

## [MHD301] METAL AND REINFORCED CONCRETE STRUCTURES

### GENERAL INFORMATION

<b>Studies</b>	UNIVERSITY MASTER IN INDUSTRIAL ENGINEERING		<b>Subject</b>	?
<b>Semester</b>	1	<b>Course</b>	1	<b>Mention / Field of specialisation</b>
<b>Character</b>	COMPULSORY		<b>Language</b>	CASTELLANO
<b>Plan</b>	2025	<b>Modality</b>	Face-to-face	<b>Total hours</b> 65 class hours + 85 non-class hours = <b>150 total hours</b>
<b>Credits</b>	6	<b>Hours/week</b>	3.61	

### 2030 AGENDA GOALS



### PROFESSORS

AIZPURU NAZABAL, AITZIBER  
GOMENDIO RUIZ, AMAIA  
IRIONDO GABILONDO, JAIONE  
ELKORO UGARTEBURU, ANDER

### REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	[!] ELASTICIDAD Y RESISTENCIA DE MATERIALES [!] TEORÍA DE ESTRUCTURAS

### LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
<b>MH2517</b> - Demonstrate capacity for the design, construction and operation of industrial plants.		x		1,08
<b>MH2518</b> - Demonstrate knowledge of construction, building, facilities, infrastructure and urban planning in the field of industrial engineering.		x		0,36
<b>MH2519</b> - Demonstrate knowledge and skills in structural design and calculation.		x		2,88
<b>MH2523</b> - Demonstrate knowledge and skills to perform certifications, audits, verifications, tests and reports.		x		0,48
<b>MH2526</b> - Apply acquired knowledge and problem-solving skills in new, unfamiliar or changing environments within broader (or multidisciplinary) contexts related to their area of study.		x		0,08
<b>MH2527</b> - Demonstrate the ability to integrate knowledge and deal with the complexity of formulate judgments based on incomplete or limited information, including reflections on the SDGs, human rights and fundamental rights, and on social, health and safety, environmental, economic and industrial implications and responsibilities.		x		0,36
<b>MH2528</b> - Communicate its conclusions and the ultimate knowledge and rationale behind them to specialized and non-specialized audiences in a clear and unambiguous manner.		x		0,28
<b>MH2529</b> - Possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.		x		0,24
<b>MH2530</b> - Work with people, involving them and leading them in a dynamic directed towards a common objective that includes reflection on their ethical and social responsibility, with a global vision of the work to be carried out and the characteristics required (quality, deadlines, etc.), assuming responsibility for the decisions taken.		x		0,24

**Total:** 6

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

### SECONDARY LEARNING RESULTS

**RMH106** [!] *Diseña y proyecta una estructura metálica y/o de hormigón armado con apoyo de programas informáticos específicos.*

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		6 h.	6 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	1 h.		1 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	2 h.	8 h.	10 h.
Computer simulation exercises, individually and/or in teams	2 h.	8 h.	10 h.
Carrying out visits and/or learning trips to other university centres, laboratories, companies		1 h.	1 h.

and/or thermal power plants

Tutoring sessions and monitoring of training activities

1 h.

1 h.

Reading and personal and/or shared analysis of relevant and current publications (books, articles, catalogues, etc.) related to the speciality

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

60%

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

20%

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

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

20%

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

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

**NCH - Non-class hours:** 25 h.

**TH - Total hours:** 30 h.

**RMH104** [!] *Dimensiona y verifica tanto los elementos estructurales como las uniones de una estructura metálica cumpliendo los criterios de agotamiento descritos en la normativa vigente.*

#### 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 h.

2 h.

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

7 h.

7 h.

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

2 h.

2 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

5 h.

5 h.

Computer simulation exercises, individually and/or in teams

2 h.

3 h.

5 h.

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

15 h.

15 h.

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

11 h.

4 h.

15 h.

Carrying out visits and/or learning trips to other university centres, laboratories, companies and/or thermal power plants

2 h.

2 h.

Tutoring sessions and monitoring of training activities

2 h.

2 h.

Reading and personal and/or shared analysis of relevant and current publications (books, articles, catalogues, etc.) related to the speciality

2 h.

2 h.

Self-assessment tests in a context of autonomous and continuous learning

2 h.

1 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

10%

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

20%

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

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

70%

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

**CH - Class hours:** 30 h.

**NCH - Non-class hours:** 30 h.

**TH - Total hours:** 60 h.

**RMH105** [!] *Conoce el método de los estados límites y dimensiona o verifica las secciones y elementos estructurales de una*

**estructura de hormigón armado incidiendo en la durabilidad de la estructura durante su vida en servicio.**

**LEARNING ACTIVITIES**

	<b>CH</b>	<b>NCH</b>	<b>TH</b>
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.
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		7 h.	7 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints		3 h.	3 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	2 h.	5 h.	7 h.
Computer simulation exercises, individually and/or in teams	2 h.	3 h.	5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	15 h.		15 h.
Carrying out exercises and solving problems individually and/or in teams	11 h.	4 h.	15 h.
Carrying out visits and/or learning trips to other university centres, laboratories, companies and/or thermal power plants		2 h.	2 h.
Tutoring sessions and monitoring of training activities		2 h.	2 h.
Reading and personal and/or shared analysis of relevant and current publications (books, articles, catalogues, etc.) related to the speciality		2 h.	2 h.

**EVALUATION SYSTEM**

	<b>W</b>
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	20%
Individual written and/or oral tests or individual coding/programming tests	70%

**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

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

**CH - Class hours:** 30 h.

**NCH - Non-class hours:** 30 h.

**TH - Total hours:** 60 h.

**CONTENTS**

**LEARNING RESOURCES AND BIBLIOGRAPHY**

**Learning resources**

Subject notes

Specific Master Software

Presentations by external Lecturers

Topic related web quires

Video projections

Computer practical training

[!] *Visitas a edificios/obras*

[!] *MUdle plataforma*

**Bibliography**

A. Hirt MA, Crisinel M. Charpentes Métalliques. Presses polytechniques et universitaires romandes; 2005

Argüelles Alvares R, Arriaga Martitegui F, Argüelles Bustillo JM, Atienza. Estructuras de Acero. Tomo II: Tomo II: Uniones y Sistemas Estructurales, 2ª edición. Editorial Bellisco; 2015

Ministerio de Transportes, Movilidad y Agenda Urbana. Código estructural: Real Decreto y Articulado. Centro de publicaciones del Mitma, 2021

Juan Carlos Arroyo Portero, Francisco Morán Cabré, Álvaro García Meseguer. Hormigón armado 16ª edición. Cínter, D.L. 2018

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