

## [GMQ302] THEORY OF MECHANISMS

### GENERAL INFORMATION

<b>Studies</b>	DEGREE IN MECHANICAL ENGINEERING	<b>Subject</b>	?
<b>Semester</b>	1	<b>Course</b>	3
<b>Character</b>	COMPULSORY	<b>Mention / Field of specialisation</b>	
<b>Plan</b>	2022	<b>Modality</b>	Face-to-face
<b>Credits</b>	4,5	<b>Hours/week</b>	3.14
		<b>Language</b>	EUSKARA/CASTELLANO/ENGLISH
		<b>Total hours</b>	56.5 class hours + 56 non-class hours = <b>112.5 total hours</b>

### 2030 AGENDA GOALS



### PROFESSORS

MATEOS HEIS, MODESTO  
ARETXABALETA RAMOS, LAURENTZI  
MCCLOSKEY GOMEZ, ALEX

### REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
PHYSICS I MECHANICS	(No previous knowledge required)

### LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
<b>GMR304</b> - To know the principles of theory of machines and mechanisms	x			3,78
<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		0,4
<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>4,5</b>

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

### ENAE LEARNING RESULTS

- ENA102** - Knowledge and comprehension: Knowledge and comprehension of the engineering disciplines of their specialty, at the level necessary to acquire the rest of the competencies of the degree, including notions of the latest advances.
- 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 specialty; 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 specialty, 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.
- ENA107** - Engineering projects: Project capacity some state-of-the-art knowledge of their engineering specialty.
- ENA108** - Research and innovation: Ability to carry out bibliographic searches and consult and use databases and other information sources with discretion, in order to carry out simulation and analysis with the aim of conducting research on technical topics of their specialty.
- ENA109** - Research and innovation: Ability to consult and apply codes of good practice and security in their specialty.
- ENA110** - Research and innovation: Capacity and ability to project and carry out experimental investigations, interpret results, and reach conclusions in their field of study.
- ENA111** - Practical application of engineering: Understanding of the applicable techniques and methods for analysis, design and research and their limitations in the field of their specialty.
- ENA112** - Practical application of engineering: Practical competency to solve complex problems, carry out complex engineering projects, and conduct investigations specific to their specialty.
- 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 specialty.
- ENA115** - Practical application of engineering: Knowledge of the social, health and safety, environmental, economic and industrial implications of engineering practice.
- ENA118** - Preparation of judgements: Ability to manage complex technical or professional activities or projects of their specialty, 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.

**ENA121** - Continued training: Ability to acknowledge the need for their own continued training and to undertake this activity throughout their professional life independently.

**ENA122** - Continued training: Ability to stay up to date on science and technology innovations.

## SECONDARY LEARNING RESULTS

### 1RGM392 (1 sem)

#### LEARNING ACTIVITIES

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

CH

1 h.

NCH

2 h.

TH

3 h.

#### EVALUATION SYSTEM

W

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

100%

#### MAKE-UP MECHANISMS

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

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

CH - Class hours: 1 h.

NCH - Non-class hours: 2 h.

TH - Total hours: 3 h.

### 1RGM391 (1 sem)

#### LEARNING ACTIVITIES

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

CH

1 h.

NCH

2 h.

TH

3 h.

#### EVALUATION SYSTEM

W

Self-assessment

50%

Observation (technical capacity, attitude and participation)

50%

**Comments:** The average of the marks of the tutor's assessment and the self-assessment carried out by the work team is calculated, using the defined rubrics. Afterwards, the final mark is calculated taking into account the co-evaluation among the members of the team.

#### MAKE-UP MECHANISMS

(No mechanisms)

CH - Class hours: 1 h.

NCH - Non-class hours: 2 h.

TH - Total hours: 3 h.

### 1RGM394 (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

1 h.

NCH

3 h.

TH

4 h.

#### EVALUATION SYSTEM

W

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%

#### 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

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

**CH - Class hours:** 1 h.  
**NCH - Non-class hours:** 3 h.  
**TH - Total hours:** 4 h.

**1RGM390 (1 sem)**

**LEARNING ACTIVITIES**

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

**CH**

1 h.

**NCH**

3 h.

**TH**

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**

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

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

**CH - Class hours:** 1 h.  
**NCH - Non-class hours:** 3 h.  
**TH - Total hours:** 4 h.

**1RGM393 (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**

1 h.

**NCH**

3 h.

**TH**

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**

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

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

**CH - Class hours:** 1 h.  
**NCH - Non-class hours:** 3 h.  
**TH - Total hours:** 4 h.

**RGM310 [!]** *Realiza el análisis cinético y cinemático de mecanismos utilizando la mecánica clásica y analítica*

**LEARNING ACTIVITIES**

Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints

**CH**

2 h.

**NCH**

14 h.

**TH**

16 h.

Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects

13 h.

13 h.

**EVALUATION SYSTEM**

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

**W**

100%

**MAKE-UP MECHANISMS**

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

**CH - Class hours:** 15 h.  
**NCH - Non-class hours:** 14 h.  
**TH - Total hours:** 29 h.

**RGM312 [!]** *Utiliza las leyes fundamentales de la mecánica clásica y analítica en una situación real*

**LEARNING ACTIVITIES**

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

**Comments:** The calculations of the mechanisms semester project are carried out using the latest version of MATLAB software.

**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

**Comments:** Students have the responsibility of meeting the experts to do the tracking of the project and to ensure the achievement of the goals.

**W**

100%

**MAKE-UP MECHANISMS**

(No mechanisms)

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

**CH**

14,5 h.

**NCH**

14 h.

**TH**

28,5 h.

**CH - Class hours:** 14,5 h.

**NCH - Non-class hours:** 14 h.

**TH - Total hours:** 28,5 h.

**RGM311 [!]** *Analiza las vibraciones de un sistema mecánico empleando las ecuaciones de Lagrange*

**LEARNING ACTIVITIES**

Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints

Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects

**CH**

2 h.

**NCH**

15 h.

**TH**

17 h.

20 h.

20 h.

**EVALUATION SYSTEM**

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

**W**

100%

**MAKE-UP MECHANISMS**

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

**CH - Class hours:** 22 h.

**NCH - Non-class hours:** 15 h.

**TH - Total hours:** 37 h.

**CONTENTS**

1. Kinematics and kinetics of mechanisms.
2. Analytical mechanics.
3. Mechanical vibrations.

**LEARNING RESOURCES AND BIBLIOGRAPHY**

**Learning resources**

Slides of the subject  
Specific Master Software  
Moodle Platform  
Labs

**Bibliography**

1. Meriam J.L. Dinámica, Ed. Reverté, 3ª Ed, 1997
2. Beer F.P. y Johnston E.R., Mecánica Vectorial para Ingenieros. Dinámica, McGraw-Hill, 6ª Ed. 1998
3. Sandor, G.N., Mechanism Design Analysis and Synthesis, Vol. I y II, Prentice-Hall, 3ª Ed., 1997

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4. Shigley J.E. y Uicker J.J Jr., Teoría de máquinas y mecanismos,  
McGraw-Hill, 1983