Course guide
330122 - EMA - Materials Engineering

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR’S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2022  ECTS Credits: 6.0  Languages: Catalan

LECTURER

Coordinating lecturer: Soler Conde, Marc Antoni
Others: Soler Conde, Marc Antoni

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of the mechanical behavior in service of the materials.
2. Know the basic processes of forming different types of engineering materials.
3. Select the most suitable material for basically structural applications.

Transversal:
4. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
5. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
6. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
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</tbody>
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Total learning time: 150 h
## CONTENTS

### (ENG) 1. Els materials d’enginyeria i les seves propietats

**Description:**
Materials properties in engineering.

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

### Stress-strain in materials

**Description:**  
content english

**Full-or-part-time:** 4h  
Theory classes: 2h  
Self study : 2h

### Tensile test and properties.

**Description:**  
Fundamental concepts of Young’s modulus  
Practical cases of design based on young’s modulus  
Yield stress  
Dislocations and sliding

**Full-or-part-time:** 9h  
Theory classes: 3h  
Self study : 6h

### 4. Fracture

**Description:**  
Brittle fracture  
Mechanisms of fracture  
Fracture probability in brittle materials

**Full-or-part-time:** 6h  
Theory classes: 2h  
Self study : 4h

### 5. Fatigue

**Description:**  
Fatigue failure.  
Design based on fatigue  
Examples

**Full-or-part-time:** 8h  
Theory classes: 3h  
Self study : 5h
### 6. Creep

**Description:**
Kinetic theory of diffusion.
Creep mechanisms and resistant materials to hot creep.
A turbine blade: a practical case of creep-limited design at high temperature.

**Full-or-part-time:** 6h
Theory classes: 2h
Self study: 4h

### 7. Metallic materials

**Description:**
Ferrous alloys
*Steels
*Cast irons
Non ferrous alloys

**Full-or-part-time:** 8h
Theory classes: 4h
Self study: 4h

### 8. Non-metallic materials

**Description:**
Polymers
Ceramics
Composites

**Full-or-part-time:** 4h
Theory classes: 2h
Self study: 2h

### 9. Cold forming

**Description:**
Rolling
Deep drawing
Streching

**Full-or-part-time:** 10h
Theory classes: 4h
Self study: 6h
10. Hot forming

Description:
Forging
Stamping
Rolling
Extrusion

Full-or-part-time: 10h
Theory classes: 4h
Self study: 6h

11. Materials selection

Description:
Material selection criteria
Objective function
Property maps

Full-or-part-time: 4h
Theory classes: 4h

ACTIVITIES

A.1. FEM exercices

Full-or-part-time: 30h
Theory classes: 16h
Laboratory classes: 14h

A.2. Quality systemes and laboratory test

Full-or-part-time: 12h
Laboratory classes: 4h
Self study: 8h

A.3. Materials Selection

Description:
Problem resolution on materials selection.

Full-or-part-time: 7h
Laboratory classes: 4h
Self study: 3h
A.4. Test. FEM

Description:
Finite element modeling test

Full-or-part-time: 6h
Self study: 6h

A.5. Progres test 1

Full-or-part-time: 2h
Theory classes: 2h

Test

Full-or-part-time: 2h
Theory classes: 2h

A.7. Presentation

Description:
Cours activity presentation

Full-or-part-time: 4h
Laboratory classes: 4h

GRADING SYSTEM

N=A4*0.3+A5*0.25+A1*0.25+A4*0.10+A2*0.05+A7*0.05

BIBLIOGRAPHY

Basic:

Complementary:

**RESOURCES**

**Other resources:**
- Commercial calculation program using the ABAQUS finite element method.
- Laboratory equipment.