

Course guide

330126 - TECI - Structural Theory and Industrial Construction

Last modified: 21/04/2026

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2016). (Compulsory subject).
BACHELOR'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2017). (Optional subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Francesco Greco

Others: Jordi Josep Torrelles Rico

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Conocimiento y utilización de los principios de análisis y cálculo de estructuras matriciales, con aplicación del diseño y cálculo, a nivel seccional, de estructura industriales tanto de hormigón como metálicas, y con la utilización específica de normativas vigentes

Transversal:

2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
3. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
4. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
5. 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

LEARNING OBJECTIVES OF THE SUBJECT

Understand, comprehend, and utilize the theoretical foundations for structural analysis: Calculation and application of matrix analysis for evaluating stresses in structures.

Understand, comprehend, and utilize the basic theory associated with the design and calculation of reinforced concrete structures.

Understand, comprehend, and utilize the basic theory associated with the design and calculation of steel and timber structures.

Understand, comprehend, and utilize the various current national and international regulations related to the design and calculation of structures and industrial constructions.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	45,0	30.00
Hours small group	15,0	10.00

Total learning time: 150 h

CONTENTS

(ENG) Título del contenido 1: Cálculo y aplicación de análisis matricial, Introducción a elementos Finitos.

Description:

Calculation of stresses using the matrix method of structures. Concepts of the finite element method.

Specific objectives:

Understand, comprehend, and utilize the calculation of stresses in structures using the matrix method, both for manual application and with computer tools.

Related activities:

1, 4, 5, 6.

Full-or-part-time: 33h 33m

Theory classes: 10h

Laboratory classes: 3h 33m

Self study : 20h

(ENG) Título del contenido 2: Teoría básica asociada al diseño y cálculo de estructuras de hormigón armado.

Full-or-part-time: 50h

Theory classes: 15h

Laboratory classes: 5h

Self study : 30h

(ENG) Título del contenido 3: Teoría básica asociada al diseño y cálculo de estructuras metálicas y de madera.

Full-or-part-time: 33h 33m

Theory classes: 10h

Laboratory classes: 3h 33m

Self study : 20h

(ENG) Título del contenido 4: Aplicación normativas vigentes, nacionales e internacionales, asociadas al diseño y cálculo de estructuras y construcciones industriales.

Full-or-part-time: 33h 33m

Theory classes: 10h

Laboratory classes: 3h 33m

Self study : 20h

ACTIVITIES

(ENG) TÍTULO DE LA ACTIVIDAD 1: PRÁCTICA DE LABORATORIO: ANÁLISIS MATRICIAL (CONTENIDO 1).

Description:

Laboratory practice on computers with specific software for structural analysis. Obtain stresses in a structure using a computer. Summarize the stresses that allow for dimensioning.

Specific objectives:

The student will prepare a report (in pairs) according to the provided guidelines and submit it to the instructor. The reports are returned corrected with corresponding feedback from the instructor in the following session. This represents 1/3 of the laboratory grade.

Material:

Practical Book (available on the Atenea digital campus)

Website: <http://www.epsem.upc.edu/~practiquesresistenciamaterials>

All the necessary material for carrying out the practice.

Full-or-part-time: 15h

Laboratory classes: 5h

Self study: 10h

(ENG) TÍTULO DE LA ACTIVIDAD 2: PRÁCTICA DE LABORATORIO: ESTRUCTURAS HORMIGÓN (CONTENIDO 2 Y 4).

Full-or-part-time: 15h

Laboratory classes: 5h

Self study: 10h

(ENG) TÍTULO DE LA ACTIVIDAD 3: PRÁCTICA DE LABORATORIO: ESTRUCTURAS METÁLICAS (CONTENIDO 3 Y 4).

Full-or-part-time: 15h

Laboratory classes: 5h

Self study: 10h

(ENG) TÍTULO DE LA ACTIVIDAD 4: PRUEBA INDIVIDUAL DE EVALUACIÓN CONTINUA: CÁLCULO MATRICIAL DE ESTRUCTURAS. (CONTENIDO 1).

Full-or-part-time: 7h

Theory classes: 2h

Self study: 5h

(ENG) TÍTULO DE LA ACTIVIDAD 5: PRUEBA INDIVIDUAL DE EVALUACIÓN CONTINUA: CÁLCULO DE ESTRUCTURAS DE HORMIGÓN Y METÁLICAS CON APLICACIÓN DE LA NORMATIVA VIGENTE EN EL CAMPO DE LA INGENIERÍA ESTRUCTURAL (CONTENIDOS: 2, 3 Y 4).

Full-or-part-time: 7h

Theory classes: 2h

Self study: 5h

(ENG) TÍTULO DE LA ACTIVIDAD 6: PRUEBA FINAL: (CONTENIDOS: 1ª a 4).

Full-or-part-time: 13h

Theory classes: 3h

Self study: 10h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the [Action Framework for Academic Integrity in Assessment at the UPC](#).

Laboratory (Activities 1, 2, 3) 10% of the course grade.

Evaluation Test (Activity 4) 45% of the course grade.

Evaluation Test (Activity 5) 45% of the course grade.

Final exam 90% of the course grade.

The final grade of the course will be the best between the continuous evaluation and the re-take grade.

To pass the subject, the student must achieve a weighted average of the continuous assessment ≥ 5 .

EXAMINATION RULES.

It is an essential condition for passing the course to have completed the practicals satisfactorily.

BIBLIOGRAPHY

Basic:

- Rivera Amores, Juanjo. Anàlisi d'estructures: teoria i problemes [on line]. Barcelona: Edicions UPC, 2005 [Consultation: 06/11/2020]. Available on: <http://hdl.handle.net/2099.3/36638>. ISBN 8483018179.
- Rivera Amores, Juanjo. Mecànica de materials: problemes [on line]. Barcelona: Edicions UPC, 2008 [Consultation: 06/11/2020]. Available on: <http://hdl.handle.net/2099.3/36772>. ISBN 9788483017616.
- Courbon, Jean. Tratado de resistencia de materiales. 2ª ed. Madrid: Aguilar, 1968.
- Chiumenti, M.; Cervera, Miguel. Estática de estructuras: problemas resueltos. Barcelona: Centro Internacional de Métodos Numéricos en la Ingeniería (CIMNE), 2007. ISBN 9788496736207.
- Beer, Ferdinand P., i altres. Mecánica de materiales [on line]. 7ª ed. México: McGraw-Hill, 2017 [Consultation: 08/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8071. ISBN 9786071502636.
- Gere, James M. Resistencia de materiales. 5ª ed. Madrid: International Thomson Editores, 2002. ISBN 9788497320658.
- Budevsky, O. Fonaments de l'anàlisi química. Barcelona: Universitat de Barcelona, 1998. ISBN 8483380331.
- Jiménez Montoya, P.; García Meseguer, A.; Morán, F. Hormigón armado [on line]. 15ª ed. Barcelona: Gustavo Gili, 2009 [Consultation: 27/05/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=3209549>. ISBN 9788425223075.
- Espanya. Ministerio de Fomento. EHE-08: instrucción de hormigón estructural: con comentarios de los miembros de la Comisión Permanente del Hormigón [on line]. 5ª ed. Madrid: Ministerio de Fomento, Secretaría General Técnica, 2011 [Consultation: 12/11/2020]. Available on: <http://www.ponderosa.es/docs/Norma-EHE-08.pdf>. ISBN 9788449808999.
- Espanya. Comisión Permanente del Hormigón. Guía de aplicación de la Instrucción de Hormigón Estructural (EHE-08): edificación. Madrid: Ministerio de Fomento, 2014. ISBN 9788449809781.
- UNE EN 1993-1-3:2012: Eurocódigo 3: proyecto de estructuras de acero [on line]. Madrid: AENOR, 2010-2016 [Consultation: 10/06/2022]. Available on: https://portal-aenormas-aenor-com.recursos.biblioteca.upc.edu/aenor/Suscripciones/Personal/pagina_per_sus.asp.
- Código técnico de la edificación y sus reformas [on line]. Pamplona: DAPP Publicaciones Jurídicas, 2011 [Consultation: 18/06/2024]. Available on: <https://www.codigotecnico.org/>. ISBN 9788492507320.



Complementary:

- Timoshenko, Stephen. Resistencia de materiales. Madrid: Espasa-Calpe, 1989.
- Argüelles Álvarez, R. Cálculo de estructuras. Madrid: Escuela Técnica Superior de Ingenieros de Montes, 1981-86. ISBN 8460024105.
- Ortiz Berrocal, Luis. Resistencia de materiales [on line]. 3ª ed. Madrid: McGraw-Hill, 2007 [Consultation: 02/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=3962. ISBN 9788448156336.
- Marí Bernat, Antonio R., i altres. Hormigón armado y pretensado: ejercicios [on line]. Barcelona: Ediciones UPC, 1999 [Consultation: 12/11/2020]. Available on: <http://hdl.handle.net/2099.3/36182>. ISBN 8483013029.
- Manual de ejemplos de aplicación de la EHE a la edificación. Madrid: Asociación Científico-técnica del Hormigón Estructural, 2001. ISBN 8489670234.
- Calavera Ruiz, J. Cálculo de estructuras de cimentación. 5ª ed. Madrid: INTEMAC, 2015. ISBN 9788488764263.
- Fédération internationale du béton. Structural concrete: textbook on behaviour, design and performance. Vol. 1-3. 2ª ed. Lausanne: International Federation for Structural Concrete, 2000. ISBN 2883940428.