240EM141 - Selection of Materials in Mechanical Design

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy
Academic year: 2018
Degree: MASTER'S DEGREE IN MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Teaching unit Optional)

ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Teaching unit Optional)
MASTER'S DEGREE IN MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Teaching unit Optional)

ECTS credits: 4,5
Teaching languages: Spanish

Teaching staff
Coordinator: JOSE MARIA CABRERA MARRERO

Prior skills
Microstructure and mechanical properties of materials

Degree competences to which the subject contributes

Specific:
CEMCEM-02. (ENG) Dissenyar i desenvolupar productes, processos, sistemes i serveis, així com l'optimització d'altres ja desenvolupats, atenent a la selecció de materials per a aplicacions específiques
CEMCEM-03. (ENG) Aplicar mètodes innovadors en la resolució de problemes i aplicacions informàtiques adequades, pel disseny, simulació, optimització i control de processos de producció i transformació de materials
CEMCEM-07. (ENG) Dissenyar, calcular i modelar aspectes relacionats amb els materials per a components mecànics, estructures i equips

Transversal:

Teaching methodology

The structure of the subject is of 3 theoretical ECTS and 2 ECTS of work in groups of students. Classes of the discipline occur during two hours a week. Along the semester students must prepare a pre-project which subject will be decided together with the professor and groups of three-four students. Weekly meetings will be scheduled to follow the pre-project. This must be presented in written report and defended orally. The generic competences that the student will reach will be a) capacity to understand and to rationalize the process of selection of materials, b) capacity to develop manufacturing techniques and knowledge of characterization techniques, c) capacity to work in equipment and e) capacity of communication written and oral technique.

Learning objectives of the subject

objectives
### Study load

<table>
<thead>
<tr>
<th></th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>112h 30m</td>
<td>40h 30m</td>
<td>0h</td>
<td>0h</td>
<td>72h</td>
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<tr>
<td><strong>Percentage:</strong></td>
<td>36.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>64.00%</td>
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### Content

| Process of Design | Learning time: 3h  
Theory classes: 3h |
<table>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Steps and examples</td>
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| Materials Selection | Learning time: 6h  
Theory classes: 6h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Behaviour and characteristics of materials. The process of materials selection. Evaluation methods. Ratio cost ? properties. Shape effect. Examples</td>
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| Manufacturing methods | Learning time: 7h  
Theory classes: 7h |
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<tr>
<td><strong>Description:</strong></td>
<td>Types and classification of manufacturing processes. Economical aspects</td>
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| Software EDUPACK | Learning time: 2h  
Theory classes: 2h |
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<tr>
<td><strong>Description:</strong></td>
<td>introduction to EDUPACK software</td>
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| Interaction between materials, processing technology and design | Learning time: 8h  
Theory classes: 8h |
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<tr>
<td><strong>Description:</strong></td>
<td>Design of cast, forged, sheet metal formed, machined, sintered and soldered pieces. Design after the behavvoir. Selection maps. Examples.</td>
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The final mark, $N_{\text{final}}$, will be calculated according to the following equation:

$$N_{\text{final}} = 0.60N_{\text{ef}} + 0.40N_{\text{project}}$$

where $N_{\text{ef}}$ is the mark obtained in the final exam and $N_{\text{project}}$ is the mark of a pre-project carried out along the course.

In case of re-evaluation $N_{\text{ef}}$ will be substituted by the reevaluation exam mark.

### Bibliography

**Basic:**