220578 - Mechanics Technology

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN MANAGEMENT ENGINEERING (Syllabus 2012). (Teaching unit Optional)
MASTER'S DEGREE IN MANAGEMENT ENGINEERING (Syllabus 2012). (Teaching unit Optional)
ECTS credits: 3
Teaching languages: Spanish

Teaching staff
Coordinator: Xavier Saluena Berna
Others: Jasmina Casals Terré

Degree competences to which the subject contributes

Specific:
7. Apply theories and inherent principles in the production and logistics area in order to analyze uncertainty complex situations and make decisions using engineering tools.

General:
1. Ability to apply knowledge to solve problems in new environments or unfamiliar environments within broader contexts (or multidisciplinary) related to engineering.
2. Self-learning capacity to independent continuous training.
3. Ability to effectively communicate their findings, knowledge and concluding reasons to skilled and unskilled audiences, clearly and unambiguously.
4. Ability to integrate knowledge and formulate judgments with the aim of making decisions based on information that, with incomplete or limited include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.
5. Ability to understand the impact of engineering solutions in a global and social context.
6. Ability to operate and lead multidisciplinary and multicultural groups, with negotiation skills, group work, relationships in an international setting, and conflict resolution.
220578 - Mechanics Technology

**Teaching methodology**

The course is divided into three parts:

**Theory classes**

Guided activities class

Self-study for doing exercises and activities.

In the theory classes, teachers will introduce the theoretical basis of the concepts, methods and results and illustrate them with examples appropriate to facilitate their understanding.

In the guided activity class (in the laboratory), teachers guide students in applying theoretical concepts to solve problems in machine, always using practical view.

Students, independently, need to work on the materials provided by teachers and the outcomes of the sessions of exercises/problems, in order to fix and assimilate the concepts.

The teachers provide the curriculum and monitoring of activities (by ATENEA).

**Learning objectives of the subject**

The objective of the subject of Manufacturing Technology is the one to develop the knowledge of the processes of manufacture from a design that includes the prototyping, preliminary series, the design of tools as well as the control of the quality. The subject combines explanatory sessions with practical exercises and a practical session on measurement with modern machines of measurement of coordinates and explanation of processes in factory.

**Study load**

<table>
<thead>
<tr>
<th><strong>Total learning time</strong>: 75h</th>
<th>Hours large group:</th>
<th>8h</th>
<th>10.67%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>3h</td>
<td>4.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>16h</td>
<td>21.33%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>48h</td>
<td>64.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Módulo 1: Introduction to the manufacture processes</th>
<th>Learning time: 18h 30m</th>
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</thead>
<tbody>
<tr>
<td>Description:</td>
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</tr>
<tr>
<td>Relation between the manufacture and the management of the production.</td>
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<tr>
<td>The manufacture in the present market and the globalisation.</td>
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<tr>
<td>Solutions: Concurrent engineering and re-engineering.</td>
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<tr>
<td>Technologies CAX in the context of concurrent engineering.</td>
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<td>Productivity versus flexibility. Flexible manufacture. SMED.</td>
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<td>Cells of manufacture and systems of flexible manufacture.</td>
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<tr>
<td>Rapid prototyping and Rapid tooling.</td>
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<td>Technologies of numerical control and systems CAD-CAM.</td>
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<td>Management of improvements of the productivity in the industry.</td>
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<tr>
<td>Planning of processes (CAPP).</td>
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<tr>
<td>Related activities:</td>
<td></td>
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<tr>
<td>Activity 1: Theory/Large groups sessions</td>
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<tr>
<td>Activity 3: Final exam</td>
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<td>Activity 4: Project of evaluation</td>
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<tr>
<th>Módulo 2: Measurement and uncertainty</th>
<th>Learning time: 13h</th>
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<tbody>
<tr>
<td>Description:</td>
<td></td>
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<tr>
<td>Processes of measurement and management of the quality in manufacture Functional and nonfunctional measures</td>
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<tr>
<td>Defect zero and process control</td>
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<tr>
<td>Dimensional and geometric tolerances</td>
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<tr>
<td>Uncertainty of measurement</td>
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<tr>
<td>Related activities:</td>
<td></td>
</tr>
<tr>
<td>Activity 1: Theory/Large groups sessions</td>
<td></td>
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<tr>
<td>Activity 2: Guided activities session</td>
<td></td>
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<tr>
<td>Activity 3: Final exam</td>
<td></td>
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<tr>
<td>Activity 4: Project of evaluation</td>
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</tbody>
</table>
Módulo 3: Metallic molds for the manufacture of metallic pieces, of plastic, glass or compound materials.

**Description:**
- Castability of materials.
- Molded materials in the aeronautics, automobile, feeding, chemistry, naval, graphical, electrical and energetics industry.
- Materials for the manufacture of metallic molds.
- Processes of moulding and design of molds.
- Simulation of moulding processes (CAPE).
- Manufacture of metallic molds, technical and CAD-CAM.

