COURSE DATA

Data Subject	
Code	34920
Name	Engineering graphics
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1404 - Degree in Industrial Electronic Engineering	School of Engineering	1	Second term

Subject-matter

Degree	Subject-matter	Character
1404 - Degree in Industrial Electronic Engineering	5 - Graphic expression	Basic Training

Coordination

Name	Department
CASTELLO MORENO, JAIME	242 - Electronic Engineering
ESTEVE GOMEZ, VICENTE	242 - Electronic 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.

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

OUTCOMES

1404 - Degree in Industrial Electronic Engineering

- CG3 - 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.
- CG16 - 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

This course allows for the following learning outcomes:

- Know how to interpret technical plans and drawings in different systems of representation (CG3,CG16).
- Be able to represent on paper the 3-dimensional objects and to reconstruct and interpret by drawing the shape and position (CG3,CG16).
- Know and use different standards used in the technical representation (CG3,CG16).
- Understand the concepts of drawing and cutting set and its application in industrial design (CG3,CG16).
- Be able to use tools of computer aided design (CG3,CG16).

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 technical and social skills, among which include:

- Ability to work as a team (including resolution of problems between them).
- Ability to solve exercises using the full application of the knowledge acquired by the student from the notebook.
- Ability to deliver a comprehensive and organized notebook.

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.

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.

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.

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.

RINGS: 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. Pentadecagon 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

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	10,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	30,00	0
Resolution of case studies	5,00	0
Resolution of online questionnaires	5,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

- Classroom work: theory classes, practical classes and laboratory classes (CG3,CG16).
- Student's home work: preparation of classes, solving of exercises and problems, job preparation and presentation of results (CG3,CG16).
- Individual and group tutorials (CG3,CG16).

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 (CG3,CG16).

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 (CG3,CG16).

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

REFERENCES

Basic

- JON MCFARLAND, AutoCAD 2010. (Anaya Multimedia 2010) ISBN 978-84-415-2675-4 DIBUJO GEOMÉTRICO y SISTEMAS DE REPRESENTACIÓN
- 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)
- CORDERO AMPUERO, A, LEICEAGA BALTAR, J.A, FERRERO CASTRO, R. Dibujo Técnico Bachillerato. (Ediciones Anaya S.A. Madrid, 2002)
- 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)
- ONNIE ROSKES Google Sketchup Cookbook: Practical Recipes and Essential Techniques. Editorial OReailly Media. 2009
- AMOS BARBERO, Basilio y GARCÍA MATÉ, Esteban. Dibujo Técnico. (AENOR N.A.. Madrid, 2006)
- BONNIE BIAFORE, Visio 2007 Bible. Editorial Wiley. 2007