Course guide
320136 - EG - Engineering Graphics

Last modified: 19/04/2023

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 717 - DEGD - Department of Engineering Graphics and Design.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Francisco Bermúdez Rodríguez

Others: Francisco Bermúdez Rodríguez
Adrià Sallés Blanch
Paula Bermúdez Mas

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CED21-DIDP. Ability to make decisions regarding the graphic representation of concepts. (Specific technology module: industrial design).
CED22-DIDP. Ability to apply specific methods, techniques and instruments for each form of technical representation. (Specific technology module: industrial design).
CED60-DIDP. Practical knowledge of complex component and product design and development. (Specific technology module: Industrial Design)
CED61-DIDP. Practical knowledge of product detail design. (Specific technology module: Industrial Design)

Generical:
CG02-DIDP. Acquisition of technical, scientific, humanistic, aesthetic, environmental and creativity enhancing knowledge and procedures necessary for professional practice related to product design.

Transversal:
CT04 N2. Teamwork - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favour communication, task assignment and cohesion.

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 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.

STUDY LOAD

Type	Hours	Percentage
Hours large group	15,0	10.00
Hours small group	45,0	30.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

TOPIC 1: TYPES OF TECHNICAL DRAWINGS AND CONTENT

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

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 2: SURFACE STATES AND SIGNS

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)

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 3: DIMENSIONAL TOLERANCES AND FITS

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

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 4: GEOMETRIC TOLERANCES

Description:
04.01.Tolerance zone
04.02.Indication on the drawings
04.03.References and reference elements
04.04.Others indications
04.05.Interpretation of the different geometric tolerances
04.06.General geometric tolerances
04.07.Relationship between dimensional and geometric tolerances
04.08.Application criteria and regulations

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 5: STANDARD COMPONENTS IN THREADED JOINTS

Description:
05.01. Thread systems and threaded components
05.02. Screws, bolts, pins, threaded rods, nuts, washers, safety washers and retaining rings.
05.03. Dimensional characteristics and geometric shapes
05.04. Standard names
05.05. Standard tables of components
05.06. Standard representation of threaded components and joints

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 6: STANDARD COMPONENTS IN UNTHREADED JOINTS

Description:
06.01. Cylindrical, conical, butterfly winged, taper groove and roll pins
06.02. Pins and pegs
06.03. Dimensional characteristics and geometric shapes
06.04. Standard names
06.05 Standard tables of components
06.06. Standard representation of unthreaded components and joints
06.07. Representation of components in assembly drawings

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 7: SHAFTS AND DRIVE SHAFTS

Description:
07.01. Standard geometries and dimensions
07.02. Graphic representation of drive shafts
07.03. Cylindrical and conical shaft ends (DIN 748 and DIN 1448)
07.04. Groove, ribbed and splined shafts. Standards and graphic representation
07.05. Representation of components in assembly drawings

Full-or-part-time: 5h
Theory classes: 0h 30m
Laboratory classes: 1h 30m
Self study : 3h

TOPIC 8: SPRINGS

Description:
08.01. Classification according to shape, selection of the wire and type of load
08.02. Representation and dimensioning according to UNE-EN ISO 2162
08.03. View, cut and simplified representations of traction springs, compression springs, torsion springs, spiral springs and leaf springs
08.04. Table of characteristics of springs
08.05. Representation of springs in assembly drawings

Full-or-part-time: 5h
Theory classes: 0h 30m
Laboratory classes: 1h 30m
Self study : 3h

TOPIC 9: PLAIN AND ROLLER BEARINGS

Description:
09.01. Representation and dimensioning of plain bearings
09.02. Roller bearings: components, types, types of load and dimension series
09.03. 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
09.04. General simplified and detailed representation of each type of roller
09.05. Radial and axial mounting of rollers. Representation and dimensioning
09.06. Gears. Graphic representation according to geometries and dimensions

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 10: GEAR TRANSMISSIONS

Description:
10.01. Types: cylindrical with straight teeth, cylindrical with helical teeth, conical, worm and crown gears
10.02. Fundamental graphic dimensions and parameters. Definitions
10.03. Characteristics and dimensions
10.04. Standard representation of the different types of gear
10.05. Table of characteristics of a cogwheel

Full-or-part-time: 40h
Theory classes: 4h
Laboratory classes: 12h
Self study : 24h

TOPIC 11: CHAIN, CABLE AND BELT DRIVES

Description:
11.01. Types
11.02. Chain cable and belt drives. Definitions
11.03. Characteristics and dimensions
11.04. Standard and simplified representation

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 12: CAMS AND ECCENTRICS

Description:
12.01. Definitions
12.02. Eccentrics. Types and laws of movement
12.03. Graphic representation of an eccentric. Layout
12.04. Cams. Standard layout and representation

Full-or-part-time: 10h
Theory classes: 1h
Laboratory classes: 3h
Self study : 6h

TOPIC 13: WELDING

Description:
13.01. Classification of welding procedures
13.02. Representation of welds. Graphic representations and symbols
13.03. Designation of welded joints
13.04. The UNE-EN 22553:1994 representation standard

Full-or-part-time: 5h
Theory classes: 0h 30m
Laboratory classes: 1h 30m
Self study : 3h

TOPIC 14: REPRESENTATIONS IN THE SHAPING OF SHEET METAL

Description:
14.01. Working with sheet metal
14.02. Development
14.03. Bending formulas
14.04. Deformation operations
14.05. Representations

Full-or-part-time: 5h
Theory classes: 0h 30m
Laboratory classes: 1h 30m
Self study : 3h

GRADING 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.

EXAMINATION RULES.

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:

- Félez, Jesús. Dibujo industrial. Madrid: Síntesis, 1995. ISBN 8477383316.
- Auria Apilluelo, José M. Dibujo industrial: conjuntos y despieces. Madrid: Paraninfo, 2000. ISBN 8428327297.
- French, M. J. Conceptual design for engineers [on line]. London: The Design Council, 1999 [Consultation: 03/05/2022]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?docID=3073885. ISBN 1852330279.
- Giesecke, Frederick E. Technical drawing. 13th ed. Upper Saddle River, NJ: Prenctice Hall, cop. 2009. ISBN 9780135135273.
- Ramos Barbero, B.; García Maté, E. Dibujo técnico [on line]. 3ª ed. Madrid: AENOR, 2016 [Consultation: 03/04/2023]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6774114. ISBN 9788417891237.
- Jensen, Cecil Howard. Dibujo y diseño en ingeniería. 2a ed. México: McGraw-Hill, 2002. ISBN 970103967X.
- Rodríguez de Abajo, F. J. Normalización del dibujo industrial. San Sebastián: Donostiarra, 1993. ISBN 8470631810.

Complementary:

- Espinosa, M.M.; Domínguez, M. Expresión gráfica y diseño asistido en ingeniería. Madrid: AIDA, 2010. ISBN 9788461357710.
- Espinosa, M. M.; Domínguez, M. Fundamentos de dibujo técnico y diseño asistido. Madrid: UNED, 2002. ISBN 9788436243482.

RESOURCES

Other resources:

Students enrolled in the subject have access to the course material prepared by the teaching staff at Atenea.