



## Course guide

# 220113 - TECI - Structural Theory and Industrial Construction

**Last modified:** 19/04/2023

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 737 - RMEE - Department of Strength of Materials and Structural Engineering.  
758 - EPC - Department of Project and Construction Engineering.

**Degree:** BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 4.5    **Languages:** Catalan

### LECTURER

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**Coordinating lecturer:** XAVIER ROCA RAMON  
CARLOS ROMEA

**Others:** CARLES ROMEA  
JOSE MANUEL DÍAZ

### PRIOR SKILLS

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The "Theory of Structures" module presumes prior knowledge of the subject "Continuum mechanics and Strength and Materials", as well as elementary notions of matrix algebra.

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

CE22-GRETI. Knowledge and skills for the calculation and design of industrial structures and constructions. (Specific Technology Module)

**Transversal:**

2. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

### TEACHING METHODOLOGY

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The course is organized as follows:

1. Classes with large groups. In these classes, the theoretical contents of the subject, as well as part of the practical contents, are developed. The expository strategy to be used in each lecture will be at the teacher's discretion, and will depend upon the goals set out in the corresponding module. The first and second partial exams will also take place in these classes.
2. Classes with medium-sized/small groups. These classes will focus on the practical application of the concepts developed in the theoretical lectures. Practical problems will be solved by either the teacher or the students themselves as part of their self-learning process. If appropriate, supervised activities may also be carried out.

### LEARNING OBJECTIVES OF THE SUBJECT

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Provide students with the basic notions of both structural design and industrial construction.



## STUDY LOAD

| Type              | Hours | Percentage |
|-------------------|-------|------------|
| Self study        | 67,5  | 60.00      |
| Hours large group | 31,0  | 27.56      |
| Hours small group | 14,0  | 12.44      |

**Total learning time:** 112.5 h

## CONTENTS

### Module 1. Introduction to structures

**Description:**

- 1.1. Concept of structure
- 1.2. Steps for structural analysis
- 1.3. Classification of structures
- 1.4. Solution methods in structural analysis
  - 1.4.1. Force method
  - 1.4.2. Displacement method
  - 1.4.3. Comparison of force and displacement methods

**Full-or-part-time:** 7h

Theory classes: 2h

Laboratory classes: 1h

Self study : 4h

### Module 2. Basic notions of the displacement method

**Description:**

- 2.1. Slope-deflection equations
- 2.2. Particularization to non-sway structures
- 2.3. Simplifications derived from symmetry conditions.
- 2.4. Sway structures

**Full-or-part-time:** 27h 30m

Theory classes: 6h 45m

Laboratory classes: 3h

Self study : 17h 45m



### Module 3. Matrix form of the displacement method: the stiffness method.

**Description:**

- 3.1. Geometrical description of the structure. Reference systems.
- 3.2. Matrix form of the slope-deflection equations: the stiffness matrix.
- 3.3. Transformation of coordinates
- 3.4. Structural equilibrium in matrix form.
- 3.5. Imposition of boundary conditions.
- 3.6. Pin-ended beams
- 3.7. Thermal effects.

**Full-or-part-time:** 21h 45m

Theory classes: 6h 45m

Laboratory classes: 3h

Self study : 12h

### Module 4. Introduction to industrial construction

**Description:**

- 4.1 Construction Processes
- 4.2 Legal framework of construction processes

**Full-or-part-time:** 23h 30m

Theory classes: 6h 45m

Laboratory classes: 3h

Self study : 13h 45m

### Module 5. Basics on building systems: functions and characteristics

**Description:**

- 5.1 Foundations and Structures
- 5.2 External closures: façades and roofs
- 5.3 Interior elements
- 5.4 Finishings

**Full-or-part-time:** 32h 45m

Theory classes: 8h 45m

Laboratory classes: 4h

Self study : 20h

## GRADING SYSTEM

1st exam "Structural theory", weight 40%

Proposed activity "Structural theory", weight: 10%

2nd exam "Industrial construction", weight: 40%

Proposed activity "Industrial construction", weight: 10%

The bad results of the partial examination will be able to recover with another test to realise the day fixed by the final examination. This test can access all the students enrolled that they have asked it with a minimum of 72 hours before. The qualification of the test will be between 0 and 10, and will substitute to the initial qualification always it will be upper.



## BIBLIOGRAPHY

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**Basic:**

- Cervera, M.; Blanco, E. Mecanica de estructuras, vol. 2, Métodos de análisis [on line]. 2ª ed. Barcelona: Edicions UPC, 2002 [Consultation: 19/05/2020]. Available on: <http://hdl.handle.net/2099.3/36196>. ISBN 8483016232.