205068 - Smart Textiles

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
Teaching unit: 702 - CMEM - Department of Materials Science and Metallurgy  
Academic year: 2019  
Degree: MASTER'S DEGREE IN SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Teaching unit Optional)  
MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Teaching unit Optional)  
MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)  
ECTS credits: 3  
Teaching languages: English

Teaching staff
Coordinator: Mònica Ardanuy Raso  
Others: Gil Gali, Ignacio  
Fernandez Garcia, Raul

Teaching methodology
Sessions of theory  
Sessions of practical work at class  
Sessions of practical work at laboratory

Learning objectives of the subject
OE1. To know the main characteristics and properties smart and multifunctional textiles  
OE2. To be able to develop new smart textiles for specific applications

Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group: 27h</th>
<th>36.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
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<td></td>
<td>Hours small group:</td>
<td>00%</td>
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<td></td>
<td>Guided activities:</td>
<td>00%</td>
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<tr>
<td></td>
<td>Self study: 48h</td>
<td>64.00%</td>
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### Content

<table>
<thead>
<tr>
<th>LESSON 1. BASIC CONCEPTS</th>
<th>Learning time: 15h</th>
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</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Practical classes: 3h</td>
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<tr>
<td></td>
<td>Laboratory classes: 3h</td>
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<td>Self study: 9h</td>
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**Description:**
1.1. Definitions
1.2. Basic principles:
   1.2.1. Shape memory
   1.2.2. PCMs (phase-change materials)
   1.2.3. Piezoelectricity, piezoresistivity, flexoelectricity, thermoelectricity
   1.2.4. Optic fibres
   1.2.5. Thermochromism
   1.2.6. Photovoltaic systems
   1.2.7. Functional nanotechnology
   1.2.8. Others

**Specific objectives:**
- OE1, OE2

<table>
<thead>
<tr>
<th>LESSON 2. SUBSTRATES FOR SMART TEXTILES</th>
<th>Learning time: 10h</th>
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</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Laboratory classes: 4h</td>
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<tr>
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<td>Self study: 6h</td>
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**Description:**
2.1. Textile materials
   2.1.1. Woven fabrics
   2.1.2. Knitted fabrics
   2.1.3. Nonwoven fabrics
   2.1.4. Other textile structures
2.2. Non-textile flexible substrates
   2.2.1. Elastomeric
   2.2.2. Plastic films
   2.2.3. Others
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LESSON 3. COMPONENTS AND ACTUATORS FOR SMART TEXTILES

**Description:**
content english

**Related activities:**
3.1. Conductive yarns
3.2. Finishes
3.2.1. Inks
3.2.2. Coatings
3.3. Other components

**Learning time:** 15h
Laboratory classes: 6h
Self study: 9h

LESSON 4. PROCESSES FOR THE DEVELOPMENT OF SMART TEXTILES

**Description:**
4.1. Weaving and knitting
4.2. Coating, active finishing, printing
4.3. Embroidery
4.4. Joining technologies
4.5. Other production techniques for smart textiles

**Learning time:** 15h
Laboratory classes: 6h
Self study: 9h

LESSON 5. CASE STUDIES

**Description:**
Analysis of case studies (projects and/or existing products) according to several points of view such as functionality, application and design.

**Learning time:** 20h
Laboratory classes: 7h
Self study: 13h

**Qualification system**

Exam 1: 20%
Exam 2: 20%
Exercises and practical cases: 30%
Course project: 30%.
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Bibliography

Basic:
