COURSE DATA

DATA SUBJECT

Code: 34750
Name: Engineering graphics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	Escola Tècnica Superior d'Enginyeria	1	Second quarter
1934 - Double Degree Program in Chemistry-Chemical Engineering	Facultat de Química	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	Graphic expression	BASIC
1934 - Double Degree Program in Chemistry-Chemical Engineering	Primer curso	COMPULSORY

COORDINATION

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SUMMARY

This course is taught in the second semester of the first degree course in Chemical 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 it 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 / LEARNING OUTCOMES

1401 - Degree in Chemical Engineering

Acquire knowledge of basic and technological subjects to facilitate the learning of new methods and theories, and develop the versatility to adapt to new situations.

Act autonomously in learning, make informed decisions in different contexts, issue judgements based on experimentation and analysis and transfer knowledge to new situations.

Develop spatial awareness and apply graphic representation techniques, using both traditional methods of metric and descriptive geometry and computer-aided design applications.

Propose creative and innovative solutions to complex situations or problems, specific to the field of knowledge, to respond to diverse professional and social needs.

To know and understand, from within the field of the degree itself, the inequalities based on sex and gender in society; to integrate the different needs and preferences based on sex and gender in the design of solutions and problem resolution.

DESCRIPTION OF CONTENTS

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.

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.

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

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

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

PRESENCIAL ACTIVITIES

Activity	Hours

Theory	15,00
Laboratory	30,00
Classroom practices	15,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	10,00
Preparation of lessons	45,00
Preparation for assessment activities	15,00
Resolution of case studies	5,00
Total hours	**90,00**

TEACHING METHODOLOGY

- Classroom work: theory classes, practical classes and laboratory classes .
- Homework: preparation of classes, solving of exercises and problems, projects preparation and presentation of results.
- Individual and group tutorials.

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.

- The student has attended all laboratory sessions and obtained a minimum grade of 5 in the laboratory assessment. The student will be considered to have fulfilled this activity if they have attended at least 80% of the hours and have adequately justified their inability to attend the remaining sessions due to the occurrence of a force majeure eve

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.

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

- 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
- BONNIE ROSKES Google Sketchup Cookbook: Practical Recipes and Essential Techniques. Editorial OReailly Media. 2009

- BONNIE BIAFORE, Visio 2007 Bible. Editorial Wiley. 2007