Degree competences to which the subject contributes

Transversal:
1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
3. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

Teaching methodology
Based learning in individual and small group sessions and theory groups.

Learning objectives of the subject
The use of new technologies in engineering is increasing on the industry, the geometry modelling complex and specific quality characteristics, the finite element calculation, simulation of mechanisms, computer aided manufacturing tools, automatic calculation...are usually used in industry, and therefore necessary product design decisions.
The objectives of the course are:
- Understand the theoretical and practical issues.
- Become familiar with the computer programmes related with course.
- Become familiar with the working methods of engineering: today fully integrated in the industrial environment.
- Able to understand, translate or model a problem of the industry.
## Study load

<table>
<thead>
<tr>
<th></th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>15h</td>
<td>0h</td>
<td>45h</td>
<td>0h</td>
<td>90h</td>
</tr>
<tr>
<td></td>
<td>10.00%</td>
<td>0.00%</td>
<td>30.00%</td>
<td>0.00%</td>
<td>60.00%</td>
</tr>
</tbody>
</table>

Total learning time: 150h
# Content

<table>
<thead>
<tr>
<th>Topic 1 : CAD</th>
<th>Learning time: 50h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 15h</td>
</tr>
<tr>
<td></td>
<td>Self study: 30h</td>
</tr>
</tbody>
</table>

### Description:

- **INTRODUCTION**
  1. CAD Tools in the different phases of product development
  2. CAD systems history
  3. Classification of CAD systems
  4. Selection of CAD systems.
  5. Design methods
  6. Cycle product life
- **GEOMETRIC MODELS**
  1. Solids: Wireframe / Boundary / Constructive Geometry / Volumetric
  2. Superficies and curves: polygon meshes / Bezier / Splines / Nurbs
  3. Superficies analytical / quadratic / Patches
  4. Treball with point clouds
- **DATA QUALITY CAD**
  1. Problems in data quality
  2. Quality Organizational / Functional
  3. Continuity tangency / curvature / Class A
  4. Geometry and process manufacturing
- **DATA EXCHANGE**
  1. Integration of CAD systems
  2. Native Formats
  3. Neutral Formats

### Related activities:

AVCAD1, AVCAD2
### TOPIC 2: CAM

**Description:**
- Introduction to machining
- CNC machines. Typology and Overview.
- Milling machine operations
- Programming languages. ISO and conversational. Post-processing.
- Preliminary use of CAM tools, raw material,
- Using a CAM 2.5 D (SOLID CAM)
- Using a 3D CAM (SOLID CAM)
- New trends in machining: IMACHINING SOLID CAM. (optimized path, constants efforts)
- Introduction to CAM 5D (SOLID CAM). Simulation of machinery.

**Related activities:**
AVCAM1

### TOPIC 3: CAE

**Description:**
- Kinematics Simulations
- Dynamics Simulations
- Static FEA Simulations
- FEA simulations. Fatigue
- FEA Simulations. Thermal problems

**Related activities:**
AVCAE1, AVCAE2, AVCAE3

**Learning time:** 50h
- Theory classes: 5h
- Laboratory classes: 15h
- Self study: 30h
Planning of activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVCAD1: INDIVIDUAL CAD WORK</td>
<td>6h</td>
</tr>
<tr>
<td>AVCAD2: GROUP CAD WORK</td>
<td>18h</td>
</tr>
<tr>
<td>AVCAM1: WORKING WITH MILLING</td>
<td>15h</td>
</tr>
<tr>
<td>AVCAE1: CIN AND DIN SIMULATION</td>
<td>6h</td>
</tr>
<tr>
<td>AVCAE2: STATIC AND FATIGUE FEA</td>
<td>6h</td>
</tr>
</tbody>
</table>

Qualification system

The evaluation of knowledge, skills and abilities is made from:
- Deliveries scheduled AVCAD1, AVCAD2, ........................................33%
- Deliveries scheduled AVCAM1..................................................... 33%
- Deliveries scheduled AVCAE1, AVCAE2, AVCAE3 ............................ 34%

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.

Regulations for carrying out activities

The realization and delivery of planned activities is mandatory in order to obtain a continuous assessment rating.

Bibliography