Course guide
330510 - EG2 - Graphic Expression 2

Last modified: 04/05/2023

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2017). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** English

LECTURER

Coordinating lecturer: Lopez Martinez, Joan Antoni

Others: Romero Rodriguez, Jose Antonio

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE5. Spatial vision capacity and knowledge of graphic representation techniques, both by traditional methods of metric geometry and descriptive geometry, and by computer aided design applications.

Generical:
CG3. Knowledge of basic and technological subjects that will enable students to learn new methods and theories and that will endow them with the versatility needed to adapt to new situations.
CG10. The ability to work in a multilingual and multidisciplinary environment.

Transversal:
1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
2. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
3. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Basic:
CB1. Students will be able to demonstrate their knowledge of a field of study that builds on secondary education and is usually found at a level that, while supported by advanced textbooks, also includes aspects that involve knowledge of the latest developments in the field of study.
CB2. Students will be able to apply their knowledge to their work or vocation in a professional manner and demonstrate that they possess the competencies that are typically demonstrated by elaborating and defending arguments and solving problems in the field of study.

TEACHING METHODOLOGY

MD1 Master class or lecture (EXP)
MD2 Problem solving and case study (RP)
MD4 Directed theoretical and practical work (TD)
MD5 Small-scale project, activity or assignment (PR)
MD7 Assessment activities (EV)

The subject consists of three hours per week in a small group in the graphic expression laboratory, where theoretical concepts are taught and immediately worked on through practical exercises, using either traditional tools or computer-aided design (CAD) tools.

LEARNING OBJECTIVES OF THE SUBJECT

- OAG05. To possess the knowledge that allows us to understand the norms and systems of representation in mechanical design, and the spatial vision necessary to read and interpret the plans for a project.
- OAG06. To present the standardised and non-standard elements related to mechanical design in order to conceive and design mechanisms through a series of CAD practices.
- OAG07. Capacity for spatial vision and knowledge of graphic representation techniques, either by traditional means of metric and descriptive geometry or using CAD applications.
- OAG08. Acquisition of the graphic language of mechanisms, machines and installations in the field of industrial engineering.
- OAG09. Experimentation with the use of graphic engineering and CAD applications.
- OAG10. To obtain the knowledge necessary for interpreting and carrying out the graphic design of any project.
- OAG11. Knowledge and skills to apply graphic engineering techniques.
- OAG12. Knowledge and skills for calculating, designing and testing machines.

STUDY LOAD

Type	Hours	Percentage
Hours small group	45,0	40.00
Self study	67,5	60.00

Total learning time: 112.5 h

CONTENTS

1.- TYPES OF TECHNICAL DRWAINGS AND CONTENT

Description:
01.01. Drawings of industrial products: assemblies and parts
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

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

2.- SURFACE FINISHING AND SYMBOLS

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)

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

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 classes
03.04. The quality and position of tolerances
03.05. Preferred tolerances and general tolerances
03.06. The transfer of elevations
03.07. The 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

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

4.- GEOMETRIC TOLERANCING

Description:
03.11. Geometric tolerancing typology
03.12. Symbols and meanings
03.13. Norms on geometric tolerancing
03.14. UNE 1-121: 1991-1
03.15. Indication
03.16. Rectangle tolerance, reference elements
03.17. General tolerances

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

5.- 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

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

6.- STANDARD COMPONENTS IN UNTHREADED JOINTS

Description:
05.01. Cylindrical, conical, butterfly-winged, taper grooves 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

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

7.- 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. Grooved, ribbed and splined shafts. Standards and graphic representation
06.05. Representation of components in assembly drawings

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

8.- SPRINGS

Description:
07.01. Classification according to shape, selection of wire and type of load.
07.02. Representation and dimensioning according to UNE-EN ISO 2162.
07.03. Section 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.

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

9.- BUSH 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.

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

10.- GEARS AND TRAINS

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.

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

11.- CHAIN, CABLE AND BELT DRIVES

Description:
10.01. Types.
10.02. Chain cable and belt drives. Definitions.
10.03. Characteristics and dimensions.
10.04. Standard and simplified representation.

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

12.- CAMS AND ECCENTRICS

Description:
11.01. Definitions.
11.02. Eccentrics. Types and laws of movement.
11.03. Graphic representation of an eccentric. Layout.
11.04. Cams. Standard layout and representation.

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

13.- WELDING

Description:
12.01. Classification of welding procedures.
12.02. Representation of welds. Graphic representations and symbols.
12.03. Designation of welded joints.
12.04. UNE-EN 22553:1994 representation standard.

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

14.- 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

Specific objectives:
OAG05, OAG06, OAG07, OAG08, OAG11, OAG12

Related activities:
1,2

Full-or-part-time: 6h 25m
Practical classes: 2h 25m
Self study : 4h

ACTIVITIES

1.- ACTIVITIES AND PROJECTS

Description:
Activities and projects aimed at using and acquiring subject knowledge. These can be individual or in groups.

Specific objectives:
OAG09, OAG10

Material:
Atenea material and CAD.

Delivery:
Oral presentation or Atenea.

Full-or-part-time: 19h
Practical classes: 10h 30m
Self study: 8h 30m

2.- PREVIOUS TO FINAL EXAM

Description:
Individual assessment test.

Specific objectives:
OAG09, OAG10

Material:
Exam papers.

Delivery:
Completed test.
10% of final mark.

Full-or-part-time: 6h
Practical classes: 3h
Self study: 3h

GRADING SYSTEM

A continuous assessment model is applied in order to assess both the independent work and the teamwork of the students.

Knowledge, skills and abilities will be assessed as follows:
- Individual and group work during the whole course: 40%
- Preliminary exam at the end of the course: 10%
- Final exam: 50%

EXAMINATION RULES.

- Face-to-face sessions of content presentation and exercise solving.
- Face-to-face sessions of practical work.
- Independent work of studying, doing exercises and seeking and analysing information.
- Preparing and carrying out assessable group activities.

BIBLIOGRAPHY

Basic:
- Giesecke, Frederick E., i altres. Technical drawing with engineering graphics. 14th ed. Harlow: Pearson, 2014. ISBN 9781292026183.
- Giesecke, Frederick E., i altres. Modern graphics communication. 4th ed. Upper Saddle River: Prentice Hall, 2010. ISBN 9780135151037.
- Lockhart, Shawna D.; Johnson, Cindy M. Engineering design communication: conveying design through graphics. 2nd ed. Boston: Prentice Hall, 2012. ISBN 9780137057146.

Complementary:
- Félez, J.; Martínez, M. L. Dibujo industrial. 3ª ed. rev. Madrid: Síntesis, 1999. ISBN 8477383316.
- Félez, J.; Martínez, M. L. Ingeniería gráfica y diseño. Madrid: Síntesis, 2008. ISBN 9788497564991.