COURSE DATA

DATA SUBJECT

Code: 34881
Name: Engineering graphics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1403 - Degree in Telematics Engineering	Escola Tècnica Superior d'Enginyeria	1	First quarter
1935 - Double Degree Program in Mathematics-Telematics Engineering	Facultat de Ciències Matemàtiques	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1403 - Degree in Telematics Engineering	Graphic expression	BASIC
1935 - Double Degree Program in Mathematics-Telematics Engineering	Primer curso	COMPULSORY

COORDINATION

CASAS YRURZUM SERGIO

PERIS DUO NATALIA

SUMMARY

This course is taught in the first semester of the first degree course in Telematics Engineering. It belongs to the basic training materials. This material is intended to give students an overview of graphic expression and its application in engineering. It provides the fundamental concepts of educating 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 necessary views to build it.
• From the analysis of the views of an object, build a drawing in the axonometric system.
• Prepare 2- and 3-dimensional drawings 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.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

No prerequisites, although some previous knowledge of technical drawing may be highly beneficial to speed up the understanding of the concepts.

COMPETENCES / LEARNING OUTCOMES

1403 - Degree in Telematics Engineering

G3 - Acquisition of the knowledge of the basic and technological subjects that allows students to learn new methods and theories and endows them with the versatility to adapt to new situations.

G5 - Knowledge to carry out measurements, calculations, assessments, evaluations, loss adjustments, studies, reports, task planning, and other analogous work in the specific field of telecommunications.

G6 - Ability in the handling of specifications, regulations and norms of compulsory compliance.

DESCRIPTION OF CONTENTS

1.1. Introduction
1.2. Notation and Basic Geometric Concepts
1.3. Scale Drawing

2.1. The classic design process.
2.2. Types and Applications of CAD Systems
2.3. Brief History of CAD Applications
2.4. Elements of a CAD System

1. INTRODUCTION AND PREVIOUS CONCEPTS
INTRODUCTION AND PREVIOUS CONCEPTS

1.1. Introduction

2. DESIGN AND CAD/CAM/CAE SYSTEMS

2.1. The classic design process.
2.2. Types and Applications of CAD Systems

3. TWO-DIMENSIONAL CAD

3.1. Work environment: Coordinate systems. Entering orders. Selection of objects.
3.2. Layers
3.3. Basic drawing orders: Points. Lines.
3.4. Basic utilities: Grids and Limits. Drawing with resolution and orthogonal. Reference to objects.
3.5. Drawing orders: Circles. Bows. Polygons. Ellipses. Texts. Other orders.
3.6. Edition orders: Delete Order, Uy Order, Shift Order, Copy Order, Tour Order, Scale Order, Symmetry Order, Rectangle and Pole-Matrix Orders, Cut Order, Chamfer Order, Splice Order, Regen Order.
3.7. Dimensions.
3.8. Drawing of planes.
3.9. CAD customization.

4.1. Operations with segments and angles: Thales theorems. Fourth, third and average proportional. Geometric calculation of the square root. Construction of perpendicular bisectors and bisectors. Construction of perpendiculars.
4.2. Circumference and arches: Definitions. Angles with respect to the circumference. Capable bow. Power of a point with respect to a circumference. Rectification of the circumference (Kochanski and Mascheroni).
4.3. Triangles: Classification (according to its sides and angles). Cevianas and notable points. Arctic triangle, Nagel's theorem, Euler's line. Properties. Basic theorems on right triangles (Pythagorean Theorem, Height Theorem, Leg Theorem).
4.4. Quadrilaterals. Classification. Properties.
4.5. Polygons. Regular polygons inscribed in a circle. Regular polygons given the side. Starry regular polygons. Non-regular polygons.
4.6. Tangencies: Tangency Theorems.
4.7. Links
4.8. Technical Curves
4.9. Conical Curves or Sections. The circumference. The ellipse. The hyperbola. The parable. Construction of conical curves.

5.1. Geometric transformations: Types of geometric transformations. Isometric transformations (translation, rotation, central symmetry, axial symmetry). Isomorphic transformations (homotecia, scaling). Anamorphic transformations (of equivalence, equicomposition).
5.2. Proportionality, equality and similarity: Proportionality. Direct similarity and inverse similarity.
5.3. Scales. Types of scales. Graphic scales. Standard scales.

4. BASIC GEOMETRIC CONSTRUCTION

4.1. Operations with segments and angles: Thales theorems. Fourth, third and average proportional. Geometric calculation of the square root. Construction of perpendicular bisectors and bisectors. Construction of perpendiculars.
4.2. Circumference and arches: Definitions. Angles with respect to the circumference. Capable bow. Power of a point with respect to a circumference. Rectification of the circumference (Kochanski and Mascheroni).
4.3. Triangles: Classification (according to its sides and angles). Cevianas and notable points. Arctic triangle, Nagel's theorem, Euler's line. Properties. Basic theorems on right triangles (Pythagorean Theorem, Height Theorem, Leg Theorem).
4.4. Quadrilaterals. Classification. Properties.

5. TRANSFORMATIONS, PROPORTION AND SCALES

5.1. Geometric transformations: Types of geometric transformations. Isometric transformations (translation, rotation, central symmetry, axial symmetry). Isomorphic transformations (homotecia, scaling). Anamorphic transformations (of equivalence, equicomposition).

6. PROJECTIONS AND REPRESENTATION SYSTEMS

6.1. Descriptive geometry
6.2. Projections and their types: Types of projections. Non-flat projections. Flat projections.
6.3. The Orthogonal Parallel Flat Projection: Types of Orthogonal Parallel Flat Projections.
6.4. The flat plane orthogonal axonometric projection: axonometric coefficients and projection scales. Fundamental or trace triangle. Relationship between axonometric reduction coefficients. Schlömilch - Weisbach theorem.
6.5. The oblique parallel flat projection: Analytical calculation of reduction coefficients.
6.6. Representation systems: dihedral system. Dimensional drawing system. Orthogonal axonometric system. Other systems. Comparison of representation systems.

7. REPRESENTATION MODELS IN THREE DIMENSIONS

7.1. Representation Models: The model of polygonal surfaces.
7.2. The real-time perspective projection: the vision pyramid.
7.3. Related 3D transformations: Translation. Turn / Rotation. Scaling. Combined Matrix Representation.
7.4. The graphic pipeline.
7.5. Practical example of 3D modeling: Sketch Up: Basic interface and commands. Push / pull and follow me. Object transformations. Details of the objects.

8. STANDARDIZATION AND SYMBOLOGY

8.1. Origins and standardization bodies
8.2. Normalization in graphic expression.
8.3. Symbology: Mathematical symbols. Symbology on units and quantities International unit system (SI).
8.4. Specific symbology in Telematics.

9. DIMENSIONS AND TOLERANCES

9.1. Introduction and definitions
9.2. Dimensioning criteria: Dimensioning based on functionality criteria. Dimensioning by manufacturing criteria. Limitation by the verification criteria.
9.3. Elements of a dimension.
9.4. Dimensioning rules: Scale invariance. Placement of dimension lines. Dimension arrows. Rate repetition. Choice of dimension plans. Dimensions of angles, arches and strings. Position of the dimension figures. Chamfer and joint dimensioning. Dimensions in holes. Dimensioning in tangencies. Other standards of dimensioning.
9.5. Tolerances and adjustments: Concepts. Sèrie and parallel dimensioning.

10. DIAGRAM REPRESENTATION MODELS

10.1. Introduction and definition
10.2. Flowcharts.
10.3. Block diagrams.
10.4. Electrical diagrams.
10.5. The Unified Modeling Language (UML)

11. FUNDAMENTALS OF INDUSTRIAL DESIGN

11.1. Analysis
11.2. Synthesis.
11.3. Evaluation.
11.4. Creativity: Phases of the creative process. The creative product.
11.5. Techniques to promote creativity: Mind maps. Art of asking. Forced relationships. SCAMPER. Attribute listing. Analogies. Bionics. Delphi method (Delphi). Morphological analysis. IDEART. 4x4x4. Da Vinci technique. Brainstorming.
11.6. The assembly drawing and the exploded view drawing

12. GRAPHIC EXPRESSION LABORATORY

Will undertake the following practices:

geometric designs.

Diagrams

2D representation

3D Rendering

Standardization and dimensioning

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

null
null

null

• Classroom work: theory classes, practical classes and laboratory classes. (G3) (G5) (G6)
• Student's home work: preparation of classes, solving of exercises and problems, job preparation and presentation of results. (G3) (G5) (G6)
• Individual and group tutorials. (G3) (G5) (G6)

EVALUATION

Students have two opportunities to pass this course: January and June.

The evaluation of the course will be carried out using the following scheme:

In the **first examination opportunity (January call)**, the final note of the course shall be calculated as follows:

FinalGrade = 0.3*LabGrade + 0.2*PartialGrade + 0.35*FinalExamGrade + 0.10*ExerGrade + 0.5 (if the student attends class)

LabGrade is obtained from the evaluation of laboratory practices. For such evaluation, the amount of preparation, the work delivered and the effort devoted by each student during the lab sessions will be taken into account. In addition, the practices may be evaluated with additional exercises during the laboratory session, with individual practice sessions exams, or a with a final laboratory exam. Although group work will be encouraged in the form of couple teams, evaluation will remain in individual terms.

PartialGrade will be obtained by carrying out a theoretical-practical test of minimum knowledge on the subject matter.

FinalExamGrade will be get through the final examination of the course. The students who get a grade greater or equal than 8 in the average grade of the two minimum knowledge tests, will have the option to skip the final exam. If so, the final exam grade will be equal to the aforementioned average grade of the minimum knowledge tests.

ExerGrade will be get through the realization of exercises and activities throughout the year. This grade will be based on the participation and involvement in the process of teaching and learning, taking into account the resolution of issues and problems proposed during classes. Activities must be delivered in time and in the way proposed by teachers to be able to be evaluated.

All grades are considered in the range of 0 to 10 points.

Students will need to get at least **5 out of 10** points in both **LabGrade** and **FinalExamGrade** to overcome the course.

It will be necessary to obtain at least **3.5 out of 10** in the **PartialGrade** in order to pass the subject.

Class attendance will be considered the situation in which the student has not missed more than 20% of the theoretical or theoretical-practical classes or more than 20% of the laboratory sessions. Class attendance implies remaining in the classroom for at least 80% of its duration.

Class attendance will be valued with a grade of 0.5 points on the grade from the January call but will not be a requirement to pass the subject.

All students who fail to overcome the course in January, are eligible to be evaluated in a **second call in June**. The grades obtained in each one of the parts of the January call will not be saved to the June call. In this call, evaluation shall be calculated in the following way:

FinalGrade = 0.3*LabGrade + 0.7*FinalExamGrade

LabGrade will be get through a final laboratory exam.

FinalExamGrade will be get through the final examination of the course.

All grades are in the range from 0 to 10 points.

Students will need to get at least **5 out of 10** points in both **LabGrade** and **FinalExamGrade** to overcome the course.

Partial minimum grades (for both examination opportunities) could be slightly reduced to favor students, always keeping the same minimum grades for everyone.

Examination Ahead of Schedule:

Given the practical and in-person approach of the course, to opt for the possibility of an examination ahead of schedule, the student must have officially signed up for the course before the start of the course.

Important note: the detection of any kind of copy in any of the proposed activities to students during the course, laboratory practice, tests or exams, either from another student or any other source, will mean the fail of the current course evaluation of all students involved in the copy, including all the members of the group in case of a group activity, being indifferent if the students are the source or the destination of the

copy, notwithstanding the possible disciplinary proceedings that may arise by the University to those students.

The assessment procedure follows the guidelines of the Reglament de Avaluació i Qualificació de la Universitat de València (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639)

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).
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REFERENCES

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