

## [GFA004] Mathematical Methods Applied to Engineering

### GENERAL INFORMATION

<b>Studies</b>	ENGINEERING PHYSICS APPLIED TO INDUSTRY		<b>Subject</b>	Mathematics
<b>Semester</b>	1	<b>Course</b>	2	<b>Mention / Field of specialisation</b>
<b>Character</b>	COMPULSORY		<b>Language</b>	EUSKARA/ENGLISH
<b>Plan</b>	2022	<b>Modality</b>	Face-to-face	<b>Total hours</b> 90 class hours + 60 non-class hours = <b>150 total hours</b>
<b>Credits</b>	6	<b>Hours/week</b>	0	

### 2030 AGENDA GOALS



### PROFESSORS

AGUIRRE ALONSO, MIKEL  
TELLERIA ALLIKA, XABIER

### REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
CALCULUS I LINEAR ALGEBRA CALCULUS II	(No previous knowledge required)

### LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
<b>GFR102</b> - Solving any mathematical problems that may arise in engineering. Aptitude in applying knowledge of: differential equations, Laplace and Fourier transforms and complex variables		x		5,4
<b>G-RTR1</b> - 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
<b>G-RTR2</b> - 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		0,36

Total: 6

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

### SECONDARY LEARNING RESULTS

#### 1RGF292 (1 sem)

#### LEARNING ACTIVITIES

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

CH NCH TH  
4 h. 4 h.

#### EVALUATION SYSTEM

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

W  
100%

#### MAKE-UP MECHANISMS

(No mechanisms)

CH - Class hours: 0 h.  
NCH - Non-class hours: 4 h.  
TH - Total hours: 4 h.

**1RGF294 [!]** (1 sem) 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
(No activities)				
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS		
(No system)		(No mechanisms)		
CH - Class hours: h.				
NCH - Non-class hours: h.				
TH - Total hours: h.				

**RGF206** [!] *Conoce las propiedades fundamentales del plano complejo y las funciones definidas en él, así como las diferentes técnicas para la resolución de problemas.*

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints		5 h.	5 h.
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		4 h.	4 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	25 h.		25 h.
Carrying out exercises and solving problems individually and/or in teams	11 h.	10 h.	21 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	10%	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	70%		
<b>CH - Class hours:</b> 36 h.			
<b>NCH - Non-class hours:</b> 19 h.			
<b>TH - Total hours:</b> 55 h.			

**1RGF291** (1 sem)

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		4 h.	4 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)	
<b>CH - Class hours:</b> 0 h.			
<b>NCH - Non-class hours:</b> 4 h.			
<b>TH - Total hours:</b> 4 h.			

**RGF205** [!] *Identifica y modeliza diferentes tipos de ecuaciones diferenciales y sistemas de ecuaciones diferenciales para la resolución de problemas físicos e ingenieriles mediante diversas técnicas y sabe utilizar las transformadas de Laplace y Fourier.*

LEARNING ACTIVITIES		CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints			5 h.	5 h.
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams			8 h.	8 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects		40 h.		40 h.
Carrying out exercises and solving problems individually and/or in teams		12 h.	15 h.	27 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%	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	50%			
<b>CH - Class hours:</b> 52 h.				
<b>NCH - Non-class hours:</b> 28 h.				
<b>TH - Total hours:</b> 80 h.				

1RGF293 (1 sem)				
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			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)		
CH - Class hours: 0 h.				
NCH - Non-class hours: 3 h.				
TH - Total hours: 3 h.				

1RGF290 (1 sem)

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.	4 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Self-assessment	25%	(No mechanisms)	
Co-assessment	25%		
Observation (technical capacity, attitude and participation)	50%		

CH - Class hours: 2 h.  
NCH - Non-class hours: 2 h.  
TH - Total hours: 4 h.

## CONTENTS

1. Complex Analysis

- Complex functions. Differentiation and Cauchy-Riemann equations.
- Complex integration.
- Cauchy's integral formulas.
- Meromorphic functions and the residue theorem.
- Laurent series.

2. Ordinary Differential Equations

- Higher order ODE's.
- ODE systems.
- Laplace and Fourier Transforms.
- Sturm-Liouville problems.
- Series solutions.
- Numeric methods, introduction.

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**LEARNING RESOURCES AND BIBLIOGRAPHY**

**Learning resources**

Subject notes  
Moodle Platform

**Bibliography**

<https://labur.eus/Cq5w9>