Course guides
220106 - TM - Materials Technology

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: 2021  ECTS Credits: 4.5  Languages: Spanish

LECTURER

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

Others: Abbasi, Hooman
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

Specific:
2. An understanding of, and skills for applying, materials engineering.

Transversal:
1. 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

* 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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>67,5</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>31,0</td>
<td>27.56</td>
</tr>
<tr>
<td>Hours small group</td>
<td>14,0</td>
<td>12.44</td>
</tr>
</tbody>
</table>

Total learning time: 112.5 h

CONTENTS

Module I: Metals, metal alloys and its shaping

Description:
Topic 1: Introduction to Technology of Materials
Topic 2: Thermal treatments of metals
Topic 3: Surface treatment
Topic 4: Processing and shaping of metals
Topic 8: Welding of metals

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:**
Topic 5: Ceramic materials and glasses

**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:**
Topic 6: Thermoplastic polymer processing
Topic 7: Composite materials processing

**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:**
Topic 9: Creep, fatigue and fracture
Topic 10: Corrosion and protection
Tema 11: Non destructive techniques to detect defects.

**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 attemtp will be comprised within the range 0-10.

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

EXAMINATION RULES.

The tests are performed in writing, in Spanish or Catalan
BIBLIOGRAPHY

Basic: