Course guide
220113 - TECI - Structural Theory and Industrial Construction

Last modified: 15/07/2025

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: 2025 **ECTS Credits:** 4.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: VIRGÍNIA MENDIZÁBAL
Casals Casanova, Miquel

Others: VIRGINIA DOLORES MENDIZÁBAL DINUCCI

Maiques Garcia, Maria

En aquesta assignatura pot haver algunes classes en català i algunes en castellà en el mateix grup. Consultar els horaris per saber l'idioma concret de cada classe/grup

PRIOR SKILLS

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

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

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.
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LEARNING OBJECTIVES OF THE SUBJECT

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%

Unsatisfactory results (less than 5.0) of the partial exam may be retaken through a written test to be held on the day set for the final exam (right at the end of it). This test can be accessed by all students who meet the requirement and who have requested it within the established period. The grade of the partial exam will be replaced by a 5 upon passing the retake test (which is evaluated between 0 and 10) or the grade of the retake test will replace the initial grade as long as it is higher.

BIBLIOGRAPHY

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.
- Casals Casanova, Miquel; Roca Ramon, Xavier. Construcció industrial: introducció i conceptes bàsics [on line]. Barcelona: Edicions UPC, 2003 [Consultation: 27/06/2025]. Available on: http://hdl.handle.net/2099.3/36747. ISBN 9788483016817.