat and mass transfer, Incropera Frank, Dewitt David, Bergman Theodore, Lavine Adrienne, sixth edition, 2011