220071 - Characterization Techniques for Metallic Alloys

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 INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: English

Teaching staff
Coordinator: Elisa Ruperez
Others: Silvia Illescas, Núria Salan

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 curriculum and monitoring of activities (by ATENEA).

Learning objectives of the subject
Knowing the different techniques of study, analysis and characterization of materials, and the differences between them in order to make a correct choice in case of requirement.

Testing protocol drawing, as practical cases, related to material suitability definition (for general or a particular use) and for knowing more about failure reasons.

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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## Content

<table>
<thead>
<tr>
<th>Module 1: Microstructural Materials Characterization Techniques</th>
<th>Learning time: 25h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Self study : 15h</td>
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### Description:
- Light Microscopy (OM-Biological, OM-Metallographic, Stereoscopy)
- Electronic Microscopy (SEM, TEM)
- Other techniques (CONFocal, AFM, FIB)

### Related activities:
- Individual questionnaire
- Team work

<table>
<thead>
<tr>
<th>Module 2: Estructural and Chemical Characterization Techniques</th>
<th>Learning time: 25h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Self study : 15h</td>
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### Description:
- Principles of Electron Diffraction Patterns: X-Ray Diffraction (XRD), Selected Areas Diffraction Patterns (SAPD)
- Chemical Characterization techniques: Auger Electron Spectroscopy, Energy Dispersive X-Ray Analysis (EDX), Photoelectron Spectroscopy (XPS, ESCA), Secondary Ion Mass Spectroscopy (SIMS)

### Related activities:
- Individual questionnaire
- Team work

<table>
<thead>
<tr>
<th>Module 3: Mechanical and Micromechanical Characterization</th>
<th>Learning time: 25h</th>
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<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Self study : 15h</td>
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</tbody>
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### Description:
- Macromechanical testing techniques: Tensile test, impact test, hardness test
- Micro&nanomechanical testing techniques: Microindentation, Nanoindentation
- Friction and Wear testing techniques

### Related activities:
- Individual questionnaire
- Team work
Regulations for carrying out activities

Deliverables modules 1-2: 40%
Teamwork: 40%
Subjective qualification: 20%

Bibliography

Basic:


Complementary:

