220033 - Manufacturing Technology and Maintenance

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2018
Degree: BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 4,5
Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: José Antonio Ortiz Marzo
Others: José Antonio Ortiz Marzo

Prior skills

Students should have mathematical problems solving ability, basic technical drawing capabilities and knowledge about science and technology of aerospace materials.

Degree competences to which the subject contributes

Specific:

1. GrETA/GrEVA - An understanding of manufacturing processes

2. GrEVA - An adequate understanding of the following, as applied to engineering: calculation methods for aeronautical design and development; the use of aerodynamic experimentation and the most important parameters in theoretical application; the experimental techniques, equipment and measuring instruments used in the discipline; simulation, design, analysis and interpretation of in-flight experiments and operations; aircraft maintenance and certification systems.

3. GrETA/GrEVA - Applied knowledge of materials science and technology; mechanics and thermodynamics; fluid mechanics; aerodynamics and flight mechanics; navigation systems and air traffic; aerospace technology; structural theory; economy and production; projects; environmental impact.

Transversal:

4. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.

Teaching methodology

The teaching methodology is divided in three parts:
- Theoretical contents sessions.
- Lab sessions or Probleme solving sessions.
- Autonomous work and homeworks.

In the theoretical sessions the professor will present the theoretical concepts.
In the lab sessions, students will practice the knowledge acquired setting practical experiments or solving problems under the supervision of the professor. Possible visit to a company.
In each module a self-study time is required in order to assimilate the concepts and resolve the proposed exercises.
220033 - Manufacturing Technology and Maintenance

Learning objectives of the subject

The main goal is to provide the tools and knowledge need to successfully develop any project related to aircraft and aerospace vehicles maintenance and production. In the class, all the contents related to design, manufacturing, maintenance and management, control and quality of aircrafts manufacturing will be covered.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group:</th>
<th>31h</th>
<th>27.56%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>14h</td>
<td>12.44%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>67h 30m</td>
<td>60.00%</td>
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</table>
## Content

<table>
<thead>
<tr>
<th>Quality control and Prototyping</th>
<th>Learning time: 23h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Laboratory classes: 3h</td>
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<tr>
<td></td>
<td>Self study : 10h</td>
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</table>

**Description:**
In this module the student will learn the requirements of aerospace parts manufacturing in particular its quality specifications and how to control this quality requirements during the manufacturing process.

**Related activities:**
Activity 1-2-3-5

**Specific objectives:**
- Aerospace requirements
- Manufacturing engineering and Lean Manufacturing
- Prototyping
- Quality control (Tolerances, metrology, calibration, measurements)

<table>
<thead>
<tr>
<th>Basic Manufacturing Technologies I</th>
<th>Learning time: 27h 30m</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 12h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study : 12h 30m</td>
</tr>
</tbody>
</table>

**Description:**
This module the main aerospace manufacturing processes related to metal casting, and cold metal deformation will be covered.

**Related activities:**
Activity 1-2-3-5

**Specific objectives:**
- Hot forming: Casting, Forging, Sintering
- Cold metal deformation
## Basic Manufacturing Technologies II

<table>
<thead>
<tr>
<th>Description</th>
<th>Learning time: 31h</th>
</tr>
</thead>
<tbody>
<tr>
<td>This module the main aerospace manufacturing processes related to sintering, joining and welding, machining will be covered.</td>
<td>Theory classes: 12h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study : 15h</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Related activities</th>
<th>Specific objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity 1-2-4-5</td>
<td>Welding and Joining</td>
</tr>
<tr>
<td>Machining</td>
<td></td>
</tr>
</tbody>
</table>

## Quality management in Aerospace Manufacturing

<table>
<thead>
<tr>
<th>Description</th>
<th>Learning time: 31h</th>
</tr>
</thead>
<tbody>
<tr>
<td>This module will cover all the processes needed to guarantee the quality and innovation in the maintenance and manufacturing of aerospace metal parts.</td>
<td>Theory classes: 12h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study : 15h</td>
</tr>
</tbody>
</table>

| Related activities | |
|--------------------| Activity 1-2-4-5 |
# Planning of activities

## THEORY SESSIONS

### Description:
Description in class of the theoretical contents of the subject

### Support materials:
- Basic and specific bibliography
- Atenea Handouts

### Descriptions of the assignments due and their relation to the assessment:
This activity is graded through two written exams: midterm (activity 3) and final (activity 4)

### Specific objectives:
After these classes, the student should have consolidated and acquired all the knowledges enumerated in the general learning goals of subject.

### Hours: 60h
- Theory classes: 40h
- Self study: 20h

## LAB SESSIONS

### Description:
In this activity the student will set up practical experiments related to the subject contents

### Support materials:
- Bibliography and Lab guide.

### Descriptions of the assignments due and their relation to the assessment:
- Lab report by group.
- It represents a part of the continuous assessment of the subject.

### Specific objectives:
- Improve and use concepts related to aerospace metrology, machining and aircraft maintenance.

### Hours: 21h 30m
- Laboratory classes: 14h
- Practical classes: 7h 30m

## MIDTERM EXAM

### Description:
Individual test related to the acquired contents.

### Support materials:
- Exam and handouts provided

### Descriptions of the assignments due and their relation to the assessment:
- Solved exam is handed to the professor
- It is part of continuous evaluation systems

### Specific objectives:
- Contents related to module 1 and 2.

### Hours: 12h
- Theory classes: 2h
- Self study: 10h
Final Exam

**Description:**
Individual test related to the acquired contents.

**Support materials:**
Exam and handouts provided

**Descriptions of the assignments due and their relation to the assessment:**
Solved exam is handed to the professor
It is part of continuous evaluation systems

**Specific objectives:**
Contents related to module 3 and 4

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
<th>Theory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam</td>
<td>12h</td>
<td>2h</td>
<td>10h</td>
</tr>
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</table>

**Problem/Work Proposed**

**Description:**
Solve a practical problem or work proposed in ATENEA in order to fix the contents developed in the theoretical sessions.

**Support materials:**
Problem/Work posted in ATENEA

**Descriptions of the assignments due and their relation to the assessment:**
Handout the solution of problem/work by group, through ATENEA

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
<th>Theory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem/Work Proposed</td>
<td>7h</td>
<td>2h</td>
<td>5h</td>
</tr>
</tbody>
</table>

**Qualification System**

Activity 2 (Lab sessions), weight: 20%
Activity 3 (Midterm test), weight: 35%
Activity 4 (Final test), weight: 30%
Activity 5 (Proposal Homework/Work), weight: 15%

The result of unsatisfactory Activity 3 (partial exam) 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.

**Regulations for carrying out activities**

All activities are compulsory.
Bibliography

**Basic:**


**Others resources:**

Throughout the course, Internet links are given to check and copies of articles to read that complement the explanations given in class.

**Audiovisual material**

World of microsystems