**Related activities:**
- Activity 1: Theory/Large groups sessions
- Activity 3: Final exam
- Activity 4: Project of evaluation

**Specific objectives:**

Módulo 4: Processes of metallic cold forming

**Description:**
- Metallic sheet.
- Metallic sheet in the industry of the automobile, aeronautics, naval, feeding, and electrical.
- Processes of die out and design of dies.
- Electrodischarge machining.
- Simulation of processes of cold forming (CAPE).
- Manufacture of metallic dies, technical and CAD-CAM.

**Related activities:**
- Activity 1: Theory/Large groups sessions
- Activity 3: Final exam
- Activity 4: Project of evaluation

**Learning time:**
- 10h 30m
  - Theory classes: 7h
  - Self study: 3h 30m

- 10h 30m
  - Theory classes: 3h 30m
  - Self study: 7h
## Módulo 5: Processes of metallic hot forming

**Description:**
Processes of rolled, drawing, extrusion, forging and sintering.
Pieces hot forming in the aeronautics, naval, railway, tools, anchorages and construction industry.
Processes of hot forming and design of dies and stamps.
Simulation of hot deformation processes (CAPE).
Manufacture of metallic stamps, technical and CAD-CAM.

**Related activities:**
- Activity 1: Theory/Large groups sessions
- Activity 3: Final exam
- Activity 4: Project of evaluation

### Learning time:
- Theory classes: 3h 30m
- Self study: 6h

## Módulo 6: Heat and superficial treatments and machining processes

**Description:**
Machining processes.
Machining components in the aeronautics, naval, automobile, energetics, tools, graph, chemistry, railway and structures industry
Heat and superficial treatments
Manufacture of machining processes, technical and CAD-CAM.

**Related activities:**
- Activity 1: Theory/Large groups sessions
- Activity 2: Guided activities session
- Activity 3: Final exam
- Activity 4: Project of evaluation

### Learning time:
- Theory classes: 3h 30m
- Guided activities: 1h 30m
- Self study: 8h
Planning of activities

| ACTIVITY 1: THEORY/LARGE GROUPS SESSIONS | Hours: 21h  
Theory classes: 21h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Attendance to the theory sessions.</td>
</tr>
</tbody>
</table>
| **Support materials:**                   | Notes posted to the Atenea platform.  
General literature of the course. |
| **Descriptions of the assignments due and their relation to the assessment:** | During some sessions, exercises will be conducted in the class, individually or in small groups.  
It represents 5% of the final course grade. |
| **Specific objectives:**                 | Transfer the necessary knowledge for a correct interpretation of the contents in the large group sessions, resolving doubts about the content of the course and generic skills development. |

| ACTIVITY 2: GUIDED ACTIVITIES SESSION | Hours: 5h  
Guided activities: 3h  
Self study: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Preparation after the guided activities session and attendance to the session.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Notes posted to the Atenea platform.</td>
</tr>
</tbody>
</table>
| **Descriptions of the assignments due and their relation to the assessment:** | During this session, in the metrology and factory laboratory, practices will be developed.  
After that, a report by groups will be realized as homeworks.  
It represents 15% of the final course grade. |
| **Specific objectives:**                 | To include the processes of mechanized, heat treatments, as well as the techniques of verification of received material. Verification of quality in manufacture with Machines of Measurement of Coordinates (MMC). |

| ACTIVITY 3: FINAL EXAM | Hours: 33h  
Theory classes: 3h  
Self study: 30h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Individual and writing assessment about the contents of all modules.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Instructions and terms for the final exam.</td>
</tr>
</tbody>
</table>
| **Descriptions of the assignments due and their relation to the assessment:** | The hand-in will be the result of the exam.  
It represents 50% of the final course grade. |
Specific objectives:
The exam must demonstrate that the student has acquired and assimilated the concepts, principles and fundamentals related to all modules.

ACTIVITY 4: PROJECT OF EVALUATION

Description:
Proposed problems to realise of nonattendance form, individually.

Support materials:
Instructions and terms for the project.

Descriptions of the assignments due and their relation to the assessment:
The hand-in would be given and will gather throughout the course in ATENEA. It represents 30% of the final course grade.

Specific objectives:
The project must demonstrate that the student has acquired and assimilated the concepts, principles and fundamentals related to 3 modules 1 and 2. Los problemas comprueban si el estudiante/a ha adquirido y asimilado los conceptos, principios y fundamentos básicos relacionados con 3 de los módulos chosen by the educational ones of random form.

Qualification system
The final grade depends on the following assessment criteria:

- Activity 1, weight: 10%
- Activity 2, weight: 15%
- Activity 3 (final exam), weight: 50%
- Activity 4 (project of evaluation), weight: 25%

Regulations for carrying out activities
Activity 2 will take place in groups and written and will send to ATENEA
Activity 3 will be take place individually and will be written in attendance form.
Activity 4 will take place in groups and written and will send to ATENEA

Bibliography
Basic: