220070 - Materials Engineering: Learning From Disasters

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2017

Degree: BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)

ECTS credits: 3

Teaching languages: English

Teaching staff
Coordinator: Silvia Illescas Fernández, Núria Salán Ballesteros, Elisa Rupérez de Gracia

Requirements
It is necessary to have attended previous subjects related to science and technology of materials (to have basic concepts of fracture, fatigue, creep, corrosion, welding, non destructive test).

Teaching methodology
The course is divided into parts:
Theory classes
Practical classes
Self-study for doing exercises and activities.
In the theory classes, teachers will introduce the theoretical basis of the concepts, methods and results and illustrate them with examples appropriate to facilitate their understanding.
In the practical classes (in the classroom), teachers guide students in applying theoretical concepts to solve problems, always using critical reasoning. We propose that students solve exercises in and outside the classroom, to promote contact and use the basic tools needed to solve problems.
Students, independently, need to work on the materials provided by teachers and the outcomes of the sessions of exercises/problems, in order to fix and assimilate the concepts.
The teachers provide the syllabus and monitoring of activities (by ATENEA).

Learning objectives of the subject
Failure study cases, often disaster, allow a good knowledge better than expected in relation to materials engineering. Usually, a good knowledge of Materials Science and Engineering provides information enough to avoid disaster. Thus, a good selection of materials and a careful choice of the environmental and service conditions can provide safety throughout the cycle life of a component or structure.
In this course, principles of corrosion or fracture mechanics are the basis for further study of historical failure cases. In addition, a review of the principal families of materials is promoted from:
* Materials Selection Criteria
* Interpretation of mechanical properties
* Effect of environmental conditions on components and structures
* Effect of industrial processing (heat treatment, bonding techniques, thermomechanical processes ...)

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### Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group:</th>
<th>30h</th>
<th>40.00%</th>
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<tbody>
<tr>
<td></td>
<td>Self study:</td>
<td>45h</td>
<td>60.00%</td>
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</tbody>
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### Content

#### Module 1: Fracture

**Learning time:** 25h  
Theory classes: 10h  
Self study: 15h

**Description:**  
1. Fracture principles, Fracture mechanisms in materials, Fracture characterization, Study cases

#### Module 2: Corrosion

**Learning time:** 25h  
Theory classes: 10h  
Self study: 15h

**Description:**  
2. Corrosion principles, Corrosion mechanisms, Study cases

#### Module 3: Other Failure Mechanisms

**Learning time:** 25h  
Theory classes: 10h  
Self study: 15h

**Description:**  
3. Other Failure mechanisms: Stress Cracking, Welding, Processing Defects, Crystallinity, Materials Selection? Study Cases

### Qualification system

Deliverable module 1: 20%  
Deliverable module 2: 20%  
Deliverable module 3: 20%  
Teamwork: 40%
Bibliography

Complementary:


