Degree competences to which the subject contributes

Specific:
1. IND_BASIC: Capability for spatial vision and an understanding of graphic representation techniques, using the traditional methods of metric and descriptive geometry as well as computer-aided design applications.

Transversal:
2. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
3. 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.
4. 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

- Face-to-face lecture sessions
  Lectures are given using digital presentations. The presentations will be made available to students on the virtual campus before classes begin to help them follow them. The assessment will be based on mid-semester examinations (or an optional final examination for students who fail the first one).
  - Face-to-face practical work sessions
  During practical work sessions, students work individually or in small groups of 2-3 on problems and questions under the lecturer's supervision. A collection of problems will be made available on the virtual campus. Systems for self-assessment (with assessment criteria or rubrics), co-assessment (among students) and delivery of reports, corrected by the teacher and returned, are made available to facilitate independent learning.
  - Face-to-face laboratory work sessions
  Students work in pairs during laboratory sessions. Guidelines for practicals will be made available to students on the virtual campus at the start of the course. Students must hand in a report for each practical. Marks will be based on the work carried out in the laboratory and the reports handed in.

Learning objectives of the subject

On completion of the course, students should be able to:
  - Correctly use and interpret the language and basic concepts of Chemistry.
  - Recognise the structure of matter and relate it to the physical and chemical properties of organic and inorganic substances.
  - Apply stoichiometric calculations to solve problems.
  - Recognise the equipment and apply the basic techniques of the chemistry laboratory.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>60h</td>
<td>40.00%</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>
# 320004 - EGE - Graphic Expression in Engineering

## Content

### TOPIC 1: PLANE GEOMETRY

**Description:**
1.1. Tangencies and tangential contacts.
1.2. Conic sections.
1.3. Technical curves.

**Related activities:** AV0 and AV1 (CTP1), AV2 (SPP1), AV3 (AINP1), AV4 (CTP2), AV5 (SPP2), AV6 (AINP2), AV7 (CTP3), AV8 (SPP3) and AV9 (AGNP1).

**Specific objectives:**
- OE1. Formulate the principles and basic techniques of plane geometry.
- OE2. Understand the formulation of geometry exercises on the basis of graphic and textual descriptions.
- OE3. Find solutions to plane geometry problems.

**Learning time:** 30h
- Practical classes: 12h
- Self study: 18h

### TOPIC 2: SOLID GEOMETRY

**Description:**
2.1. Projections and representation systems: basic operational techniques.
2.2. Point, line and plane. Relative positions.
2.3. Conditions of perpendicularity, parallelism and belonging.
2.4. Distances.
2.5. Angles.

**Related activities:** AV10 (CTP4), AV11 (SPP4), AV12 (AINP3), AV13 (CTP5), AV14 (SPP5), AV15 (AINP4), AV16 (CTP6), AV17 (SPP6), AV18 (AINP5), AV19 (CTP7) AV20 (SPP7), AV21 (AINP6), AV22 (CTP8), AV23 (SPP8), AV24 (AGNP2) and AV25 (CPP1).

**Specific objectives:**
- OE4. Understand the principles that determine solid geometry.
- OE5. Understand the descriptions of problems focusing on spatial situations and relationships.
- OE7. Understand the functioning of the main representation systems used in engineering.
- OE8. Make proper use of these representation systems to find solutions to problems.

**Learning time:** 60h
- Practical classes: 24h
- Self study: 36h
TOPIC 3: INDUSTRIAL STANDARDISATION

Learning time: 60h
Practical classes: 24h
Self study: 36h

Description:
3.1. Introduction. Industry standards.
3.2. Freehand technical drawing.
3.3. Obtaining standardised views.
3.4. Treatments: cuts, sections and breaks.
3.5. Dimensioning: guidelines for industrial dimensioning.
3.6. Screw threads and other standardised items.
3.7. Graphic representation of industrial assemblies.

Related activities:
AV26 (CTP9), AV27 (SPP9), AV28 (AINP7), AV29 (CTP10), AV30 (SPP10), AV31 (AGNP3), AV32 (CTP11), AV33 (SPP11), AV34 (CTP12), AV35 (SPP12), AV36 (CTP13), AV37 (PTG) and AV38 (CPP2).

Specific objectives:
For students to:
OE9. Understand and correctly apply the rules for industrial technical drawing.
OE10. Identify errors in the application of the rules for industrial technical drawing and make the necessary corrections.
OE11. Develop virtual prototypes in a 3D environment.
### Planning of activities

| AV1: (CTP1) PLANE GEOMETRY | Hours: 0h 35m  
|                           | Practical classes: 0h 35m |
| AV0: PRESENTATION OF THE SUBJECT | Hours: 0h 10m  
|                           | Practical classes: 0h 10m |
| AV2: (SPP1) TANGENCIES AND TANGENTIAL CONTACTS. | Hours: 3h 15m  
|                           | Practical classes: 3h 15m |
| AV3: (AINP1) | Hours: 6h  
|                           | Self study: 6h |
| AV4: (CTP2) PLANE GEOMETRY (II) | Hours: 0h 45m  
|                           | Practical classes: 0h 45m |
| AV5: (SPP2) | Hours: 3h 15m  
|                           | Practical classes: 3h 15m |
| AV6: (AINP2) | Hours: 6h  
|                           | Self study: 6h |
| AV7: (CTP3) PLANE GEOMETRY (III) | Hours: 0h 45m  
|                           | Practical classes: 0h 45m |
| AV8: (SPP3) | Hours: 3h 15m  
|                           | Practical classes: 3h 15m |
| AV9: (AGNP1) | Hours: 6h  
|                           | Self study: 6h |
| AV10: (CTP4) SOLID GEOMETRY | Hours: 0h 45m  
Practical classes: 0h 45m |
|-----------------------------|-----------------|
| AV11: (SPP4)                | Hours: 3h 15m   
Practical classes: 3h 15m |
| AV12: (AINP3)               | Hours: 6h       
Self study: 6h |
| AV13: (CTP5). SOLID GEOMETRY (II) | Hours: 0h 45m  
Practical classes: 0h 45m |
| AV14: (SPP5)                | Hours: 3h 15m   
Practical classes: 3h 15m |
| AV15: (AINP4)               | Hours: 6h       
Self study: 6h |
| AV16: (CTP5). SOLID GEOMETRY (III) | Hours: 0h 45m  
Practical classes: 0h 45m |
| AV17: (SPP6)                | Hours: 3h 15m   
Practical classes: 3h 15m |
| AV18: (AINP5)               | Hours: 6h       
Self study: 6h |
| AV19: (CTP7). SOLID GEOMETRY (IV) | Hours: 0h 45m  
Practical classes: 0h 45m |
### 320004 - EGE - Graphic Expression in Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV20: (SPP7)</td>
<td></td>
<td>Practical classes: 3h 15m</td>
</tr>
<tr>
<td>AV21: (AINP6)</td>
<td></td>
<td>Self study: 6h</td>
</tr>
<tr>
<td>AV22: (CTP8) SOLID GEOMETRY (V)</td>
<td></td>
<td>Practical classes: 0h 45m</td>
</tr>
<tr>
<td>AV23: (SPP8)</td>
<td></td>
<td>Practical classes: 3h 15m</td>
</tr>
<tr>
<td>AV24: (AGNP2)</td>
<td></td>
<td>Self study: 12h</td>
</tr>
<tr>
<td>AV25: (CPP1)</td>
<td></td>
<td>Laboratory classes: 3h 15m</td>
</tr>
<tr>
<td>AV26: (CTP9) INDUSTRIAL STANDARDISATION (I)</td>
<td></td>
<td>Practical classes: 0h 45m</td>
</tr>
<tr>
<td>AV27: (SPP9)</td>
<td></td>
<td>Practical classes: 3h 15m</td>
</tr>
<tr>
<td>AV28: (AINP7)</td>
<td></td>
<td>Self study: 6h</td>
</tr>
<tr>
<td>AV29: (CTP10) INDUSTRIAL STANDARDISATION (II)</td>
<td></td>
<td>Practical classes: 0h 45m</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Hours</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>AV30:</td>
<td>(SPP10)</td>
<td>3h 15m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h 15m</td>
<td></td>
</tr>
<tr>
<td>AV31:</td>
<td>(AGNP3)</td>
<td>30h</td>
</tr>
<tr>
<td></td>
<td>Self study: 30h</td>
<td></td>
</tr>
<tr>
<td>AV32:</td>
<td>(CTP11) INDUSTRIAL STANDARDISATION (III)</td>
<td>0h 45m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 0h 45m</td>
<td></td>
</tr>
<tr>
<td>AV33:</td>
<td>(SPP11)</td>
<td>3h 15m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h 15m</td>
<td></td>
</tr>
<tr>
<td>AV34:</td>
<td>(CTP12) INDUSTRIAL STANDARDISATION (IV)</td>
<td>0h 45m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 0h 45m</td>
<td></td>
</tr>
<tr>
<td>AV35:</td>
<td>(SPP12)</td>
<td>3h 15m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h 15m</td>
<td></td>
</tr>
<tr>
<td>AV36:</td>
<td>(CTP13) INDUSTRIAL STANDARDISATION (V)</td>
<td>0h 45m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 0h 45m</td>
<td></td>
</tr>
<tr>
<td>AV37:</td>
<td>(PTG)</td>
<td>3h 15m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h 15m</td>
<td></td>
</tr>
<tr>
<td>AV38:</td>
<td>(CPP2) EXAMINATION</td>
<td>4h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
<td></td>
</tr>
</tbody>
</table>
Qualification system

30% First examination
30% Second examination
5% Laboratory sessions
15% Application/practicals
10% Sketch I
10% Sketch II

Unsatisfactory results of the "First examination" (not presented are no applicable) may be taken through the hand-drawn test called "Sketch II" (to be done during class time), only for marks under 5. The grade obtained will be recorded as a grade in the "Sketch II" test and, if it is higher than the "First examination" test, it will replace the initial grade, maximum possible is 5.

Regulations for carrying out activities

To pass the subject, students must complete the laboratory practicals and hand in the necessary reports.
Bibliography

Basic:


Rodríguez de Abajo, Fco. J.; Álvarez Bengoa, V. Curso de dibujo geométrico y de croquización: primer curso de escuelas de ingeniería. 12a ed. San Sebastián: Donostiarras, 1992. ISBN 8470632876.


Complementary:


Others resources:

Hyperlink

General

http://www.isftic.mepsyd.es/jovenes/dibujo_tecnico/.

http://ocw.unican.es/ensenanzas-tecnicas/expresion-grafica-y-dao/material-de-clase

Geometría Plana


Geometría Espacial


Normalització Industrial


http://ocw.upm.es/expresion-grafica-en-la-ingenieria/dibujo-industrial-ii/material-de-clase/

CAD (Tutorials)