

Academic Year/course: 2021/22

## 66433 - Advanced Materials in Mechanical Engineering

### Syllabus Information

**Academic Year:** 2021/22

**Subject:** 66433 - Materiales avanzados en Ingeniería Mecánica

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 536 - Master's in Mechanical Engineering

**ECTS:** 4.5

**Year:** 1

**Semester:** Second semester

**Subject Type:** Optional

**Module:**

### 1. General information

### 2. Learning goals

### 3. Assessment (1st and 2nd call)

### 4. Methodology, learning tasks, syllabus and resources

#### 4.1. Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem sets and case studies, laboratory work, tutorials, autonomous work, and assessment activities.

#### 4.2. Learning tasks

The course includes the following learning tasks:

- **Lectures** A01 (15 hours). The teacher explains the main contents of the course.
- **Practice sessions** A02 (15 hours). They consist of problem sets and case studies, and the public defenses of the student work.
- **Laboratory sessions** A03 (10 hours).
- **Special practice sessions** A04 (5 hours).
- **Assignment** A05 (25 hours). The student will study several research articles given by the teacher. It can be done individually or in pairs, depending on the number of students. If needed, students should analyze and seek additional information for full understanding of the articles. The student will prepare a report for each assignment and submit them to the teacher. This work will be defended orally in front of the teachers and the rest of the class.
- **Tutorials** A06 (5 hours). Students can attend office hours to review and discuss the materials and topics presented in both theoretical and practical classes.
- **Study of theory** A07 (32 hours).
- **Assessment** A08 (5.5 hours). Reports, assignments, and written tests.

#### 4.3. Syllabus

The course will address the following topics:

1. Materials used in mechanical engineering and its application in various industrial sectors: automotive, aerospace, naval, metalmechanic, chemical, energy, building.
2. Selection of materials for various applications in mechanical engineering. following the property diagrams method (by M. Ashby, Professor at University of Cambridge), including the shape/section of components. Resolution of practical cases.
3. Inspection techniques for damage monitoring during service, as well as the basics of failure, and necessary concepts to identify the failure mechanism and determine its root cause.
4. The latest trends in materials in mechanical engineering and its forming processes, manufacturing and mechanical properties. High Entropy Alloys, Alloys for Mechanical Alloying, Glassy Alloys, Shape Memory Alloys, Advanced Polymers, Composites and Ceramics.

#### **4.4. Course planning and calendar**

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website or to the Course website.