Course guide
240IMA21 - 240IMA21 - Design, Ecodesign and Recycling

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

Degree:
- MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).
- MASTER'S DEGREE IN RESEARCH IN MECHANICAL ENGINEERING (Syllabus 2021). (Optional subject).

Academic year: 2022  ECTS Credits: 4.5  Languages: Spanish, English

LECTURER

Coordinating lecturer: NOEL LEÓN ALBITER
Others:
- MARIA LLUÍSA MASPOCH RULDA
- JESSICA CALVO MUÑOZ
- ANA HERNÁNDEZ EXPÓSITO
- LEANDRO ISIDRO MARTINEZ OROZCO

TEACHING METHODOLOGY

Presentation of master classes, directed activities and laboratory sessions in order to provide the necessary and sufficient knowledge to allow an adequate and efficient understanding of the subject.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, the student should be able to understand the basic aspects related to optimization, recycling, and alternatives in the use of plastic materials.

Specific objectives include:
- To know the design principles that make material optimization possible during the manufacture of a plastic part.
- To know the main characteristics of polymeric materials and biopolymers.
- To understand the main ways of recycling plastic materials.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>13,5</td>
<td>12.00</td>
</tr>
<tr>
<td>Self study</td>
<td>72,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>27,0</td>
<td>24.00</td>
</tr>
</tbody>
</table>

Total learning time: 112.5 h
## CONTENTS

### T1. Introduction

**Description:**
- Basic concepts about plastic materials
- Processing methods (injection molding)

**Related activities:**
Master class

**Full-or-part-time:** 10h 30m  
Theory classes: 3h  
Self study: 7h 30m

### T2. Plastic design principles

**Description:**
- Introduction
- Thickness effect
- Stress concentrators
- Ribs and reinforcements
- Demolding

**Related activities:**
Master class

**Full-or-part-time:** 9h 30m  
Theory classes: 3h  
Self study: 6h 30m

### T3. CAD-CAE, plastic parts examples

**Description:**
- Background
- Advantages
- Most used programs
- Practical examples

**Related activities:**
Master class

**Full-or-part-time:** 9h 10m  
Theory classes: 2h  
Self study: 7h 10m
# T4. Waste, alternatives to waste and ecodesign principles

**Description:**
- Demand and production of plastics
- Plastic waste: Industrial and post-consumer
- Alternatives to plastic waste: the 3Rs rule
- Ecodesign strategies

**Related activities:**
Master class

**Full-or-part-time:** 9h 30m  
Theory classes: 2h  
Self study: 7h 30m

---

# T5. Plastic recycling

**Description:**
- Mechanical recycling
- Polymer degradation
- Chemical recycling

**Related activities:**
Master class

**Full-or-part-time:** 9h 30m  
Theory classes: 2h  
Self study: 7h 30m

---

# T6. ACV - Activity: CES edupack

**Description:**
- Introduction
- Evolution
- Program operation
- Activity

**Related activities:**
Master class

**Full-or-part-time:** 12h 50m  
Theory classes: 3h  
Laboratory classes: 2h  
Self study: 7h 50m
T7. Practical cases of recycling plastics + bioplastics

**Description:**
- Examples of revaluation of plastics
- Biodegradation
- Life cycle/carbon footprint
- Main biopolymers

**Related activities:**
Master class

**Full-or-part-time:** 9h 30m
Theory classes: 3h
Self study: 6h 30m

---

T8. Rubber recycling

**Description:**
- Introduction
- Natural and synthetic rubbers
- Mechanical recycling
- Chemical recycling

**Related activities:**
Master class

**Full-or-part-time:** 9h 30m
Theory classes: 3h
Self study: 6h 30m

---

T9. Laboratory sessions

**Description:**
- Fast identification techniques for plastics
- Injection of plastic materials

**Related activities:**
Team work

**Full-or-part-time:** 10h
Laboratory classes: 10h

---

T10. Metals recycling

**Description:**
- Relevance of recycling
- Recyclable metals
- Recycling processes

**Related activities:**
Master class

**Full-or-part-time:** 9h 30m
Theory classes: 3h
Self study: 6h 30m
T11. Work presentations

Description:
- Selection of scientific papers of interest
- Presentation/exposition of the main results

Full-or-part-time: 13h
Theory classes: 3h
Self study: 10h

GRADING SYSTEM

The final score will correspond to:
0,47*Final exam + 0,17*Seminars + 0,16*Activity + 0,1*Works + 0,1*Laboratory sessions

BIBLIOGRAPHY

Basic:

RESOURCES

Other resources:
Teaching material available in Atenea