COURSE DATA

DATA SUBJECT

Code: 34794
Name: Engineering graphics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1402 - Degree in Telecommunications Electronic Engineering	Escola Tècnica Superior d'Enginyeria	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	Graphic expression	BASIC

COORDINATION

ESTEVE GOMEZ VICENTE

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.

The theory classes will be taught in Spanish (or Valencian if applicable) and the practical and laboratory classes according to the information sheet available on the web 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

No prerequisites

COMPETENCES / LEARNING OUTCOMES

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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.

R2 - Ability to use communication and computer applications (offimatics, databases, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunications and electronics networks, services and applications.

DESCRIPTION OF CONTENTS

1. INTRODUCTION TO CAD SYSTEMS

C.A.D. Programs. Types. History of applications C.A.D. C.A.D. Systems / C.A.M. The C.A.D. in the industry. Applications C.A.D. in engineering.

2. TWO DIMENSIONS CAD

Installation and program startup. Main menu and settings. Management peripherals. Zones screen. 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

3. CAD CUSTOMIZATION

Libraries. Keyboard and menus. Tablets. AutoLISP routines.

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.
CIRCUMFERENCE: Circumference: definition and elements. Angles on a circle. Central, registered, semiinscrito, interior, exterior, circumscribed. Capable of arc segment. Rectification of the circumference: buildings and Mescheroni Kochansky.

4. GEOMETRIC CONSTRUCTION

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.
TRIANGLES: Definition. Classification. Cevian. Remarkable points of a triangle. Incenter. Circumcenter. Barycenter. Orthocenter. Exicentro. Pedal triangle of a triangle. Nagel theorem. Equality and similarity of triangles. Fundamental properties of triangles. Applications.
RING: Classification and definitions. Construction of squares, rectangles, rhombuses, rhomboids, trapezoids, and trapezoids.
CONSTRUCTION of regular polygons inscribed in a circle, hexagon, triangle, square, octagon. Side of the decagon inscribed in a circle. Construction. Side of the pentagon inscribed in a circle. Construction. Pentadecágono construction. Approximate enrollment of other regular polygons.
REGULAR POLYGONS CONSTRUCTION GIVEN THE SIDE: Particular cases. Triangle. Square. Pentagon. Hexagon. Heptagon. General case. Approximate construction of other regular polygons. Starry regular polygons.

5. 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. Contraescala. Construction of graphic scales. Triangle universal scales. Scale of crosscutting. Standardized scales.
Equal polygons. Condition for two polygons are directly equal. Equivalent role. Triangles and polygons equivalent Equicomposición. Applications.

6. TANGENCY AND POLARITY.

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

7. CONICS AND FLAT TECHNICAL CURVES

Conic sections: Historical background. Conic sections and curves. Definitions and classification theory Damdelin and fundamental elements of a Conic.
ELLIPSE: Definition and elements. Construction of the ellipse points, affinity for a circle and projective bundles. Conjugate diameters. Construction of the ellipse given conjugate diameters. Construction of Manheim. Focal and head circumference circumferences. Tracing tangents. Intersection with a line.
Hyperbole: Definition and elements. Construction of the hyperbola of points and projective bundles. Focal and head circumference circumferences. Tracing tangents. Asymptotes. Plotting asymptotes. Intersection with a line.
PARABLE: Definition and elements. Constructions of parabola by points and projective bundles. Tracing tangents. Intersection with a line. Projective transformations of conics.

8. REPRESENTATION SYSTEMS

Descriptive Geometry: Origin, objectives and definitions. Classification of projections. Rationale and scope of each system of representation. Comparative study of the system of representation.
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 scales exonométricas.

9. 3D REPRESENTATION MODELS

Perspective projection. Affine transformations, drawing primitives, lighting and texturing. Introduction to 3D rendering programs.

10. INTRODUCTION TO THE STANDARDS

Fundamentals of industrial design. Origins of Standardization. Definition of normalization. Concept of norm. Aims and benefits of standardization. General principles of a system of rules. Influence of standardization in society. Classification rules: its scope, its content, in character. Spanish Standardization, the I.R.A.N.O.R. U.E.E. Standards technical drawing application. D.I.N. Standards e I.S.O. Standard definition of the dimensions.
VIEW: Direction of projection. Names of obtaining views and folding down the planes of the cube projection or by turning the part or object. Explicit surfaces. Choice of views. Main View. Determination of the third eye. Exceptional views. Oblique doldrums. European system and American system. Symbol of the method of representation. Sets: cutting.
SECTIONS, CUTS AND TEARS: General. Definitions. Object. Sections: lessons and important observations. Courts: lessons and observations on them. Breakage. Special Courts. Conventions, rules and general advice on indications, cutting lines and hatching.
SKETCHING: Concept. Minimum requirements: proportion, line quality. Geometric accuracy. Correspondence descriptive. Criteria and recommendations for its implementation.

11. DIMENSIONING, TOLERANCES AND ADJUSTMENTS

Definition. Dimension lines. Auxiliary dimension lines. Numbers dimension. Systems Dimension: according to the manufacturing process, according to the function to perform. For verification and control. Special rules of dimensioning. Taper, convergence and tilt. Concepts and dimension. Standard tapers and their applications. Surface signs. Written directions. Representation in the drawings of the surface signs and written instructions. Examples.
Concepts: Allocation of tolerances in the drawings. System settings. Definitions. Fundamental principles of ISO tolerance system. Kinds of settings. Base systems and shaft hole base. Using the settings. ISO recommended settings. Tolerance on assembly drawings. Verification measures. Tolerances on shape and position. Object. Definitions and symbols. Directions to the drawings

12. SYMBOLS

Generic symbols. Specific symbols. Applicable regulations.

13. FUNDAMENTALS OF INDUSTRIAL DESIGN

METHODOLOGY. Information, creativity and techniques. Brainstorming, combinatorial methods, ... Aesthetic design factors: laws of the psychology of form.
Ergonomic design. Ergonomics: concept and historical development. Human-environment: bio-physiological factors and needs. Morphological factors and psychological needs of men and operating-functional. The perception of the environment. Psicoperceptual experience. The environment as a language.
ASSEMBLY DRAWINGS AND PARTS. Drawing Concepts Joint Exploded parts list. Composition of assembly drawings and parts list. Guidelines assembly drawings (view selection, choice of scale, reference to the elements, to represent simple sets standards). Exploded. Rules to consider when making a list of parts.

14. MODELS OF REPRESENTATION OF CHARTS

Flow Charts, Block Diagrams, methodology and tools. Specific diagrams.

15. 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

• 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.

EVALUATION

The assessment of student learning will be carried out following two models:

A) By evaluating the activities carried out by the students, the laboratory practices and the grade of the examinations that are carried out.

B) From the note of the tests of minimum knowledge that will be realized in the official date and of the qualification obtained in the laboratory practices.

To qualify for the evaluation mode A) the student must have attended 80% of the classes, have performed 80% of the proposed activities, have obtained in them an average grade of 5 or higher and have obtained in the Laboratory a rating equal to or greater than 5. The tests of this modality will be directed to verify that the fundamental concepts have been assimilated and the problem solving and resolution has been worked. The laboratory practices will contribute to the final grade of the subject with 50%. The note in this part will be the result of an ongoing evaluation of all laboratory sessions. In each one of them will be evaluated the demonstrated skill, interest in the practice and development of this throughout the session. For the evaluation of the learning in the laboratory practices will be considered both the participation of the student in the preparation prior to the experimentation as well as the ability shown in the laboratory and the

evaluation of the reports made. (G3, G5, G6)

In mode B) the test will consist of the resolution of a practical case in which the student must demonstrate his knowledge of the concepts and techniques seen in class and its application, assessing his ability to extract the information from the statement and raise the problem resolution . With the test, the student can only access 75% of the maximum mark. However, the student who opts for this modality will also value the work done during the course, provided that the grade of the test is equal to or greater than 4 and will be added to the grade of the test. (G3, G5, G6)

For the evaluation of the laboratory practices in this modality the student will have to give resolved all the Practices.

Students who opt for option A), and who do not approve the subject in the first call of this form, must present themselves to the test of the second call and the form of evaluation will be, then, the one of modality B).

In any case, the evaluation system will be governed by what is established in the Evaluation and Qualification Regulations of the University of Valencia for Degrees and Masters

(https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639).

REFERENCES

CAD

- Referencia b1: JON MCFARLAND, 'AutoCAD 2010'. (Anaya Multimedia 2010) ISBN 978-84-415-2675-4 DIBUJO GEOMÉTRICO y SISTEMAS DE REPRESENTACIÓN
- Referencia b2: GUTIERREZ VAZQUEZ, A, IZQUIERDO ASENSI, F, NAVARRO DE ZUVILLAGA, J, PLACENCIA VALERO, J. 'Dibujo Técnico'. (Ediciones Anaya S.A. Madrid, 1979).
- Referencia b3: RIOJA CASTELLANO, Vicente. 'TÉCNICAS DE REPRESENTACIÓN. CONCEPTOS BÁSICOS'. Edita servicio de publicaciones de la Universidad Politécnica de Valencia (SPUPV-2005-187)
- Referencia b4: CORDERO AMPUERO, A, LEICEAGA BALTAR, J.A, FERRERO CASTRO, R. 'Dibujo Técnico' Bachillerato. (Ediciones Anaya S.A. Madrid, 2002).
- Referencia b5: 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) REPRESENTACIÓN 3D
- Referencia b6: ONNIE ROSKES 'Google Sketchup Cookbook: Practical Recipes and Essential Techniques'. Editorial O'Reailly Media. 2009. NORMALIZACIÓN
- Referencia b7: RAMOS BARBERO, Basilio y GARCÍA MATÉ, Esteban. 'Dibujo Técnico'. (AENOR N. A.. Madrid, 2006).

DIAGRAM REPRESENTATION

- Referencia b8: BONNIE BIAFORE, 'Visio 2007 Bible'. Editorial Wiley. 2007