COURSE DATA

Data Subject	
Code	34881
Name	Engineering Graphics
Cycle	Grade
ECTS Credits	6.0
Academic year	2019 - 2020

Study (s)

Degree	Center	Acad. year	Period
1403 - Degree in Telematics Engineering	School of Engineering	1	First term

Subject-matter

Degree	Subject-matter	Character
1403 - Degree in Telematics Engineering	7 - Graphic expression	Basic Training

Coordination

Name	Department
CASAS YRURZUM, SERGIO	240 - Computer Science
PAREJA MONTORO, IGNACIO	240 - Computer Science
PERIS DUO, NATALIA	240 - Computer Science

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

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.

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. (G6)

• Be able to represent on paper the 3-dimensional objects and to reconstruct and interpret by drawing the shape and position. (G6)

• Know and use different standards used in the technical representation. (G6) (G5)

• Understand the concepts of drawing and cutting set and its application in industrial design. (G6) (G3) (G5)

• Be able to use tools of computer aided design. (G3)

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

• Manage effectively assisted drawing programs exposed. (G3)

• Compose and draw sheets. (G5)

• Know how to analyze and classify the exercises themselves critically. (G3)

• Know how to analyze and score a critical exercise of other groups. (G3)

• Find and select the information they require specialized bibliographic sources. (G6)

• Represent objects in three dimensions, to reconstruct and interpret through drawing its shape and position (spatial view). (G5)

• Know how to make charts and diagrams. (G5)

In addition to the specific objectives mentioned above, the course will encourage the development of several social and technical abilities, 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. Libraries. Keyboard and menus. Tablets. AutoLISP routines.

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.
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

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. (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)**, whenever the student accredits class attendance, the final note of the course shall be calculated as follows:

FinalGrade = 0.3*LabGrade + 0.1*PartialGrade1 + 0.1*PartialGrade2 + 0.35*FinalExamGrade + 0.15*ExerGrade

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.

PartialGrade1 will be get by means of a practical test of minimum knowledge about approximately the first half of the agenda.

PartialGrade1 will be get by means of a practical test of minimum knowledge about approximately the second half of the agenda.

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 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.

Students will need to get at least **3.5 out of 10** points in both **PartialGrade1** and **PartialGrade2** to overcome the course.

Class attendance is defined as the situation in which the student has not missed more than 20% of the theory/exercise classes nor more than 20% of laboratory sessions. Class attendance implies the permanence in the classroom for at least 80% of the duration of the lesson.

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)

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)
- 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.
- RAMOS BARBERO, Basilio y GARCÍA MATÉ, Esteban. Dibujo Técnico. (AENOR N.A.. Madrid, 2006).
- BONNIE BIAFORE, Visio 2007 Bible. Editorial Wiley. 2007.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available