Course guides
295025 - SE - Selection and Ecodesign

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.
Degree: BACHELOR’S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR’S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Compulsory subject).
Academic year: 2020
ECTS Credits: 6.0
Languages: English

LECTURER
Coordinating lecturer: JOSE ANTONIO BENITO PARAMO
Others:

PRIOR SKILLS
Knowledge of the main characteristics of the different materials families, as well as their classification. Knowledge of the main mechanical properties, thermal properties, etc... important in mechanical design.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
CEI-16. Understand the basic applications of environmental technologies and sustainability principles.
CEMT-22. Knowledge and application of materials technology in the production, transformation, processing, selection, control, maintenance, recycling and storage of all types of materials.

Transversal:
02 SCS N1. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world’s situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.

TEACHING METHODOLOGY
The course will be based on lectures, resolution of problems and sessions in the computer room to work with the software CES EduPack

LEARNING OBJECTIVES OF THE SUBJECT
The student will learn how to translate the constraints of an engineering component to mathematical relationships of the properties (mechanical, thermal, optical, etc...) of the material. Moreover, the student will get familiar with the Ashby methodology for materials selection and the use of the program CES EduPack. Ecodesign criteria will be introduced.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours large group</td>
<td>45.0</td>
<td>30.00</td>
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<tr>
<td>Hours small group</td>
<td>15.0</td>
<td>10.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90.0</td>
<td>60.00</td>
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</table>
Total learning time: 150 h

## CONTENTS

### Introduction

**Description:**
The importance of materials in the design processes will be explained and some examples of the influence of materials developments on the progress of society will be analyzed.

**Full-or-part-time:** 1h 30m  
Theory classes: 1h 30m

### The design process

**Description:**
The design process. Types of design. Design tools and materials data. Case study.

**Full-or-part-time:** 2h  
Theory classes: 1h  
Self study : 1h

### Engineering materials and their properties

**Description:**
The classification of the materials will be reviewed and related to the classification applied in the software CES EduPack, with special attention to the differences between materials of different families or within a specific family. The important properties (mechanical, thermal, electrical, optical and durability) which appear in the datasheet of each material in the Level 2 of CES EduPack will also be checked.

**Full-or-part-time:** 4h 30m  
Theory classes: 3h  
Practical classes: 1h 30m

### Materials properties charts

**Description:**
Materials properties charts. Exploring the relationship between different properties.

**Full-or-part-time:** 12h 30m  
Theory classes: 1h 30m  
Practical classes: 1h 30m  
Laboratory classes: 2h  
Self study : 7h 30m
<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Full-or-part-time</th>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Laboratory classes</th>
<th>Self study</th>
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<tbody>
<tr>
<td>Materials Selection</td>
<td>Definition of the problem. Selection process. Material indices. Attribute limits.</td>
<td>41h 30m</td>
<td>6h</td>
<td>4h 30m</td>
<td>6h</td>
<td>25h</td>
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<tr>
<td>Shape factor</td>
<td>Efficient shapes. Introducing the concept of efficient shapes in the materials selection process. Examples.</td>
<td>13h 30m</td>
<td>1h 30m</td>
<td>2h</td>
<td>2h</td>
<td>8h</td>
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<tr>
<td>Ecodessing</td>
<td>Life cycle assessment and EcoAudit. Eco-informed materials selection. Examples.</td>
<td>29h</td>
<td>6h</td>
<td>3h</td>
<td>4h</td>
<td>16h</td>
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<tr>
<td>Monographic work</td>
<td>The students will have to select an engineering component and propose the best materials for the given application, following the methodology explained during the course.</td>
<td>31h</td>
<td>11h</td>
<td></td>
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<td>20h</td>
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</tbody>
</table>

**GRADING SYSTEM**

35% final exam + 25% midterm exam + 20 % Practical Work + 20% Monographic work

THERE IS NOT A RE-EVALUATION EXAM
BIBLIOGRAPHY

Basic: