

## Course guide

### 320136 - EG - Engineering Graphics

**Last modified:** 04/12/2025

**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:** 2025    **ECTS Credits:** 6.0    **Languages:** Spanish

#### LECTURER

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**Coordinating lecturer:** Francisco Bermúdez Rodríguez

**Others:** Francisco Bermúdez Rodríguez  
Adrià Sallés Blanch  
Paula Bermúdez Mas

En aquesta assignatura pot haver algunes classes en català i algunes en castellà en el mateix grup. Consultar els horaris per saber l'idioma concret de cada classe/grup.

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**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

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- 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.

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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

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### 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: Prentice 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

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### Other resources:

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