

## [GMA302] MATHEMATICS II

### GENERAL INFORMATION

<b>Studies</b>	DEGREE IN MECHANICAL ENGINEERING	<b>Subject</b>	MATHEMATICS
<b>Semester</b>	2	<b>Course</b>	1
<b>Character</b>	BASIC TRAINING	<b>Mention / Field of specialisation</b>	
<b>Plan</b>	2022	<b>Modality</b>	Face-to-face
<b>Credits</b>	6	<b>Hours/week</b>	5.06
		<b>Language</b>	EUSKARA
		<b>Total hours</b>	91 class hours + 59 non-class hours = <b>150 total hours</b>

### PROFESSORS

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MATEOS HEIS, MODESTO
BORGE DE PRADA, JUAN

### REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
MATHEMATICS I	(No previous knowledge required)

### LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
<b>G-RA07</b> - To solve mathematical problems that may arise in engineering, demonstrating the ability to apply knowledge of: linear algebra; geometry; differential geometry and differential and partial differential equations		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		0,28
<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		0,32
<b>Total:</b>				<b>6</b>

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

### ENAAE LEARNING RESULTS

- ENA101** - Knowledge and comprehension: Knowledge and understanding of mathematics and other basic sciences inherent in them engineering speciality, at a level that allows them to acquire the other competencies of the degree.
- 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.
- 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.
- 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.
- 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

**RGM113** [!] *Modeliza y resuelve los problemas geométricos, los físicos y los de ingeniería, utilizando las ecuaciones diferenciales*

#### LEARNING ACTIVITIES

	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	4 h.		4 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	18 h.	10 h.	28 h.
Self-assessment tests in a context of autonomous and continuous learning		4 h.	4 h.

#### EVALUATION SYSTEM

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

*W*

10%

#### MAKE-UP MECHANISMS

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

Individual written and/or oral tests or individual coding/programming tests 90%

**CH - Class hours:** 22 h.  
**NCH - Non-class hours:** 14 h.  
**TH - Total hours:** 36 h.

**RGM114 [!]** *Utiliza el álgebra lineal para modelizar y resolver problemas de ingeniería, utilizando software matemático*

**LEARNING ACTIVITIES**

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
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.	2 h.	4 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	6 h.		6 h.
Computer simulation exercises, individually and/or in teams	1 h.	1 h.	2 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	51 h.	19 h.	70 h.
Self-assessment tests in a context of autonomous and continuous learning		17 h.	17 h.

**EVALUATION SYSTEM**

*W*

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	10%
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	10%
Individual written and/or oral tests or individual coding/programming tests	80%

**MAKE-UP MECHANISMS**

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

**CH - Class hours:** 60 h.  
**NCH - Non-class hours:** 39 h.  
**TH - Total hours:** 99 h.

**RGM190 [!]** *Conocer y aplicar las fases para desarrollar de forma guiada, con los objetivos y la planificación previamente definidos, un proyecto de complejidad técnica acorde con los conocimientos de formación básica de la ingeniería. Reflexiona sobre los cono*

**LEARNING ACTIVITIES**

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	2,4 h.	1,6 h.	4 h.

**EVALUATION SYSTEM**

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Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%
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**MAKE-UP MECHANISMS**

*(No mechanisms)*

**Comments:** Continuous evaluation. FEEDBACK received from the tutor in the project follow-up meetings.

**CH - Class hours:** 2,4 h.  
**NCH - Non-class hours:** 1,6 h.  
**TH - Total hours:** 4 h.

**RGM191 [!]** *Contribuir en la estrategia de funcionamiento del equipo priorizando los objetivos comunes, fomentando y valorando la participación de todas las personas y responsabilizándose de las tareas individuales, así como del cumplimiento de plazos.*

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	1,8 h.	1,2 h.	3 h.
<b>EVALUATION SYSTEM</b>	<b>W</b>	<b>MAKE-UP MECHANISMS</b>	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	(No mechanisms)	
<b>Comments:</b> Continuous evaluation. FEEDBACK received from the tutor in the project follow-up meetings			
<b>CH - Class hours:</b> 1,8 h.			
<b>NCH - Non-class hours:</b> 1,2 h.			
<b>TH - Total hours:</b> 3 h.			

**RGM193** [!] *Redacta una memoria de proyecto clara y concisa utilizando las fuentes de información y estructura de memoria facilitadas, 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	2,4 h.	1,6 h.	4 h.
<b>EVALUATION SYSTEM</b>	<b>W</b>	<b>MAKE-UP MECHANISMS</b>	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	(No mechanisms)	
<b>Comments:</b> Continuous evaluation. FEEDBACK received in the meetings with the tutor for the follow-up of the project			
<b>CH - Class hours:</b> 2,4 h.			
<b>NCH - Non-class hours:</b> 1,6 h.			
<b>TH - Total hours:</b> 4 h.			

**RGM194** [!] *Realiza una presentación oral y defensa del proyecto clara y concisa, haciendo 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	2,4 h.	1,6 h.	4 h.
<b>EVALUATION SYSTEM</b>	<b>W</b>	<b>MAKE-UP MECHANISMS</b>	
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)	
<b>Comments:</b> Continuous evaluation. FEEDBACK received from the tutor in the project follow-up meetings.			
<b>CH - Class hours:</b> 2,4 h.			
<b>NCH - Non-class hours:</b> 1,6 h.			
<b>TH - Total hours:</b> 4 h.			

## CONTENTS

1. Ordinary differential equations

1.1 Equations in separable variables. Homogeneous. Linear. Bernoulli. 1.2. Physical problem.

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## 2. Linear algebra

2.1. System of linear equations 2.2. Matrix algebra 2.3. Determinants 2.4. Vector spaces 2.5. Linear applications 2.6. Eigenvalues, eigenvectors and diagonalisation

### LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Moodle Platform	Robert Smith, Roland Minton. Cálculo, tomos 1 y 2 (McGraw-Hill, 2007)
Class presentations	Salas, S. L., Hille, E. & Etgen, G. J. Calculus: una y varias variables (Reverte, 2003)
Computer practical training	Lay, D. C. & Murrieta, J. M. Álgebra lineal y sus aplicaciones (Pearson Educación, 2007)
Slides of the subject	Poole, D. Álgebra lineal: una introducción moderna (Cengage Learning Editores, 2011)
Video projections	
Subject notes	