Universidad Zaragoza

Academic Year of Degree: 2026/27

69935 - Composites technology

Teaching Plan Information

Academic year: 2026/27
Subject: 69935 - Composites technology
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Tipo de enseñanza: In person
Ambit: Industrial engineering, mechanical engineering, automatic engineering, industrial organization engineering, and navigation engineering
Degree: 657 - Master in Mechanical Engineering
ECTS: 3.0
Year: 1
Semester: Second semester
Subject type: Optional
Module:

1. General information

Objectives of the subject

The subject will focus on teaching the student what composite materials are, what can be done with them and how to design parts and structures with these materials. Due to the design and processing characteristics of these materials, special emphasis will be placed on both the design possibilities and the form of design depending on the manufacturing method and design requirements.

Firstly, various applications of composite materials and various fields of application are presented so that the student knows the possibilities of use. Subsequently, the components at the composition level, both fibers and resins, and the possibilities of combination for the creation of reinforcement materials are presented. Once the materials are known, their design and calculation particularities, their mechanical behaviour and their physical characteristics are introduced.

In a second block, the various forms of manufacture of composite materials are explained, including hand contact molding, centrifugation, metal die molding, pultrusion, continuous winding, continuous lamination, prepreg, laminate machining, laminate joining and other techniques such as RTM, infusion, continuous projection, etc., always focusing on examples and their connection with the calculation. design and adaptation to the application. And it is completed with the typical test methods for materials and finished parts.

2. Learning results

1. Know the various components of composite materials, fibers, and resins. Know the various shapes and properties of composite materials.
2. Be able to calculate and design composite parts.
3. Be able to manufacture composite parts and know and identify the manufacturing processes for each application or technology.
4. Be able to test and validate composite materials and composite parts.

3. Syllabus

Syllabus

1. Introduction and raw materials
2. Composite Material Analysis and Design
3. Composite Manufacturing
4. Composite Testing

Laboratory Practices

1. Component calculation using the FEM. Several components will be calculated using soft DAC and ABAQUS. Subsequently, one of these components will be manufactured and tested.
2. Manufacture of complete components. The component will be fully functional. It can be a paddle racket, bicycle handlebar and/or bicycle seatpost.
3. Manufacture of a component previously calculated in practice 1 and subsequent test for numerical/experimental correlation.

4. Academic activities

The various concepts related to the subject are introduced in master classes, and later, in the problem/practice classes,

industrial practical cases are developed and the different types of technologies involved are introduced. The supervised sessions will be used to evaluate, correct and clarify aspects of the subject project carried out by each student, which in the case of manufacturing lines is carried out in teams, in order to analyse possible deficiencies and resolve doubts.

- Master class and development of technical cases in group: 22 hours
- Internships and supervised sessions: 8 hours
- Personal work and study: 42 hours
- Evaluation: 3 hours

5. Assessment system

The subject is preferably proposed with a **continuous assessment** that consists of three blocks:

1. Evaluation of practices. (20%, minimum grade 4/10)
2. Practical work/projects (80%, minimum grade 4/10)

In the event of not exceeding the minimum marks, there is the possibility of recovery on the same date established for the global exam.

The student also has the possibility of passing the subject through the **global evaluation** in the official calls. The evaluation will be carried out by means of a theoretical-practical test on the dates established by the center.

6. Sustainable Development Goals

7 - Affordable and Clean Energy
9 - Industry, Innovation and Infrastructure
12 - Responsible Consumption and Production

7. Bibliography

- Miravete A., Larrodé E., Castejón L. et al. Materiales Compuestos. TomoI, 2000
- Tsai S. W. Diseño y análisis de materiales compuestos. Editorial Reverté, 2002
- Tsai S. W. Double-double: A New Perspective in the Manufacture and Design of Composites. Tsai-Hill Publishers, 2021.
- Miravete A., Tsai S. W. Diseño y análisis de materiales compuestos. Editorial Reverté, 2007.
- Diseño de materiales compuestos Autor: Antonio MiraveteAño: 2000Editorial: Editorial Reverté
- Practical Analysis of Composite Laminates Autor: Antonio Miravete y J. N. ReddyAño: 1995Editorial: CRC Press
- Miravete A. Procesos de materiales compuestos. Editorial Reverté, 2000.
- Miravete A., Antequera, A y Jiménez L. Los materiales compuestos de fibra de vidrio. Editorial Reverté, 2000
- Miravete A. Ensayos y calidades de materiales composites. Editorial Reverté, 2000
- Miravete A. Comportamiento en servicio de materiales compuestos: 10 casos de estudio. Editorial Reverté, 2000