320146 - PF - Manufacturing Processes

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: José Antonio Ortiz Marzo
Others: José Antonio Ortiz Marzo
Carlos Díaz

Opening hours
Timetable: Schedule to be agreed

Prior skills
It is not necessary that students have any prior special training due to the specific nature of the subject.

Degree competences to which the subject contributes

Transversal:
1. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
3. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
4. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

Teaching methodology
- Theoretical sessions and resolution of exercises.
- Practice sessions in the laboratory.
- Independent work and exercises.

Learning objectives of the subject
Introduce concepts, techniques and methodologies in the area of manufacturing.
Provide an overview of the relationship between design and manufacturing.
Familiarization and use technical language typical of industrial environment.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>30h</th>
<th>20.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>30h</td>
<td>20.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

### TOPIC 1: Metrology and verification

**Learning time:** 23h  
Theory classes: 4h  
Practical classes: 2h  
Laboratory classes: 2h  
Self study: 15h

**Description:**

1.1. Systems of units  
1.2. Tolerances and adjustments  
1.3. Surface states, roughness  
1.4. Measuring instruments  
1.5. Errors in the measurement

**Related activities:**

AVMV

**Specific objectives:**

- To know and use the different measurement tools, as well as their particular application and manipulation.

### TOPIC 2: Machining processes

**Learning time:** 45h  
Theory classes: 10h  
Practical classes: 5h  
Laboratory classes: 5h  
Self study: 25h

**Description:**

- Introduction machining processes  
- Turning  
- Drilling and reaming, Threading  
- Milling  
- Grinding  
- Sawed and smoothed  
- Gears manufacturing

**Related activities:**

AVMEC

**Specific objectives:**

- To know and differentiate the different machines and accessories available in the workshop.  
- To learn the correct way of using it, as well as the basic safety and behavior norms in a mechanical workshop.
### TOPIC 3: Joining and cutting processes

**Description:**
- Electric arc welding
- Resistance welding
- Oxyacetylene welding
- Cutting processes: by Water, laser, flame cutting
- Gluing processes

**Related activities:**
- AVUT

**Specific objectives:**
To know and differentiate the different machines and accessories available in the workshop. To learn the correct way of using them, as well as the basic rules of security and behavior in a mechanical workshop.

**Learning time:** 16h
- Theory classes: 3h
- Practical classes: 1h 30m
- Laboratory classes: 1h 30m
- Self study: 10h

---

### TOPIC 4: Other processes of transformation

**Description:**
- Hot forming (Casting, Forging, Sintering, Lamination, Extrusion)
- Cold forming (Cutting, drawing, bending)
- EDM (Electrical Discharge Machining)

**Learning time:** 14h 30m
- Theory classes: 3h
- Practical classes: 1h 30m
- Self study: 10h
### TOPIC 5: Numerical Control (CNC)

| Description: |
| :: |
| - Definition |
| - Machines with CNC |
| - Classifications CNC |
| - Components of machines with CNC |
| - Axes and reference systems |
| - Programming |
| - Languages used |
| - ISO programming language |
| - Common types of functions |
| - Scheduling workflows. |

| Related activities: |
| AVCNC |

| Specific objectives: |
| To know the different programming tools available. |
| To know the different CNC machines available. |

### TOPIC 6: Thermoplastics. Transformation processes

| Description: |
| :: |
| - Injection |
| - Mould making |
| - Basic criteria for the design of parts |
| - Extrusion |
| - Compression molding |
| - Foams |
| - Pultrusion |
| - Blowing |
| - Rapid Prototyping processes |

| Specific objectives: |
| To understand the possibilities of transformation of the thermoplastics aimed at product design. |
Planning of activities

**AVMV: METROLOGY LAB**
**Description:**
Measuring objects, using different tools available.

**AVMEC: MECHANICAL WORKSHOP**
**Description:**
Step by different workstations where you can do various tasks such as turning operations, milling

**AVUT: MECHANICAL WORKSHOP**
**Description:**
Step by different workstations where you can perform welding and cutting.

**AVCNC: MECHANICAL WORKSHOP**
**Description:**
Solve basic problems of programming and the application to the machine.

Qualification system

Written tests: 25% first test, 25% final test.
Work in group-based on problem solving: 25%
Report /s activities linked AVMV, AVMEC, AVUT, AVCNC: 25%

The result of unsatisfactory Activity first test can redirect through a written test to be held on the day fixed for the final exam scheduled on the same track (3 hours). This test can be accessed by students with a grade of less than 5 self assessment. The rating of the test will be between 0 and 10, will have the weight corresponding to that activity. The grade for the application of renewal replace the initial qualification provided that it is superior.

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.
If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

Bibliography