COURSE DATA

Data Subject	
Code	34750
Name	Engineering graphics
Cycle	Grade
ECTS Credits	6.0
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	School of Engineering	1	Second term
1934 - Double Degree Program in Chemistry-Chemical Engineering	Faculty of Chemistry	1	Second term

Subject-matter

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	5 - Graphic expression	Basic Training
1934 - Double Degree Program in Chemistry-Chemical Engineering	1 - Primer curso	Obligatory

Coordination

Name	Department
HERNAIZ PEREZ, MARIA DESAMPARADOS	245 - Chemical Engineering
PASTOR ALCAÑIZ, LAURA	245 - Chemical Engineering
SAN VALERO TORNERO, PAU	245 - Chemical Engineering

SUMMARY

This course is taught in the second semester of the first degree course in Industrial Electronics Engineering. Belongs to the basic training materials. This material is intended to give students an overview of graphic expression and its application in engineering. Provides the fundamental concepts of education vision in space and technical drawing, with special emphasis on the use of common software.

The course **contents** are: Representation techniques. Spatial conception. Standardization. Computer Aided Design. Fundamentals of industrial design.

The general **objectives** of the course are:

- Improve education of vision in the space-plane.
- From a given object in 3 dimensions, draw the views necessary to build it.
- From the analysis of the views of an object, build a drawing in axonometric system.
- Prepare drawings 2 and 3 dimensional with CAD tools.
- Use the drawing as a tool to explain "what is" or ideas and intentions (graphic expression).
- Students will use their powers of observation and analysis, sensitivity, retention, intuitive thinking and deduction.
- Recognize the graphic meta-lenguage.
- Represent objects and mechanical parts by the use of drawing.
- Describe the methodology to be used in industrial design.
- Promote and improve student research skills.

- Be able to meet deadlines.
- Encourage the student's critical ability.
- Encourage the student's creativity ability.

Observations: The classes will be taught in the language as stated in the course sheet available on the website of the degree.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1401 - Degree in Chemical Engineering

- G3 - Knowledge of basic and technological subjects that allows students to learn new methods and theories and provides them with versatility to adapt to new situations.
- B5 - Ability for spatial vision and understanding of graphic representation techniques using both traditional methods of metric and descriptive geometry and computer-aided design applications.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

This course allows for the following **learning outcomes**:

- Know how to interpret technical plans and drawings in different systems of representation (G3, B5).
- Be able to represent on paper the 3-dimensional objects and to reconstruct and interpret by drawing the shape and position (B5).
- Know and use different standards used in the technical representation (G3, B5).
- Understand the concepts of drawing and cutting set and its application in industrial design (B5).
- Be able to use tools of computer aided design (B5).

To complement the above results, this subject also to acquire the following **skills**:

- Manage effectively assisted drawing programs exposed.
- Compose and draw sheets.
- Know how to analyze and classify the exercises themselves critically.
- Know how to analyze and score a critical exercise of other groups.
- Find and select the information they require specialized bibliographic sources.
- Represent objects in three dimensions, to reconstruct and interpret through drawing its shape and position (spatial view).
- Know how to make charts and diagrams.

In addition to the specific objectives mentioned above, the course will encourage the development of several **social and technical skills**, among which include:

- Ability to work as a team.
- Ability to solve exercises using the full application of the acquired knowledge.
- Ability to delivery the different activities in date and form.

DESCRIPTION OF CONTENTS

1. BLOCK 0. INTRODUCTION TO TECHNICAL DRAWING

1. INTRODUCTION TO STANDARIZATION

Basic Concepts. Drawing in Engineering. Classification of technical drawings. Purpose and advantages of standardization. Classification of standards: by its scope, by its content, by its nature. Spanish and international standardization: UNE and ISO standards of Technical Drawing. Lines, letters, scales and standard formats.

2. INTRODUCTION TO COMPUTER AIDED DESIGN (CAD)

Introduction to CAD systems. Fundamental concepts. Introduction to CAD Software in 2 dimensions (AutoCad). Installation and program startup. Main menu and settings. Management peripherals. Screen zones. Orders and options. Grid. Zoom. Force coordinates. Ortho. Drawing and editing. Work environment. Management of the display. Layer management. Managing blocks and attributes.

Dimension. Management of the drawings. Plotting of drawings.

2. BLOCK 1. APPLIED GEOMETRIC DRAWING

3. FUNDAMENTALS GEOMETRIC CONSTRUCTIONS

Transactions with segments and angles. The theorem of Thales. Extension of the theorem of Thales. Construction of perpendiculars: bisector of a segment. Construction of the segment mean proportional between two given segments. Graphical construction of the square root. The circumference. Triangles. Squares. Constructions of regular polygons inscribed in a circumference: Hexagon, triangle, square, octagon. Regular polygons construction given the side. Starry regular polygons.

4. PROPORTION AND SCALES

Proportionality: The Height theorem, the theorem of the Catheter and Power point. Similarity: Criteria of similarity of triangles.
Scales: Definition. Graphic scale. Contraescale. Construction of graphic scales. Triangle universal scales. Scale of crosscutting. Standardized scales.
Equal polygons: Condition for directly equal two polygons. Equivalent role. Triangles and polygons equivalent. Equivalent composition. Applications.

5. TANGENCY AND POLARITY

Problems of tangencies. Polarity in the circle. Conjugate points: Pole and Polar. Plotting the polar. Autopole Triangle. Harmonic set determined by orthogonal circumference.

3. BLOCK 2. APPLIED DESCRIPTIVE GEOMETRY

6. FUNDAMENTALS OF SYSTEMS OF REPRESENTATION

Descriptive geometry: Origin, objectives and definitions. Classification of projections. Rationale and scope of each system of representation. Comparative study of the systems of representation. Basics of diedric system.
Axonometric system: General considerations on the need for axonometric system. Historical. Classification of axonometric. Orthogonal axonometric. Rationale and description of the system.
Classification. Fundamental triangle or traces. Lines of maximum slope and slope angles. Reduction coefficients and axonometric scales.

7. STANDARIZED REPRESENTATION

Standardized Views. European system and American system. Denomination of the views and their obtaining. Choice of views. Main view Determination of the third view. Exceptional views. Sections, cuts and tears. Sketching. Representation of standardized views of 3D volumes by isometric perspective.

8. STANDARIZED DIMENSIONING, TOLERANCES AND ADJUSTMENTS

Dimensioning. UNE standards of dimension. Introduction to tolerances and adjustments. Tolerances and adjustments recommended in the UNE standards

4. BLOCK 3. TECHNICAL REPRESENTATIONS APPLIED TO THE INDUSTRIAL ENVIRONMENT

9. BACKGROUND OF INDUSTRIAL DESIGN, SIMBOLOGY AND GRAPHIC REPRESENTATION OF EQUIPMENT, INDUSTRIAL INSTALLATIONS AND PROCESSES

Basics of industrial design.
Graphic representation of equipment, installations and industrial processes. Symbols and signs in industrial drawing: ISO and UNE standards. Symbols and signs of Chemical Engineering. Types of diagrams: Flow diagrams, Blog diagrams, methodology and tools. General rules for diagram representation. Graphic representation of equipment: drawings of assembly and cutting. Concepts of drawing of set, drawing of cutting and list of pieces. Composition of the set drawing and list of pieces. Guidelines on overall drawings (selection of views, choice of scale, reference of elements, rules to represent sets

5. LABORATORY OF GRAPHIC EXPRESSION

The graphic expression laboratory will consist of computer-aided drawing sessions where the contents of the theoretical-practical part will be worked on in a transversal and integrated manner. Also, the use of computer-aided design software will be extended and deepened.

For this purpose, the laboratory activities are planned:

Assembly drawings and parts of an industrial equipment used by the Chemical Engineer.
Piping and instrumentation diagrams of industrial facilities
Fundamentals of computer-aided design in three dimensions
Representation of industrial equipment in 3D.

WORKLOAD

ACTIVITY	Hours	% To be attended
Laboratory practices	30,00	100
Theory classes	15,00	100
Classroom practices	15,00	100
Development of group work	5,00	0
Development of individual work	10,00	0
Study and independent work	10,00	0
Preparation of evaluation activities	15,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	30,00	0
Resolution of case studies	5,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

• Classroom work: theory classes, practical classes and laboratory classes (G3, B5).

• Homework: preparation of classes, solving of exercises and problems, projects preparation and presentation of results (B5).

• Individual and group tutorials (G3, B5).

EVALUATION

The evaluation is based on the following aspects:

1. Practical classroom activities, virtual classroom questionnaires and deliverable activities (30%). The activities and questionnaires will be aimed at verifying that the fundamental concepts have been assimilated and the approach and resolution of problems and practical cases have been worked on. All practical classroom activities, virtual classroom questionnaires and deliverable activities must be submitted in date and form to be evaluated.

2. Individual test (20%). The test will consist in the resolution of a practical case in which the student must demonstrate his/her knowledge of the concepts and techniques seen in class and its application, assessing his/her aptitude to extract the information from the statement and propose the resolution of the problem. In addition, it will contain theoretical-practical questions for the evaluation of the acquisition of the minimum contents of the subject.

3. Laboratory (50%). The global mark of the laboratory part will be the result of the continuous evaluation of all laboratory sessions. In each one of them the demonstrated skills, the interest and attitude throughout the session will be valued, as well as well as the evaluation of the projects and activities delivered (B5, G3). **For the evaluation of the laboratory in the first call the student must submit all the projects and activities resolved in date and form.**

The subject will be considered passed in the first call when the weighted average mark is equal to or greater than 5 out of 10 and the following requirements are met:

- A minimum score of 5 has been obtained in the individual test.

- All laboratory sessions have been attended and a minimum of 5 has been obtained in the laboratory evaluation.

The qualification of the parts passed in the first call will be saved for the second call. Those parts not passed will be evaluated by the individual test on the official date of the second call. The parts will be will be considered passed if a minimum mark of 5 is obtained in each of them. The final grade will be calculated with the percentages indicated above.

Non-recoverable activities: Non-recoverable activities are the attendance to the 10 laboratory sessions.

Anyhow, the evaluation system will be based on the guides stated in the “Reglament d’Avaluació i Qualificació de la Universitat de València per a Graus i Màsters” (ACGUV 108/2017).

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

REFERENCES

Basic

- JON MCFARLAND, AutoCAD 2010. (Anaya Multimedia 2010) ISBN 978-84-415-2675-4
- GUTIERREZ VAZQUEZ, A, IZQUIERDO ASENSI, F, NAVARRO DE ZUVILLAGA, J, PLACENCIA VALERO, J. Dibujo Técnico. (Ediciones Anaya S.A. Madrid, 1979).
- RIOJA CASTELLANO, Vicente. TÉCNICAS DE REPRESENTACIÓN. CONCEPTOS BÁSICOS. Edita servicio de publicaciones de la Universidad Politécnica de Valencia (SPUPV- 2005-187)
- DOMÍNGUEZ RODRIGO, FJ y MARTI DOLZ, J.El sistema axonométrico. Primera parte. Edita servicio de publicaciones de la Universidad Politécnica de Valencia (SPUPV- 92.199)
- BASILIO RAMOS BARBERO, ESTEBAN GARCÍA MATÉ, Dibujo Técnico. 3º Edición. (AENOR, Madrid, 2016). ISBN: 978-84-8143-918-2

Additional

- BONNIE ROSKES Google Sketchup Cookbook: Practical Recipes and Essential Techniques. Editorial OReailly Media. 2009
- BONNIE BIAFORE, Visio 2007 Bible. Editorial Wiley. 2007