Course guide
240IME33 - 240IME33 - Conformation Systems of Pieces

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 712 - EM - Department of Mechanical 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: 2023
ECTS Credits: 4.5
Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: IRENE BUJ CORRAL
Others:

PRIOR SKILLS

It is recommended to previously take the subject Manufacturing Systems of the GETI or another equivalent subject.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEEMAT3. Design, calculate and model aspects related to the materials for mechanical components, structures and equipment.
CEMEI22. Knowledge and abilities to verify and control the facilities, processes and products.

TEACHING METHODOLOGY

Two class hours for theory and exercises are planned in large groups. There will also be 5 laboratory classes of 2 hours in small groups.

LEARNING OBJECTIVES OF THE SUBJECT

General objective:
- To define the maximum number of processes by means of which the innumerable products that surround us have been manufactured, except those concerning machining processes. In addition, to apply such knowledge to the definition of the general manufacturing process for pieces.

Specific objectives:
- To describe the Manufacturing and Control processes for pieces obtained by: Casting, Forging, Extrusion, Tube Manufacturing, Sintering, Welding, Thin Metal Sheet Parts, Thick Metal Sheet Parts, obtention of plastic and composite materials parts and union and assembly processes. Identification of applications and limitations of each process.
- To identify the limitations of the production means available, as well as the way to achieve a better use of such media.
- To learn to recognize the workpieces' specifications which condition and impose the suitable and most appropriate process according to available production means.
- To define the most convenient combination of manufacturing processes for manufacturing a workpiece of given specifications, in order to achieve a product as competitive as possible.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>27.0</td>
<td>24.00</td>
</tr>
<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>
</tbody>
</table>

Total learning time: 112.5 h

CONTENTS

1-Casting processes

Description:

Specific objectives:
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize casting processes, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

Related activities:
Casting processes exercises. Laboratory classes 1 to 5 to see the manufacture of models by means of 3D printing and manufacture of parts with sand casting.

Full-or-part-time: 28h
- Theory classes: 6h
- Laboratory classes: 8h
- Self study: 14h

2-Forging processes

Description:

Specific objectives:
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize forging processes, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

Related activities:
Exercises about forging processes.

Full-or-part-time: 8h
- Theory classes: 4h
- Self study: 4h
3-Extrusion

Description:
- Introduction. Direct and indirect hot extrusion. Direct and indirect cold extrusion.

Specific objectives:
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize extrusion of metals, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

Related activities:
Exercises about extrusion of metallic parts.

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

5-Manufacture of tubes

Description:

Specific objectives:
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize manufacture of metallic tubes, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

Related activities:
Exercises about manufacture of tubes.

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

5-Metal sheet parts

Description:

Specific objectives:
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize manufacture of metal sheet parts, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

Related activities:
Exercises about metal sheet forming

Full-or-part-time: 16h
Theory classes: 6h
Laboratory classes: 2h
Self study: 8h
6-Sintering processes

Description:
- Introduction to the sintering process. Materials used for sintering. Industrial process. Applications and limitations of sintered parts. Advantages and disadvantages of the sintering process versus other manufacturing processes. Processes in which sintering is the only process to be used and Design recommendations for parts to be obtained by means of sintering processes

Specific objectives:
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize manufacture of sintered parts, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

Related activities:
Sintering exercises

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

7-Manufacture of plastic parts

Description:

Specific objectives:
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize manufacture of plastic parts, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

Related activities:
Exercises about manufacture of plastic parts. Laboratory class about manufacturing process for obtaining plastic models with 3D printers.

Full-or-part-time: 14h
Theory classes: 7h
Self study : 7h
### 8-Assembly and joining processes

**Description:**

**Specific objectives:**
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize assembly processes, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

**Related activities:**
Exercises related to assembly and joining systems.

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

### 9-Surface treatments

**Description:**
Electrolytic treatments, electroless treatments, galvanization, anodization and painting processes.

**Specific objectives:**
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize surface treatments, as well as different types of machines that can be employed and main applications, advantages and limitations of the different process variants.

**Related activities:**
Exercises related to surface treatments.

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

### 10-Heat treatments

**Description:**
Heat treatments for steel parts, heat treatments for copper and aluminium parts, heat treatments for other materials.

**Specific objectives:**
To provide students with knowledge and skills required to identify, evaluate, compare and select: basic elements that characterize heat treatments, as well as different types of facilities that can be employed and main applications, advantages and limitations of the different process variants.

**Related activities:**
Exercises related to heat treatments.

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

Formula for calculation of final mark is:
\[ N_{\text{final}} = 0,15 \cdot N_{\text{LT}} + 0,1 \cdot N_{\text{TC}} + 0,75 \cdot \max\{\text{NEF}; 0,6 \cdot \text{NEF} + 0,4 \cdot \text{NPP}\} \]

Reassessment:
The Reassessment Exam corresponds to the content of theory and exercises of the subject. The obtained mark of the Reevaluation Exam NER replaces the marks NPP of the Partial Exam and NEF of the Final Exam.
\[ N_{\text{final}} = 0,1 \cdot N_{\text{LT}} + 0,1 \cdot N_{\text{TC}} + 0,8 \cdot N_{\text{ER}} \]

EXAMINATION RULES.

Exams will contain theory and exercises. In the theory part nothing can be read. In the exercises part, it is possible to read a sheet with formulae.

BIBLIOGRAPHY

Basic: