Course guides
295754 - 295EM032 - Advances in the Processing of Plastic Materials

Unit in charge: Barcelona East School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.
Degree: MASTER'S DEGREE IN MATERIALS SCIENCE AND ADVANCED MATERIALS ENGINEERING (Syllabus 2019). (Compulsory subject).
Academic year: 2021 ECTS Credits: 6.0 Languages: Spanish

LECTURER
Coordinating lecturer: MARIA LLUISA MASPOCH RULDUA
Others: Santana Perez, Orlando
         García Masabet, Violeta Del Valle
         Abt, Tobias Martin
         León Albiter, Noel

PRIOR SKILLS
Knowledge about structure and properties of polymeric materials, transport phenomena.

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:
01 EIN N2. ENTREPRENEURSHIP AND INNOVATION - Level 2. Taking initiatives that give rise to opportunities and to new products and solutions, doing so with a vision of process implementation and market understanding, and involving others in projects that have to be carried out.
02 SCS N2. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.
06 URI N2. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

TEACHING METHODOLOGY

LEARNING OBJECTIVES OF THE SUBJECT
- To deepen in the rheological behavior of polymers and their relation with the molecular structure.
- To study the techniques of characterization of the rheological behavior of polymeric materials.
- To Study the techniques of processing plastic materials by analyzing the production lines and the relationship between the process parameters and the quality of the piece obtained.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>42,0</td>
<td>28.00</td>
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<tr>
<td>Self study</td>
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<td>64.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>6,0</td>
<td>4.00</td>
</tr>
</tbody>
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Total learning time: 150 h

CONTENTS

1.- Flow of polymeric systems

Description:
- Rheological behavior of polymers.
- Techniques of rheological characterization.
- Factors that determine rheological behavior.
- Elastic effects on the fluid

Full-or-part-time: 30h
- Theory classes: 10h
- Self study: 20h

2.- Extrusion and main lines of production

Description:
- The extrusion process
- Description of the machine
- Operation curves: parameters and effects
- Main production lines and typical defects:
  - Production of Multicapas: Coextrusion, lamination and coating.
  - Sheet production
  - Fiber production
  - Production of pipes
  - Film production (calendering and blowing)
  - Production of hollow bodies (blown extension)

Full-or-part-time: 41h 20m
- Theory classes: 12h
- Laboratory classes: 6h
- Self study: 23h 20m

3.- Thermoforming

Description:
- Process description.
- Types of thermoforming.
- Material requirements.
- Typical defects and solutions.

Full-or-part-time: 4h 30m
- Theory classes: 2h
- Self study: 2h 30m
### 4.- Rotational Molding

**Description:**
- Descripción del Proceso.
- Requerimientos del material.
- Defectos típicos y soluciones.

**Full-or-part-time:** 4h 30m  
Practical classes: 2h  
Self study: 2h 30m

### 5.- Injection molding

**Description:**
- Machines and parameters of the process  
- Description of the mold and functionalities  
- Defects and solutions in injected parts

**Full-or-part-time:** 41h 20m  
Theory classes: 12h  
Laboratory classes: 6h  
Self study: 23h 20m

### 6.- Advanced Processing Techniques

**Description:**
- Over-injection  
- Co-Injection  
- Fluid Assisted Injection  
- Injection + Microfoam  
- Additive Manufacturing: FDM

**Full-or-part-time:** 6h 10m  
Theory classes: 2h  
Self study: 4h 10m

### 7.- Additive manufacturing

**Description:**
- content english

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

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**GRADING SYSTEM**
BIBLIOGRAPHY

Basic:

RESOURCES

Audiovisual material:
- Nom recurs. Resource

Hyperlink: