240025 - Engineering Drawing

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 717 - EGE - Department of Engineering Presentation
Academic year: 2017
Degree: BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory) BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2010). (Teaching unit Compulsory) BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory) BACHELOR'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Teaching unit Optional)
ECTS credits: 7,5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: IGNASI GARCIA ALMIRALL
Others: FERNANDEZ SANCHEZ, Joaquin
GARCIA ALMIRALL, Iñaki
GARCIA MARTINEZ, Sandra
IBARS FONOLLOSA, Guido
MARTIN GIMENEZ, Javier
MONGUET FIERRO, Josep Mª
VILLA SICILIA, Arantza
Solans Pujol, Anna Maria

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.
240025 - Engineering Drawing

**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>Total learning time: 187h 30m</th>
<th>Hours large group:</th>
<th>0h</th>
<th>0.00%</th>
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</thead>
<tbody>
<tr>
<td>Hours medium group:</td>
<td>75h</td>
<td></td>
<td>40.00%</td>
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<tr>
<td>Hours small group:</td>
<td>0h</td>
<td></td>
<td>0.00%</td>
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<tr>
<td>Guided activities:</td>
<td>0h</td>
<td></td>
<td>0.00%</td>
</tr>
<tr>
<td>Self study:</td>
<td>112h 30m</td>
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<td>60.00%</td>
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</table>
## 240025 - Engineering Drawing

### Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Drawing conventions I</strong></td>
<td>5h</td>
</tr>
<tr>
<td><strong>Learning time:</strong> Theory classes: 2h 30m</td>
<td></td>
</tr>
<tr>
<td><strong>Learning time:</strong> Self study: 2h 30m</td>
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<tr>
<td><strong>2. 3D Modelling from reading normalised dihedral representations of a single mechanical type work-piece. Type A exercises</strong></td>
<td>7h</td>
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<tr>
<td><strong>Description:</strong> 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.</td>
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<tr>
<td><strong>Learning time:</strong> Practical classes: 4h</td>
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<tr>
<td><strong>Learning time:</strong> Self study: 3h</td>
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<tr>
<td><strong>3. Normalised dihedral representations writing from 3D modelled mechanical type work-pieces. Type B exercises</strong></td>
<td>4h 30m</td>
</tr>
<tr>
<td><strong>Description:</strong> Once 3D modelling exercises have made starting with their NDR (type A exercises), 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.</td>
<td></td>
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<tr>
<td><strong>Learning time:</strong> Practical classes: 2h</td>
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<tr>
<td><strong>Learning time:</strong> Self study: 2h 30m</td>
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<tr>
<td><strong>4. Modelling mechanical type work-pieces and writing their normalised dihedral representations from non-dihedral representations. Type A+B exercises</strong></td>
<td>31h</td>
</tr>
<tr>
<td><strong>Description:</strong> 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. With these specifications Test 1 is executed at the end of these period. The solution is shown at the end once the test has finished.</td>
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<tr>
<td><strong>Learning time:</strong> Practical classes: 14h</td>
<td></td>
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<tr>
<td><strong>Learning time:</strong> Laboratory classes: 2h</td>
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<tr>
<td><strong>Learning time:</strong> Self study: 15h</td>
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</tbody>
</table>
### 5. Drawing conventions II

**Description:**

**Learning 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.

**Learning time:** 32h
- Guided activities: 32h

### 7. Space geometry and elemental metric

**Description:**

**Learning 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. Type C exercises

**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. With these specifications TEST 2 takes place at the end of this period.

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

**Learning time:** 5h  
- Theory classes: 2h 30m  
- Self study: 2h 30m

**Description:**  

### 10. Application of elemental metrics and surface theory to creation (synthesis) and measurement (analysis) of bodies formed by 3D curves. Type D exercises

**Learning time:** 42h  
- Practical classes: 20h  
- Laboratory classes: 2h  
- Self study: 20h

**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. With these specifications TEST 3 takes place at the end of this period.

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**Degree competences to which the content contributes:**

- 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. With these specifications TEST 3 takes place at the end of this period.
## Planning of activities

| **COMPLEMENTARY EXERCISES** | **Hours:** 61h  
Self study: 61h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>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.</td>
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</table>

| **TEST 1**                  | **Hours:** 2h  
Laboratory classes: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>See topic 4 of Contents</td>
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</tbody>
</table>

| **TEST 2**                  | **Hours:** 2h  
Laboratory classes: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>See topic 8 of Contents</td>
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</tbody>
</table>

| **TEST 3**                  | **Hours:** 2h  
Laboratory classes: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>See topic 10 of Contents</td>
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</tbody>
</table>

| **PROJECT**                 | **Hours:** 32h  
Self study: 32h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>See topic 6 of Contents. Homework project.</td>
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</table>

| **FINAL EXAM**              | **Hours:** 13h  
Laboratory classes: 3h  
Self study: 10h |
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<tr>
<td><strong>Description:</strong></td>
<td>Enables the student has learned the contents with respect to delay testing course can improve their grades, overall, doing exercises that make a sketch of the agenda, but in abbreviated form. The score on one side of the final exam in no case shall replace the score of the tests conducted throughout the course.</td>
</tr>
</tbody>
</table>
The mark of the course of each student will be the weighted sum of the marks obtained in each of the 3 tests carried out during the same and in the project performance. Students who can demonstrate a minimum attendance of the 80% of the classes, their final grade will be the maximum between Nfinal1 and Nfinal2. Those who cannot prove that minimum attendance their final grade will be Nfinal2.

(Mark of the course) Nfinal1 = 0.30* Np1 + 0.3* Np2 + 0.3* Np3
Nfinal2 = 0.4* Nfinal1 + 0.6* Nef
Np1: Mark of test number 1
Np2: Mark of test number 2
Np3: Mark of test number 3
Nef: Mark of the final exam

Regulations for carrying out activities

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:


Others resources:

Campus digital

In the Campus Digital it is possible to obtain the same material that is found in the school's network. The Campus Digital is also the communication channel used deliver work, consults, announcements (news±s forum) and publication of marks.

Workshop

Optionally, students can enrol in "Aula Lliure d'Expressió Gràfica". This is an open workshop in which students can solve problems related to this subject while they are directed by mentors or interns (only available in the Spring semester).

Audiovisual material

Material audiovisual i informàtic