320136 - EG - Engineering Graphics

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 717 - EGE - Department of Engineering Presentation
Academic year: 2019
Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: Francisco Bermúdez Rodríguez

Degree competences to which the subject contributes

Specific:
1. DES: Ability to take decisions related to the graphic representation of concepts.
2. DES: Ability to apply specific methods, techniques and instruments for each form of technical drawing.
3. DES: Knowledge of the types of design and products, and their presentation.

Transversal:
4. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
5. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
6. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
7. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Teaching methodology
- Face-to-face lecture and exercise sessions.
- Face-to-face practical sessions.
- Independent study, exercises, research and analysis of information.
- Preparation and completion of graded group activities.

Learning objectives of the subject

OAG1. Ensure students have the knowledge that will enable them to understand the standards and design systems used in industrial design, and to have the vision of space required to read all the plans that illustrate a design.

OAG2. Present standard and non-standard components related to industrial design for the purposes of conceiving and designing objects and mechanisms using a number of different CAD techniques.

OAG3. Ensure that as a result of the above, students have acquired the knowledge required that will enable them to
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graphically interpret and design any industrial design project.

OAG4. Become familiar with and use the generally accepted technical and graphic language used in industrial design.

<table>
<thead>
<tr>
<th>Study load</th>
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<tbody>
<tr>
<td><strong>Total learning time:</strong> 150h</td>
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<tr>
<td>Hours large group: 15h</td>
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<tr>
<td>Hours medium group: 0h</td>
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<tr>
<td>Hours small group: 45h</td>
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<tr>
<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 90h</td>
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</tbody>
</table>
## Content

### TOPIC 1: TYPES OF TECHNICAL DRAWINGS AND CONTENT

**Learning time:** 10h  
Theory classes: 1h  
Laboratory classes: 3h  
Self study: 6h

**Description:**  
01.01. Drawings of industrial products: assemblies and disassemblies  
01.02. Standard components  
01.03. Graphic representations of industrial machinery and facilities  
01.04. Graphic representations in civil engineering  
01.05. Graphic representations in architecture  
01.06. Graphic representations in industrial designs

### TOPIC 2: SURFACE STATES AND SIGNS

**Learning time:** 10h  
Theory classes: 1h  
Laboratory classes: 3h  
Self study: 6h

**Description:**  
02.01. Classification of surfaces  
02.02. Roughness. Characteristic concepts and parameters  
02.03. Surface finish symbols  
02.04. Indication of the surface finish in drawings (UNE-1037-83)  
02.05. Indication of knurled surfaces (DIN-82)

### TOPIC 3: DIMENSIONAL TOLERANCES AND FITS

**Learning time:** 10h  
Theory classes: 1h  
Laboratory classes: 3h  
Self study: 6h

**Description:**  
03.01. Introduction to tolerances and exchangeability  
03.02. The concept of tolerance and characteristic parameters  
03.03. Representation of tolerances by limits, deviations and class  
03.04. The quality and position of tolerances  
03.05. Preferred tolerances and general tolerances  
03.06. The transfer of elevations  
03.07. Concept, representation and indication of a fit  
03.08. Types of fit and parameters  
03.09. ISO fit systems: standard holders and standard shafts  
03.10. Preferred fits
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## TOPIC 4: STANDARD COMPONENTS IN THREADED JOINTS

**Description:**
- 04.01. Thread systems and threaded components
- 04.02. Screws, bolts, pins, threaded rods, nuts, washers, safety washers and retaining rings.
- 04.03. Dimensional characteristics and geometric shapes
- 04.04. Standard names
- 04.05. Standard tables of components
- 04.06. Standard representation of threaded components and joints

**Learning time:** 10h
- Theory classes: 1h
- Laboratory classes: 3h
- Self study: 6h

## TOPIC 5: STANDARD COMPONENTS IN UNTHREADED JOINTS

**Description:**
- 05.01. Cylindrical, conical, butterfly winged, taper groove and roll pins
- 05.02. Pins and pegs
- 05.03. Dimensional characteristics and geometric shapes
- 05.04. Standard names
- 05.05. Standard tables of components
- 05.06. Standard representation of unthreaded components and joints
- 05.07. Representation of components in assembly drawings

**Learning time:** 10h
- Theory classes: 1h
- Laboratory classes: 3h
- Self study: 6h

## TOPIC 6: SHAFTS AND DRIVE SHAFTS

**Description:**
- 06.01. Standard geometries and dimensions
- 06.02. Graphic representation of drive shafts
- 06.03. Cylindrical and conical shaft ends (DIN 748 and DIN 1448)
- 06.04. Groove, ribbed and splined shafts. Standards and graphic representation
- 06.05. Representation of components in assembly drawings

