

Academic Year/course: 2022/23

## 29618 - Materials Engineering

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 29618 - Materials Engineering

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

**Degree:** 430 - Bachelor's Degree in Electrical Engineering

**ECTS:** 6.0

**Year:** 2

**Semester:** Second semester

**Subject Type:** Compulsory

**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 learning process designed for this matter intended that the students acquire the habit of continuous work. For this reason, two types of activities are suggested: classroom activities and homework assignments.

**C l a s s r o o m a c t i v i t i e s i n c l u d e :**  
- Lectures, problem-solving sessions, case selection of materials, laboratory practices and presentation of practical work by a small group by the end of the course.

homework assignments include:

- Study of the lessons taught in the class or in the textbooks, self-study by reading short articles made available in ADD on topics related to the matter, problem-solving, reading the explanation of the practices, solution of the questionnaires in the ADD, preparation of reports on laboratory practice results, practical works assigned to groups and so on.

#### 4.2. Learning tasks

The learning program offered to the students includes the following activities:

- Lectures (24 hours) based on the explanation of the subject fundamentals. Prior to them, the students must read short articles related to these topics.

- Problem-solving sessions (13 hours) devoted to the problems related to material engineering and, in particular, those with relevance to electrical engineering. The specific problems will be announced, and their resolution will be part of the assessment activities.

- Laboratory practices (12 hours) will be carried out in six sections of two hours each. The student must have read the practice explanation and completed a previous questionnaire. After that, students have to prepare a report on the obtained results.

- Self-study (80 hours) devoted to the study of class lessons and to the solution of the assigned problems, as well as the previous readings required for each part of the course and the preparation of reports on laboratory practices.

- Practical work (10 hours). The students organized in small groups will design and manufacture a simple device having a practical application. Its presentation and defense will be by the end of the course.

- Evaluation (5 hours )

### 4.3. Syllabus

The program is divided into three blocks:

#### BLOCK A: STRUCTURE OF MATTER. MAIN GROUPS OF MATERIALS

- A1. Atomic structure, bonding and crystal structure
- A2. Defects and diffusion
- A3. Phase Diagrams
- A4. Introduction to metallic materials, ceramics, polymers and composites

#### BLOCK B: MATERIAL PROPERTIES

- B1. Mechanical and thermal properties
- B2. Electrical properties
- B3. Magnetic properties
- B4. Optical properties

#### BLOCK C: MATERIAL SELECTION

- C. Examples of material selection. Presentation of group works.

The lab program will consist of the following six sections:

Session 1: Tensile testing of metals and polymers

Session 2: Hardening by cold working. Annealing heat treatment

Session 3: Thermal properties: thermal expansion and thermal conductivity in metals and alloys. Thermal shock in glasses

Session 4: Electrical properties of metals and semiconductors

Session 5: Ferroelectric and dielectric properties

Session 6: Magnetic properties of materials

### 4.4. Course planning and calendar

The activities will be distributed as follows:

- Three lectures per week.
- Two hours of laboratory practice every two weeks.
- Additional activities (work, deliverables, tests) will be published in advance both in class and in the ADD.
- The final exam dates will be set by the center management.

### 4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=29618&Identificador=13330>