IDENTIFYING DATA

Graphic expression: Fundamentals of engineering graphics

Subject	Graphic expression: Fundamentals of engineering graphics
Code	V12G363V01101
Study programme	Grado en Ingeniería en Tecnologías Industriales

Descriptors	ECTS Credits		Choose	Year	Quadmester
	9		Basic education	1st	1st

Teaching language	Spanish Galician English
Department	
Coordinator	Troncoso Saracho, José Carlos Fernández Álvarez, Antonio
Lecturers	Alegre Fidalgo, Paulino Comesaña Campos, Alberto Fernández Álvarez, Antonio Patiño Barbeito, Faustino Prado Cerqueira, José Luís Troncoso Saracho, José Carlos Varela Alén, José Luis Villar García, Marcos
E-mail	antfdez@uvigo.gal tsaracho@uvigo.es
Web	http://moovi.uvigo.gal/
General description	The main objective of this course is to train students in the use of the most commonly used geometric shapes and projections in engineering drawing. The subject of Engineering Graphics also aims to improve the student's spatial vision and to introduce him/her to the concept of standardisation. To achieve these objectives, we will use both manual and computer-based drawing methods.

Training and Learning Results

Code	
B3	CG3 Knowledge of basic and technological subjects that enable students to learn new methods and theories, and to adapt to new situations.
B4	CG4 Ability to solve problems through initiative, decision-making, creativity, critical reasoning, and to communicate and transmit knowledge, skills and abilities in the field of industrial engineering.
B6	CG6 Capacity for handling specifications, regulations and mandatory standards.
C5	CE5 Spatial vision and knowledge of techniques for graphical representation, both through traditional methods of metric geometry and descriptive geometry, and through computer-aided design applications.
D2	CT2 Problem solving.
D6	CT6 Application of computer science in the field of study.
D9	CT9 Application of knowledge.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
⬛ Know, understand, and apply a body of knowledge on the fundamentals and normalisation of industrial engineering drawing, in its broadest concept, while at the same time fostering the development of the spatial skills.	B3 B4	C5	D6

Acquire the capacity for abstract reasoning and for the establishment of strategies and efficient procedures in the resolution of graphic problems within the context of engineering works and projects. — B3 B4 — C5 — D2

 Use new technologies to develop graphic communication skills, including the creation and interpretation of engineering drawings which are compliant with the Technical Drawing Standards. — B6 — C5 — D6 D9

 Adopt a positive attitude towards lifelong learning, being proactive, participative and with a spirit of self-improvement. — B4 — — D9

Contents

Topic	
Block 0. Computer-aided drawing. Sketching and application of standards.	- Introduction to Computer-aided Drawing. CAD. - Working environment. Coordinate systems. - Drawing commands. Graphical entities. Drawing aids. Object snapping. - Modify tools. Visualization options. Inquiry commands. - Plotting scaled drawings. - Sketching and application of standards.
Block 1. 2D geometry.	- Review of fundamental geometry concepts. - Conics: definitions, focal and major circles, drawing a tangent to a conic curve. - Constructing tangencies through loci, expansion/contraction and inversive geometry. - Technical curves (roulettes): trochoids and involutes (evolvents).
Block 2. Projections.	- Introduction: Types of projection. Projective invariants. - Topographic projection: Representation of basic elements (points, lines, planes). Elementary constructions, intersections, parallelism and perpendicularity. Roof plans. Landform drawing. - Multiview projection: Representation of basic elements (points, lines, planes). Parallelism and perpendicularity, true length of a segment, true size of a planar figure, planar sections. - Pictorial representation: Axonometric projection (isometric, dimetric, trimetric). Oblique projection (cavalier and cabinet projection). - Central projection: one-point perspective, two-point perspective and three-point perspective. - Surfaces: Polyhedra. Curved surfaces (ruled surfaces and surfaces of revolution). Intersection between two surfaces.
Block 3. Standardisation.	- Technical Drawing: Generalities. The graphic language of engineering. Major fields of application (architectural, topographical and engineering). Different forms of technical drawings (sketch, diagram, assembly drawing, part drawing, etc.). - Introduction to standardisation: Benefits of standardization. Specifications, regulations and technical standards. - Basic standards for Technical Drawing: Drawing sheets. Title blocks. Types of lines. Lettering. Scales. Folding of drawing sheets. - General principles of representation: Basic conventions for views. Standard arrangements of the 6 principal orthographic views (first-angle and third-angle methods). Views (auxiliary, partial, local, symmetric, enlarged features). Sectional views (cuts and sections) and variations (offset sections, aligned sections, sections revolved in the relevant view, removed sections, half sections, local cuts, auxiliary sections). General conventions for hatching. Conventional representation (repeated features, simplified intersections, runouts, initial outlines). - Dimensioning: Principles of dimensioning. Types of dimensioning. Types of dimensions. Elements of dimensioning (dimension line, nominal dimension value, terminator, etc.). Arrangement of dimensions (chain, parallel and running dimensioning). Dimensioning of common manufactured features (radii, diameters, spheres, chamfers, counterbores, countersinks, etc.). - Threads. Elements of a thread. Types of threads. Standard representation of threads. Threads in assembly. Thread specification. Simplified representation. - Working drawings: Assembly drawings (definition and types). General rules and conventions for assembly drawings. Parts list. Part drawings. Drawing numbering system. Examples. - Tolerancing: Types of tolerances (dimensional and geometrical). Specifying dimensional tolerances (linear and angular). ISO system of tolerances ISO (tolerance grades, fundamental deviations, symbols). Fits. Examples. Microtolerances.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	38	76	114
Problem solving	34	15	49
Seminars	3.5	0	3.5
Project based learning	0	22	22
Problem and/or exercise solving	3	0	3
Problem and/or exercise solving	3	0	3
Laboratory practice	1	10	11
Laboratory practice	3.5	16	19.5

