

Course guide

320179 - MEMEA - Experimental Mechanics of Advanced Materials and Structures

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

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

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: LLUIS GIL ESPERT

Others:

PRIOR SKILLS

Knowledge and use of the basic principles of strength of materials.
Basic knowledge of the main concepts of mechanics and its application to solve engineering problems.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. MEC: Students will acquire the skills and knowledge necessary to apply the fundamentals of the elasticity and strength of materials to the behaviour of real solids.
2. MEC: Knowledge and capability for design and calculation of structures and industrial buildings.

Transversal:

4. 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.
3. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

TEACHING METHODOLOGY

Lectures with audiovisual support and lab with small groups.

LEARNING OBJECTIVES OF THE SUBJECT

The aim of the course is to offer a hands on experimental experience for students, to provide with the knowledge of experimental mechanics and non-destructive testing, and to give an overview of various modelling tools and experimental techniques that can be employed to analyze and estimate properties of mechanical components and structures.



STUDY LOAD

Type	Hours	Percentage
Hours small group	30,0	20.00
Self study	90,0	60.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

(ENG) Mòdul 1: Introducció a la mecànica experimental

Full-or-part-time: 8h

Laboratory classes: 4h

Self study : 4h

(ENG) Mòdul 2: Mesura del desplaçament, la força y la deformació

Description:

1. Force, pressure and displacement transducers
2. Extensometry
3. Optical Fibber

Full-or-part-time: 82h

Laboratory classes: 32h

Self study : 50h

(ENG) Mòdul 3: Assajos no destructius

Description:

5. Inspecció ultrasònica
6. Tècniques d'anàlisi visual
7. Anàlisi modal experimental

Full-or-part-time: 60h

Laboratory classes: 24h

Self study : 36h

ACTIVITIES

(ENG) SESSIONS TEÒRIQUES

Full-or-part-time: 40h

Self study: 16h

Laboratory classes: 24h



(ENG) SESSIONS PRÀCTIQUES

Full-or-part-time: 84h
Self study: 50h
Laboratory classes: 34h

(ENG) PROJECTE

Full-or-part-time: 14h
Self study: 12h
Laboratory classes: 2h

(ENG) AVALUACIONS

Full-or-part-time: 12h
Self study: 8h
Laboratory classes: 4h

GRADING SYSTEM

Examen parcial: 20 %
Examen final: 20 %
Pràctiques de laboratori: 30 %
Projecte: 30 %

$$\text{Nota final} = 0.2 \cdot N_{\text{parcial}} + 0.2 \cdot N_{\text{final}} + 0.3 \cdot N_{\text{laboratori}} + 0.3 \cdot N_{\text{projecte}}$$

EXAMINATION RULES.

A satisfactory mark on the labs activities and on the course project are required to pass the course.

BIBLIOGRAPHY

Basic:

- Gdoutos, Emmanuel E. Recent advances in experimental mechanics: in honor of Isaac M. Daniel [on line]. Dordrecht: Kluwer Academic, 2002 [Consultation: 30/09/2022]. Available on: <https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/0-306-48410-2>. ISBN 1402006837.
- Dally, James W.; Riley, William F. Experimental stress analysis. 3rd ed. New York: McGraw-Hill, 1991. ISBN 9780070152182.
- Sharpe, William N. Springer handbook of experimental solid mechanics [on line]. New York: Springer, 2008 [Consultation: 09/05/2022]. Available on: <https://link-springer-com.recursos.biblioteca.upc.edu/referencework/10.1007/978-0-387-30877-7>. ISBN 9780387268835.
- Kobayashi, Albert S. Handbook on experimental mechanics. 2nd ed. Bethel, CT: SEM, 1993. ISBN 1560816406.