

## [GDN301] MATERIAL ELASTICITY AND STRENGTH

### GENERAL INFORMATION

<b>Studies</b>	DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING		<b>Subject</b>	MECHANICS
<b>Semester</b>	2	<b>Course</b>	2	<b>Mention / Field of specialisation</b>
<b>Character</b>	COMPULSORY		<b>Language</b>	EUSKARA/CASTELLANO
<b>Plan</b>	2022	<b>Modality</b>	Face-to-face	<b>Total hours</b> 67 class hours + 83 non-class hours = <b>150 total hours</b>
<b>Credits</b>	6	<b>Hours/week</b>	3.72	

### 2030 AGENDA GOALS



### PROFESSORS

GALFARSORO ANDUAGA, UNAI  
ELKORO UGARTEBURU, ANDER

### REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
PHYSICS I	(No previous knowledge required)

### LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
<b>GDR211</b> - To size product components based on the loads that affect the system and the material to be used, considering its efficiency			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		0,36
<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		0,24
<b>Total:</b>				<b>6</b>

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

### ENAE LEARNING RESULTS

ENAE LEARNING RESULTS	ECTS
<b>ENAE02</b> - Knowledge and understanding: A systematic understanding of the key aspects and concepts of their branch of engineering.	0,72
<b>ENAE06</b> - Analysis in engineering: Ability to apply their knowledge and understanding in analysing product, process and method engineering.	0,72
<b>ENAE08</b> - Engineering projects: Ability to apply their knowledge in the development and completion of projects which meet specific requirements.	1,6
<b>ENAE13</b> - Practical application of engineering: Ability to select and use suitable equipment, tools and methods.	1,6
<b>ENAE15</b> - Practical application of engineering: Understanding of applicable methods and techniques and their limitations.	0,96
<b>ENAE19</b> - Transversal competences: Demonstrate that they are aware of the responsibility implied in the practical application of engineering, the social and environmental impact, and show commitment with professional ethics, responsibility and regulations of the practical application of engineering.	0,4
<b>Total:</b>	<b>6</b>

### SECONDARY LEARNING RESULTS

#### 2RGD294 (2 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
1 h.	2 h.	3 h.

#### EVALUATION SYSTEM

Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree

W

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

project, master's thesis, challenges and problems

and problems

**CH - Class hours:** 1 h.

**NCH - Non-class hours:** 2 h.

**TH - Total hours:** 3 h.

**RGD220** [!] *Dimensiona elementos estructurales sometidos a diferentes estados de carga*

**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

Computer simulation exercises, individually and/or in teams

**CH**

3 h.

**NCH**

10 h.

**TH**

13 h.

4 h.

10 h.

14 h.

**EVALUATION SYSTEM**

**W**

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

50%

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

**MAKE-UP MECHANISMS**

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

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

**CH - Class hours:** 7 h.

**NCH - Non-class hours:** 20 h.

**TH - Total hours:** 27 h.

**2RGD290** (2 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**

**NCH**

**TH**

3 h.

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

**CH - Class hours:** 0 h.

**NCH - Non-class hours:** 3 h.

**TH - Total hours:** 3 h.

**RGD219** [!] *Identifica y evalúa los estados tensionales y deformaciones de estructuras y componentes de diseño*

**LEARNING ACTIVITIES**

Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning

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

Carrying out exercises and solving problems individually and/or in teams

**CH**

4 h.

**NCH**

6 h.

**TH**

10 h.

4 h.

4 h.

30 h.

12 h.

42 h.

20 h.

32 h.

52 h.

**EVALUATION SYSTEM**

**W**

Individual written and/or oral tests or individual

100%

**MAKE-UP MECHANISMS**

Individual written and/or oral tests or individual

coding/programming tests

coding/programming tests

**CH - Class hours:** 58 h.  
**NCH - Non-class hours:** 50 h.  
**TH - Total hours:** 108 h.

### 2RGD291 (2 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

3 h.

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

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

### 2RGD293 (2 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

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

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

### 2RGD292 (2 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

1 h.

2 h.

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

(No mechanisms)

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

## CONTENTS

1.- Introduction  
2.- Stress and unit strain (tension/compression and shear)  
3.- Axial deformation  
4.- Torsion  
5.- Flexure: equilibrium of beams  
6.- Bending: tension in beams

## LEARNING RESOURCES AND BIBLIOGRAPHY

### Learning resources

- [!] *Presentaciones en clase*
- [!] *Plataforma Moodle*
- [!] *Apuntes de la asignatura*
- [!] *Software específico de la titulación*

### Bibliography

- Craig RR. Mechanics of Materials. John Wiley & Sons (3ª edición); 2011
- Beer FP, Johnston ER, Dewolf JT. Mecánica de Materiales. McGraw-Hill Interamericana (4ª edición); 2007
- Hibbeler RC. Mecánica de Materiales. Prentice Hall (3ª edición); 1997
- Gere JM. Resistencia de Materiales, Timoshenko. Thomson (5ª edición); 2006
- Beford A, Liechti KM. Mecánica de Materiales. Prentice Hall (1ª edición); 2002