**Learning time:** 5h
- Theory classes: 0h 30m
- Laboratory classes: 1h 30m
- Self study: 3h
### TOPIC 7: SPRINGS

**Description:**
- 07.01. Classification according to shape, selection of the wire and type of load
- 07.02. Representation and dimensioning according to UNE-EN ISO 2162
- 07.03. View, cut and simplified representations of traction springs, compression springs, torsion springs, spiral springs and leaf springs
- 07.04. Table of characteristics of springs
- 07.05. Representation of springs in assembly drawings

**Learning time:** 5h
- Theory classes: 0h 30m
- Laboratory classes: 1h 30m
- Self study: 3h

### TOPIC 8: PLAIN AND ROLLER BEARINGS

**Description:**
- 08.01. Representation and dimensioning of plain bearings
- 08.02. Roller bearings: components, types, types of load and dimension series
- 08.03. Characteristics, regulations, standard names and the specific graphic representation of roller bearings: rigid ball bearings, angular contact ball bearings, swivel ball bearings, cylindrical rollers, conical rollers, thrust ball bearings, cylindrical roller bearings and needle roller bearings
- 08.04. General simplified and detailed representation of each type of roller
- 08.05. Radial and axial mounting of rollers. Representation and dimensioning
- 08.06. Gears. Graphic representation according to geometries and dimensions

**Learning time:** 10h
- Theory classes: 1h
- Laboratory classes: 3h
- Self study: 6h

### TOPIC 9: GEAR TRANSMISSIONS

**Description:**
- 09.01. Types: cylindrical with straight teeth, cylindrical with helical teeth, conical, worm and crown gears
- 09.02. Fundamental graphic dimensions and parameters. Definitions
- 09.03. Characteristics and dimensions
- 09.04. Standard representation of the different types of gear
- 09.05. Table of characteristics of a cogwheel

**Learning time:** 40h
- Theory classes: 4h
- Laboratory classes: 12h
- Self study: 24h
### TOPIC 10: CHAIN, CABLE AND BELT DRIVES

**Learning time:** 10h  
Theory classes: 1h  
Laboratory classes: 3h  
Self study: 6h

<table>
<thead>
<tr>
<th>Description</th>
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| 10.01. Types  
10.02. Chain cable and belt drives. Definitions  
10.03. Characteristics and dimensions  
10.04. Standard and simplified representation |

### TOPIC 11: CAMS AND ECCENTRICS

**Learning time:** 10h  
Theory classes: 1h  
Laboratory classes: 3h  
Self study: 6h

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<th>Description</th>
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| 11.01. Definitions  
11.02. Eccentrics. Types and laws of movement  
11.03. Graphic representation of an eccentric. Layout  

### TOPIC 12: WELDING

**Learning time:** 5h  
Theory classes: 0h 30m  
Laboratory classes: 1h 30m  
Self study: 3h

<table>
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| 12.01. Classification of welding procedures  
12.02. Representation of welds. Graphic representations and symbols  
12.03. Designation of welded joints  
12.04. The UNE-EN 22553:1994 representation standard |
### TOPIC 13: REPRESENTATIONS IN THE SHAPING OF SHEET METAL

**Description:**
- 13.01. Working with sheet metal
- 13.02. Development
- 13.03. Bending formulas
- 13.04. Deformation operations
- 13.05. Representations

**Learning time:** 5h  
Theory classes: 0h 30m  
Laboratory classes: 1h 30m  
Self study: 3h

### TOPIC 14: CONSTRUCTION DRAWINGS

**Description:**
- 14.01. Representation of construction components
- 14.02. Dimensioning in construction drawings
- 14.03. Representation and dimensioning of scales
- 14.04. Designation of buildings, components and compartmentalisation

**Learning time:** 2h  
Theory classes: 0h 30m  
Laboratory classes: 1h 30m

### TOPIC 15: GRAPHIC REPRESENTATIONS BASED ON DIAGRAMS

**Description:**
- 15.01. Fluid handling facilities
- 15.02. Electrical installations in buildings
- 15.03. Electrical circuits in motors
- 15.04. Pneumatic and hydraulic installations

**Learning time:** 2h  
Theory classes: 0h 30m  
Laboratory classes: 1h 30m
Qualification system

The evaluation of knowledge acquisition, skills and abilities is made from:
- Individual and group work during the year: 50%
- Final exam for the course: 50%

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

Since the proposed methodological approach is based on continuous assessment practices and having a significant relative weight in the final grade, attendance, conduct and delivery of practices (on time for each of them) is considered mandatory. A practical assistance to less than 80% of the planned sessions, means that students can not be assessed in the same. The final grade of students with these characteristics correspond exclusively to the results in the examinations of the course.

Bibliography

Basic:


Complementary: