



## Course guide

# 220106 - TM - Materials Technology

**Last modified:** 19/04/2023

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 702 - CEM - Department of Materials Science and Engineering.

**Degree:** BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 4.5    **Languages:** Spanish

### LECTURER

---

**Coordinating lecturer:** De Sousa Pais Antunes, Marcelo  
Arencón Osuna, David

**Others:** Matta Fakhouri, Farayde  
Tafzi, Khalil

### PRIOR SKILLS

---

It is highly recommended to have acquired knowledge and skills related to previous subject on Materials Science (220092).

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

---

**Transversal:**

CT04 N2. Teamwork - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favour communication, task assignment and cohesion.

### TEACHING METHODOLOGY

---

- \* Lecture sessions.
- \* Practical sessions (exercises and problems ).
- \* Lab sessions.
- \* Self-study and doing exercises and activities.

In the content of the sessions, teachers will introduce the theoretical foundations of the subject, concepts, methods and illustrate with examples appropriate to facilitate understanding.

In practical sessions in the classroom, teachers guide students in applying theoretical concepts to problem solving, based on critical thinking at all times. The exercises will be proposed that students solve exercises in the classroom and outside the classroom, to promote contact and use the basic tools needed to solve problems.

There will be practices related to the theoretical and practical aspects of the subject in order to understand the main concepts.

The student should study autonomously to assimilate and establish the basics concepts, solve exercises and prepare reports.



## LEARNING OBJECTIVES OF THE SUBJECT

To provide students with advanced knowledge on the structure, properties and processing methods of the main materials of industrial application.

Understand technological features, optimization techniques and treatments of different materials and processed necessary to modify their properties.

Have appropriate criteria for the selection of materials and processing methods that should be considered in terms of its future application.

Get the main methods of testing materials and the most common techniques of inspection and control, as well as the most common defects that can present the components developed and its influence on the final properties or in the service response.

Transmit the importance of behaviour and good use of materials, be able to recognize its problems and make the appropriate treatment.

Select processes more efficient processing of materials, from the environmental point of view.

## STUDY LOAD

Type	Hours	Percentage
Hours large group	31,0	27.56
Self study	67,5	60.00
Hours small group	14,0	12.44

**Total learning time:** 112.5 h

## CONTENTS

### Module I: Metals, metallic alloys and shaping

**Description:**

Module I: Metals, metallic alloys and shaping

**Specific objectives:**

Basic concepts of processing and shaping of metallic materials are studied, being correlated with the structures and properties of these materials. New developments and applications of technical ceramics are also studied. Descriptive of the basic characteristic are studied along with its microstructures. Moreover, the main defects of the produced parts associated to the processing technologies are exposed, along with the possible solutions.

**Related activities:**

Activities 1, 2, 3, 4 and 5.

**Full-or-part-time:** 48h

Theory classes: 12h

Laboratory classes: 8h

Self study : 28h



### Module II: Ceramics, glass and its forming

**Description:**

Module II: Ceramics, glass and its forming

**Specific objectives:**

Basic concepts of processing and shaping of ceramic materials and glasses are studied, being correlated with the structures and properties of these materials. New developments and applications of technical ceramics are also studied.

**Related activities:**

Activities 2, 4 and 5.

**Full-or-part-time:** 12h 30m

Theory classes: 3h 30m

Self study : 9h

### Module III: Thermoplastic polymers, composites materials and its forming

**Description:**

Module III: Thermoplastic polymers, composites materials and its forming

**Specific objectives:**

The basic aspects of the transformation and shaping of polymeric and composite materials are studied, relating their structures and properties with the existing manufacturing methods.

New developments and applications of technical polymers and composite materials in the industrial, automotive and aerospace fields are also analyzed.

**Related activities:**

Actividades 2, 3, 4 y 5

**Full-or-part-time:** 31h

Theory classes: 9h 30m

Laboratory classes: 2h

Self study : 19h 30m

### Module IV: Service behaviour

**Description:**

Module IV: Service behaviour

**Specific objectives:**

This module describe aspects related with the work environment of materials and its response, and shows how this environment alters the service life of the parts. With this previous knowledge, the methods and technologies that allow to prevent/delay the failure of the materials are studied.

**Related activities:**

Activities 1, 3, 4 and 5.

**Full-or-part-time:** 26h 30m

Theory classes: 6h

Laboratory classes: 6h

Self study : 14h 30m



## ACTIVITIES

---

### ACTIVITY 1: LABORATORY SESSIONS

**Description:**

Laboratory sessions. Content to be defined by the teachers in the internship script

**Specific objectives:**

Determination of structures and irregularities in real components using advanced characterization techniques.

**Material:**

Internship script

**Delivery:**

Laboratory report / questionnaire

**Full-or-part-time:** 26h

Laboratory classes: 14h

Self study: 12h

### ACTIVITY 2: EVALUATION

**Description:**

First mid-term exam

**Material:**

Written exam

**Delivery:**

Written exam

**Full-or-part-time:** 2h 30m

Theory classes: 2h 30m

### ACTIVITY 3: EVALUATION

**Description:**

Second mid-term exam

**Material:**

Written exam

**Delivery:**

Written exam

**Full-or-part-time:** 2h 30m

Theory classes: 2h 30m



#### ACTIVITY 4: DESIGN OF A PRODUCT - MATERIAL SELECTION - PROCESSING

**Description:**

Task of material selection, shaping and design

**Specific objectives:**

To go deeper in the contents of the topic through the elaboration of a manuscript related with the material selection, processing technologies and design of a product. To acquire the skills of the generic competence "Team working".

**Material:**

Task pattern  
Complementary information  
Delivery rules

**Delivery:**

Delivery of a manuscript (electronic version) at the course ending.

**Full-or-part-time:** 11h 30m

Self study: 11h 30m

#### ACTIVITY 5: LARGE GROUP SESSIONS / THEORY

**Description:**

Theory sessions of modules I, II, III and IV.

**Specific objectives:**

To get the contents of the different modules of the subject.

**Material:**

Slides  
Basic and complementary bibliography.

**Full-or-part-time:** 70h

Theory classes: 26h

Self study: 44h

### GRADING SYSTEM

- First mid-term exam: 40%
- Second mid-term exam: 40%
- : 10%
- Work : 10%

The students, independently on the grade obtained in the first mid-term exam, can assist a new attempt of the first partial. These new attempt will be carried out on the last lective week of the semester, on the day of theory session. The students should communicate its intention to do this new attempt through e-mail to the responsible professor. . The grades of this new attempt will be comprised within the range 0-10.

The grade of this new attempt of first mid-term exam will only substitute the one of the first attempt in case was higher.

### EXAMINATION RULES.

The tests are performed in writing, in Spanish or Catalan



## BIBLIOGRAPHY

---

### Basic:

- Puértolas Ráfales, José Antonio. Tecnología de superficies en materiales. Madrid: Síntesis, 2010. ISBN 9788497566803.
- Puértolas, J.A.; Ríos, M.; Castro, M. Tecnología de los materiales en ingeniería. Vol.2. Madrid: Síntesis, 2016. ISBN 9788490773888.
- Puértolas, J.A.; Ríos, R.; Castro, M. Tecnología de los materiales en ingeniería. Vol. 1. Madrid: Síntesis, 2016. ISBN 9788490773871.
- Angurel Lambán, L.A. Problemas de tecnología de materiales. Zaragoza: Prensas de la Universidad de Zaragoza, 2013. ISBN 9788415770749.
- Groover, Mikell P. Fundamentos de manufactura moderna: materiales, procesos y sistemas [on line]. 3ª ed. México: Prentice Hall, 2007 [Consultation: 16/09/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=4585363>. ISBN 9789701062401.
- Kalpakjian, S.; Schmid, S. R. Manufactura, ingeniería y tecnología [on line]. 7ª ed. México [etc.]: Pearson Educación, 2014 [Consultation: 20/09/2022]. Available on: [https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=5323](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5323).
- Asthana, R.; Kumar, A.; Dahotre, N. B. Materials processing and manufacturing science [on line]. Amsterdam: Elsevier, 2006 [Consultation: 20/09/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=274692>. ISBN 0750677163.
- DeGarmo, E. P.; Black, J. T.; Kohser, R. A. Materiales y procesos de fabricación. 2ª ed. Barcelona: Reverté, 1988. ISBN 8429148221.
- Salán, M. N. Tecnología de proceso y transformación de materiales [on line]. Barcelona: Edicions UPC, 2005 [Consultation: 19/05/2020]. Available on: <http://hdl.handle.net/2099.3/36673>. ISBN 848301789X.
- Apraiz, J. Tratamientos térmicos de los aceros. 10ª ed. Madrid: CIE-Dossat 2000, 2002. ISBN 8495312565.