[GFA009] Mathematical Modelling

GENERAL INFORMATION

Studies	DEGREE IN ENGINEERING PHYSICS APPLIED TO INDUSTRY			**Subject**	Mathematics
Semester	1	**Course**	3	**Mention / Field of specialisation**	
Character	COMPULSORY				
Plan	2022	**Modality**	Face-to-face	**Language**	ENGLISH
Credits	3	**Hours/week**	0	**Total hours**	47 class hours + 28 non-class hours = **75 total hours**

2030 AGENDA GOALS

PROFESSORS

MENDIGUREN OLAETA, JOSEBA

REQUIRED PREVIOUS KNOWLEDGE

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

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GFR201 - To understand the theoretical concepts of FEM and be able to apply it to solve problems in a dedicated environment.	x	x	x	2,56
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		0,2
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:	3

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

SECONDARY LEARNING RESULTS

1RGF391 **[!]** ***(1 sem)Coordinar el equipo de trabajo, estimulando la cohesión y clima para lograr la integración de todas las personas y su contribución para alcanzar un rendimiento apropiado, a nivel individual como grupal, para el desarrollo del proyecto en clase***

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.	2 h.

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

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous assessment. Retake is not foreseen.

CH - Class hours: 0 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 2 h.

RGF302 **Is able to select, implement, use and solve mathematical problems using FEM in a dedicated environment**

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	25 h.	6 h.	31 h.

Computer simulation exercises, individually and/or in teams	5 h.	2 h.	7 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	50%	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	30%	
Individual written and/or oral tests or individual coding/programming tests	20%	

CH - Class hours: 30 h.
NCH - Non-class hours: 8 h.
TH - Total hours: 38 h.

1RGF390 **[!]** ***(1 sem)Definir y gestionar los objetivos y planificación de un proyecto que le permita adquirir y/o reforzar los conocimientos de tecnologías - llegando en ocasiones a la vanguardia del conocimiento- y definir una estrategia de autoaprendizaje eficaz***

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.	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	85%	*(No mechanisms)* **Comments:** Continuous assessment. Retake is not foreseen.
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	15%	

CH - Class hours: 0 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 2 h.

1RGF393 **[!]** ***(1 sem)Elabora la memoria del proyecto, aportando argumentos elaborados y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.***

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		3 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%	*(No mechanisms)* **Comments:** Continuous assessment. Retake is not foreseen.

CH - Class hours: 0 h.
NCH - Non-class hours: 3 h.
TH - Total hours: 3 h.

1RGF392 **[!]** ***(1 sem)Identificar y argumentar de forma precisa los ODS en los que incide el proyecto realizado, aportando posibles acciones para la mejora.***

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 h.	1 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)* **Comments:** Continuous assessment. Retake is not foreseen.

CH - Class hours: 0 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 1 h.

1RGF394 **[!]** ***(1 sem)Realiza una presentación oral del proyecto, justificando las soluciones propuestas con argumentos elaborados y precisos, y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.***

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		3 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%	*(No mechanisms)* **Comments:** Continuous assessment. Retake is not foreseen.

CH - Class hours: 0 h.
NCH - Non-class hours: 3 h.
TH - Total hours: 3 h.

RGF301 **Knows the theoretical concepts of the Finite Element Method and its applicability**

LEARNING ACTIVITIES	CH	NCH	TH
Computer simulation exercises, individually and/or in teams	10 h.	4 h.	14 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	7 h.	5 h.	12 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	5%	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	30%	
Individual written and/or oral tests or individual coding/programming tests	65%	

CH - Class hours: 17 h.
NCH - Non-class hours: 9 h.
TH - Total hours: 26 h.

CONTENTS

1. Introduction to ABAQUS

2. The Finite Element Method (FEM)
3. Finite Elements for Solving Static Problems
4. Finite Elements for Solving Mass Diffusion Problems
5. Finite Elements for Solving Heat Transfer Problems
6. Finite Elements for Solving Dynamic Problems
7. Finite Elements for Solving Electrical Problems
8. Subroutines (e.g., UMAT, VUMAT, etc.)

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
(No resources)	https://labur.eus/bUvGz