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Active masterclass. The professor will give a presentation of each module. The students will be encouraged to take an active role in the lectures through questions, discussions and exercises.
Problem solving	Exercises and/or problems will be posed and solved individually or in groups.
Seminars	Carrying out activities to reinforce learning through the tutored group resolution of practical cases linked to the theoretical content of the subject.
Project based learning	Carrying out of activities that require active participation and collaboration among the students.

Personalized assistance

Methodologies	Description
Seminars	

Assessment

	Description	Qualification	Training and Learning Results		
Problem and/or exercise solving	It will make a first partial examination (eliminatory of matter) of the first contents of the matter, that will be able to include test type test, questions of reasoning, resolution of problems and development of practical cases. It demands reach a minimum qualification of 4,0 points on 10 possible to be able to surpass the subject.	20-30	B3 B6	C5	D2 D9
Problem and/or exercise solving	It will make a second partial examination (eliminatory of matter) of the remaining contents of the matter, that will be able to include test type test, questions of reasoning, resolution of problems and development of practical cases. It demands reach a minimum qualification of 4,0 points on 10 possible to be able to surpass the subject.	30-40	B4 B6	C5	D2 D9
Laboratory practice	It will make a proof of practise of CAD, in which it will verify the capacity of the student in the handle of systems of drawing by computer. It demands reach a minimum qualification of 5,0 points on 10 possible to be able to surpass the subject	20	B4	C5	D2 D6 D9
Laboratory practice	Along the course, in determinate sessions will pose problems or exercises for his resolution by the students and back delivery to the professor, that will evaluate them in accordance with the criteria that previously will have communicated to the students. These tasks will be so much in format paper as of CAD. It demands reach a minimum qualification of 5,0 points on 10 possible to be able to surpass the subject.	20	B4	C5	D2 D6 D9

Other comments on the Evaluation

MODALITY OF CONTINUOUS EVALUATION:

There will be two eliminatory partial tests (with an approximate weight of 25% and 35%) in which a minimum mark of 4.0 out of a possible 10 points must be obtained in each of the tests (as well as an overall 5.0) in order to pass the subject. The parts not passed can be passed later in the final exam of the subject.

In addition to the two partial tests, the practical work will also be assessed by means of a CAD test and the different sheet,

exercises and practical work that will be carried out throughout the whole four-month period (with a weight of 20% and 20% respectively for each of these two parts). In order to pass the subject, a minimum mark of 5.0/10 points must be achieved in each of these parts.

In the final exam, a theoretical-practical test will be carried out to assess the degree of acquisition of competences, in which a minimum grade of 5.0/10 will be required to pass the course.

In the second call, there will be a theoretical-practical test in order to pass the course, it will be necessary to achieve a minimum grade of 5.0/10. This exam is open to all students who have not passed the subject in any of the previous tests.

MODALITY OF NON CONTINUOUS EVALUATION:

Students who waive continuous assessment must sit the final exam with all the material and must also take a practical test in order to pass the subject. This practical test, which will complete the overall final exam, will consist of two parts, one of CAD and the other of graphic tracings (in addition, in order to take this practical test, students may be required to present a series of tasks previously carried out by the student).

In the second call, there will be a theoretical-practical test with similar characteristics to the final exam, in which, in order to pass the course, it will be necessary to achieve a minimum grade of 5.0/10. This exam is open to all students who have not passed the subject in any of the previous tests.

<u>Honor code</u>: Students are expected to observe academic integrity. If any type of unethical behaviour is detected (e.g. cheating, plagiarism, use of unauthorised electronic devices, etc.) the student will be considered as not meeting the requirements to pass the course and will be assigned a failing grade (0).

Sources of information

Basic Bibliography

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Giesecke, Mitchell, Spencer, Hill, Dygdon, Novak, Lockhart, ⬜ **Technical Drawing with Engineering Graphics,**, 14ª, Prentice Hall, 2012

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David A. Madsen, David P. Madsen, ⬜ **Engineering Drawing Design**, 5ª, Delmar Cengage Learning, 2012

Casasola Fernández, Mª Isabel y otros, **Sistemas de representación I, Teoría y problemas**, ISBN 978-84-615-3553-8, ISBN 978-84-615-3553-8, Ed. Asociación de Investigación, 2011

González García,V.; López Poza, R.; Nieto Oñate, M., **Sistemas de Represntación I**, ISBN: 84-400-2331-6,

Bertoline, Wiebe, Miller, Mohler, **Dibujo en Ingeniería y Comunicación Gráfica**, 9701019474, 9789701019474, 2ª, McGraw-Hill, 1999

Recommendations

Other comments

To be successful in this course, it is recommended to have a background in technical drawing, standardisation and computer-aided drafting at high school level.

In case of discrepancies, the Spanish version of this guide shall prevail.