Course guides
295766 - 295EM126 - Material Bonding Technology

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN MATERIALS SCIENCE AND ADVANCED MATERIALS ENGINEERING (Syllabus 2019). (Optional subject).
ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2021). (Optional subject).

Academic year: 2021  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Mateo Garcia, Antonio Manuel

Others: Santana Perez, Orlando Onofre
Cailloux, Jonathan
Sanchez Soto, Miguel Angel

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMCEAM-03. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones
CEMCEAM-04. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones

Transversal:
07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
04 COE. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.

TEACHING METHODOLOGY

In the classes of theory, the basic concepts of the subject will be exposed, starting from textbooks as a general reference. The subject will be complemented with other materials, like outlines or summaries of the theoretical concepts and fundamental laws, tests to appraise the assimilation of the theoretical concepts, collections of problems, hyphens of practices, etc...

In the classes, the proposed test questions, which the students will have worked previously at home, attempting to favour a discussion of the concepts on the part of the students will be solved. Besides the blackboard different didactic resources will be used like transparencies and presentations with computer. Real pieces of material, representative varying ones of the different processes of union with faults and failures will be presented to the classes.

The practices of laboratory will be carried out by small groups and will consist of the realization of the practice in the laboratory and the writing of a report with the results and the discussion. They will allow that the student familiarizes himself with determinate instruments, that develop his critical observation and that approaches to the scientific method and becomes familiar to analyzing and presenting experimental results. The sessions of practices have duration of two hours. Together with the examination of theory, there will be an examination with questions about the sessions of laboratory practices.
LEARNING OBJECTIVES OF THE SUBJECT

The processes of materials joining are the fundamental topic.

Specific objectives:
- To know of the main technologies of metals welding
- To understand the metallurgical changes in the welded material and their influence in the mechanical properties
- To understand the basic aspects of the adhesion, evaluation of the adhesion and the essential aspects about the effectiveness of the adhesive joints

As general objectives in the formation of the students:
- To promote the capacity to work in team.
- Promoting the development of critical analysis and scientific method
- To collaborate in the capacity to transmit knowledge in an oral way as well as written.
- Familiarize them with the use of the bibliography and of technical material in order to favour their self-learning capacity.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>28,0</td>
<td>18.67</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>14,0</td>
<td>9.33</td>
</tr>
<tr>
<td>Self study</td>
<td>102,0</td>
<td>68.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
CONTENTS

Description:

2. WELDING PROCESSES
Arc welding
Resistance welding
Gas welding
Solid state welding.
Filler metals. Fluxes.
Positions of the pieces in the welding. Preparation of the pieces to weld.
Cost of the welding.
Automatic welding.

3. DEFECTS OF WELDING
Deformations and internal tensions in the welding.
Defects of welding.

4. ADHESIVE JOINTS
General aspects about adhesion
Contact among the phases
Pretreatment of the surfaces

5. MECHANICAL PROPERTIES OF THE ADHESIVE UNIONS
Tests to evaluate the resistance to the separation of adhesive unions
Non destructive tests

6. TYPES OF ADHESIVES
Components on the formulations

Related competencies:
CEMCEAM-04. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones
CEMCEAM-03. (ENG) Realizar estudios de caracterización y evaluación de materiales según sus aplicaciones
07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
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Full-or-part-time: 150h
Theory classes: 28h
Laboratory classes: 14h
Guided activities: 6h
Self study : 102h

GRADING SYSTEM
There will be two partial exams, being at least 25% of the final qualification. Reports and problems have a minimum value of 20% of the final qualification. There will be a final exam and a retake exam.
BIBLIOGRAPHY

Basic: