Course guide
240025 - 240025 - Engineering Drawing

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 717 - DEGD - Department of Engineering Graphics and Design.

Degree: BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).
Academic year: 2023  ECTS Credits: 7.5  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: ARANTZA VILLA SICILIA

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DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

TEACHING METHODOLOGY

Lectures have a theory component, where theory concepts are incorporated as they are needed, and a practical one, in which concerning to every theme of the subject, the student will carry out individually, with the professors' help, graphical type practice exercises, applying the theoretical concepts taught.

These exercises will be carried out using the computer, at a rate of one computer per student, with the support of the commercial CAD in 3D program. Classes will be taught in the computer labs, with capacity for 32 students, at a rate of 5 hours of classes per week.

The student also has the possibility to install legally and freely the computer program in its own computer so as to practice: finish the exercises done in class, do the complementary exercises proposed at the end of each session and do non-assistance required works. The statements of the exercises to be carried out in class will be published at the beginning of the course, to facilitate the student’s preparation towards the different themes before attending to class. Various theoretical material will also be published (notes, PowerPoint¿) and some exercise tutorials. This teaching material can be consulted in the Campus Digital (Atenea) or in the School's network ( yin ).

Within the 15 weeks of the course, 3 evaluation tests are performed, which along with an Application Project that the student will do in a non-assistance way, are used to evaluate its level of learning and make up its course mark. This continuous evaluation and the exercises planning with progressive difficulty help the students who practice constantly and assimilate the knowledge day by day to pass the course without having to set for the final exam.
LEARNING OBJECTIVES OF THE SUBJECT

General objective

Promoting spatial conception, shape knowledge and graphic representation techniques mostly used in engineering, with the support provided by commercial CAD 3D software.

Specific objective

Acquiring a basic knowledge of industrial drawing language, both at a reading and executing level (graphic language convention) and the presentation of graphic documentation.

- Enlarging traditional metric and descriptive geometry knowledge, applying space geometry in the building of polyhedral bodies and curved 3D surfaces.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>75,0</td>
<td>40.00</td>
</tr>
<tr>
<td>Self study</td>
<td>112,5</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 187.5 h

CONTENTS

1. Drawing conventions I

Description:

Related competencies:
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

Full-or-part-time: 5h
Theory classes: 2h 30m
Self study: 2h 30m

2. 3D Modelling from reading normalised dihedral representations of a single mechanical type work-piece.

Description:
Exercises which intend to introduce students in using 3D CAD software (Procedures. Tools. Concepts. Strategies) while they learn how to read Normalised Dihedral Representations (NDR) and interpreting them. Instructions are also facilitated so that the student can install and configure the software in its personal computer.

Related competencies:
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

Full-or-part-time: 7h
Practical classes: 4h
Self study: 3h
3. Normalised dihedral representations writing from 3D modelled mechanical type work-pieces.

**Description:**
Once 3D modelling exercises have made starting with their NDR, students learn how to draw with the CAD software this 3D NDR work-pieces. 2D drawing tools are taught and theoretic concepts seen in topic 1 are applied.

**Related competencies:**
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

**Full-or-part-time:** 4h 30m
Practical classes: 2h
Self study : 2h 30m

4. Modelling mechanical type work-pieces and writing their normalised dihedral representations from non-dihedral representations.

**Description:**
From non-dihedral representations the student models a mechanical work-piece in 3D and draws its Normalised Dihedral Representation (NDR). The difference with the precious topic is that the student does not have a NDR as a referent and must decide, according to its own criterion, which are the necessary and sufficient views, cuts, contour lines, etc to represent the work-piece. Exercises proposed in class are tests from previous years. Once the exercised has been realised, the student can compare its work with a proposed solution to observe and rectify possible errors or missing things.

**Related competencies:**
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

**Full-or-part-time:** 31h
Practical classes: 14h
Laboratory classes: 2h
Self study : 15h

5. Drawing conventions II

**Description:**

**Related competencies:**
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

**Full-or-part-time:** 5h
Theory classes: 0h 30m
Practical classes: 2h
Self study : 2h 30m
### 6. Introduction to industrial design

**Description:**
Concept and types of design. Industrial design methodology. Application to industrial drawing. Shape & function relation.

**Related competencies:**
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

**Full-or-part-time:** 32h
Guided activities: 32h

### 7. Space geometry and elemental metric

**Description:**

**Related competencies:**
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

**Full-or-part-time:** 5h
Theory classes: 2h 30m
Self study: 2h 30m

### 8. Applying elemental metric to creation (synthesis) and measurement (analysis) of polyhedron bodies in 3D.

**Description:**
Point, straight line and plane as a vertex, edge and face of a polyhedron. Metric synthesis: 3D construction of a polyhedron from its metrical properties (angles and distances). Problems of: distances, angles or equal inclination, double, etc. Intersection of polyhedrons. Metrical analysis: application of 3D CAD software's measurement systems and of space geometry concepts to analyse a polyhedron's metrical properties.

**Related competencies:**
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

**Full-or-part-time:** 37h 30m
Practical classes: 18h
Laboratory classes: 2h
Self study: 17h 30m
9. Curves and surfaces theory

Description:

Related competencies:
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

Full-or-part-time: 5h
Theory classes: 2h 30m
Self study : 2h 30m

10. Application of elemental metrics and surface theory to creation (synthesis) and measurement (analysis) of bodies of revolution.

Description:
3D modelling of surfaces sets defined by their properties, metrical values, relative positions, intersections or unrolled. The application is limited to the study of sphere, toroid, revolution cylinder and revolution cone; with all the possible interactions.

Related competencies:
CE5. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.

Full-or-part-time: 42h
Practical classes: 20h
Laboratory classes: 2h
Self study : 20h

ACTIVITIES

COMPLEMENTARY EXERCISES

Description:
Non-evaluable exercises proposed to execute after each session, to consolidate and enlarge knowledge acquired during each lecture and to prepare upcoming sessions. These exercises help the student to obtain more autonomy and speed, while training for the corresponding test.

Full-or-part-time: 61h
Self study: 61h

Grading exercises

Full-or-part-time: 13h
Laboratory classes: 13h
Test of Interpretation and Normalized Graphic Representation  
**Description:**  
Related to topics 1 to 5 of Contents  
**Full-or-part-time:** 2h  
Laboratory classes: 2h

Test about Geometry (metrics of polyhedrons and solids of revolution)  
**Description:**  
Related to topics 7 to 10 of Contents  
**Full-or-part-time:** 2h  
Laboratory classes: 2h

Project of Standard Definition of Industrial objects  
**Description:**  
Homework project.  
**Full-or-part-time:** 32h  
Self study: 32h

FINAL EXAM  
**Full-or-part-time:** 13h  
Laboratory classes: 3h  
Self study: 10h

**GRADING SYSTEM**

**EXAMINATION RULES.**

The tests will not last longer than 2 hours. The student will be allowed to take and check its own notes, bibliography, exercises solved on paper. Consulting material on electronic devices or Internet is totally forbidden. Carrying out a test involves the preparation by the student of a file to be deposited in the School's computer network. This will be the work evaluated.  
Each student must perform the test on the day, time and hour assigned to its group of practice, in agreement with the official list elaborated by the Planificació Acadèmica, regardless of which group of practices the student attends regularly. To who justifiably and likely cannot attend a test on the day and hour assigned, must ask to be changed each time to the one responsible of the subject, so that depending on the available places, another hour is assigned.  
The application project is carried out in groups, with a computer and out of the teaching hours. A copy in paper must be handed in (in an A4 format) of the plans requested and all the files used must also be sent by Campus Digital. Together with the statement of the project, some presentation standards regarding to the format, deadline for submission will be duly published.  
The final exam consists in three parts, each one of them concerning to the three tests performed during the course and weighing a 30% test number 1, 35% test number 2 and 35% test number 3. The student will receive at the beginning of the session the statements to the three tests and will dispose of a maximum of three hours to carry out the three parts. The qualification obtained in one of the three parts of the final exam at any cases can replace the mark of one of the tests performed during the course.
BIBLIOGRAPHY

Basic:

Complementary: