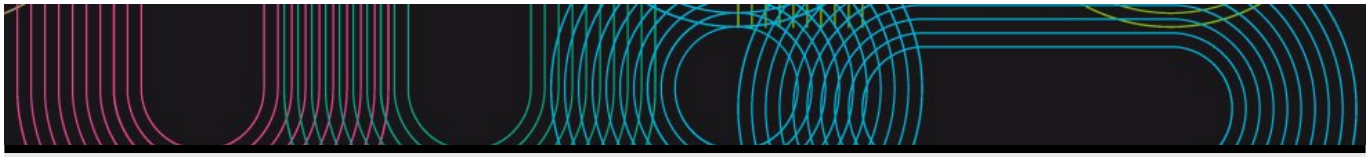
Universidade Vigo

Subject Guide 2020 / 2021



IDENTIFYING DATA				
Graphic expression: Graphic expression				
Subject	Graphic expression: Graphic expression			
Code	P52G381V01101			
Study programme	(*)Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Solla Carracelas, María Mercedes			
Lecturers	Casqueiro Placer, Carlos Solla Carracelas, María Mercedes			
E-mail	merchisolla@cud.uvigo.es			
Web	http://faitic.uvigo.es			
General description	This course aims to train the students in different aspects of the Graphic Expression in order to give them adequate skills for the management and interpretation of the representation systems most commonly used in the industrial field and its basic techniques to introduce them to the knowledge of the geometric shapes, generation and properties of the most frequent geometric entities, including the acquisition of spatial vision and comprehension to introduce them into the study of technological aspects of Graphic Expression in Engineering as well as into the knowledge and application of Standardization, in both basic and specific aspects. The subject will be developed aiming to enable the student to handle traditional techniques as well as new information and communication technologies.			

Competencies	
Code	
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
B4	Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of Industrial Engineering in Mechanical specialty.
B6	Capacity for handling specifications, regulations and mandatory standards.
C5	Capacity for spatial vision and knowledge of the techniques of graphic representation, using traditional methods of metric geometry and descriptive geometry, and through the application of computer-aided design.
D2	Problems resolution.
D6	Application of computer science in the field of study.
D9	Apply knowledge.
D17	Working as a team.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
To know, understand and apply the basic principles and standardization of industrial engineering drawing, while training the development of spatial vision and comprehension.	B3 B4	C5	D2 D6
Development of the capacity to contrast appearances *lexicos *fraseologicos and grammatical of the second foreign language with the own			
Development of the capacity to contrast appearances *lexicos *fraseologicos and grammatical of the second foreign language with the own			
Development of the capacity to contrast appearances *lexicos *fraseologicos and grammatical of the second foreign language with the own			

To acquire the capacity for abstract reasoning, and the establishment of efficient strategies and procedures for the resolution of graphic problems within the context of engineering projects.	B3 B4	C5	D2
Use of a graphic communication between technicians, by means of the realization and interpretation of plans according to the Technical Drawing Standards, involving the use of new technologies	B6	C5	D6 D9
To assume a favorable attitude for a permanent learning in the profession, being proactive and with a collaborative and committed spirit.	B4		D9
Work as a team, developing knowledge based on a critical and responsible technical-cultural exchange.	B4 B6		D9 D17
ENAEE learning outcome: KNOWLEDGE AND UNDERSTANDING: LO1.1.- knowledge and understanding of the mathematics and other basic sciences underlying their engineering specialisation, at a level necessary to achieve the other programme outcomes [level of achievement (basic (1), intermediate (2) and advanced (3)) for this learning outcome: Intermediate (2)].	B3	C5	
ENAEE learning outcome: ENGINEERING ANALYSIS: LO2.2.- ability to identify, formulate and solve engineering problems in their field of study; to select and apply relevant methods from established analytical, computational and experimental methods; to recognise the importance of non-technical societal, health and safety, environmental, economic and industrial constraints [Intermediate (2)].	B4	C5	D2 D9
ENAEE learning outcome: INVESTIGATION AND INNOVATIONS: LO4.1.- ability to conduct searches of literature, to consult and to critically use scientific databases and other appropriate sources of information, to carry out simulation and analysis in order to pursue detailed investigations and research of technical issues in their field of study [Basic (1)].	B6		
ENAEE learning outcome: INVESTIGATION AND INNOVATIONS: LO4.2.- ability to consult and apply codes of practice and safety regulations in their field of study [Intermediate (2)].	B6		
ENAEE learning outcome: ENGINEERING PRACTICE: LO5.3.- understanding of applicable materials, equipment and tools, engineering technologies and processes, and of their limitations in their field of study [Basic (1)].			D6 D9
ENAEE learning outcome: ENGINEERING PRACTICE: LO5.4.- ability to apply norms of engineering practice in their field of study [Intermediate (2)].	B6		D9
ENAEE learning outcome: COMMUNICATION AND TEAM-WORKING: LO7.1.- ability to communicate effectively information, ideas, problems and solutions with engineering community and society at large [Intermediate (2)].	B4		
ENAEE learning outcome: COMMUNICATION AND TEAM-WORKING: LO7.2.- ability to function effectively in a national and international context, as an individual and as a member of a team and to cooperate effectively with engineers and non-engineers [Intermediate (2)].			D17

Contents	
Topic	
Informative note:	Due to the circumstances occurred in the 2020-2021 academic year (delay in the incorporation date of new students and the need to dedicate three weeks to a zero level course in mathematical-physical knowledge, which will allow to begin the course with guarantees), a 85% of the 225 hours (corresponding to a subject of 9 ECTS) will be planned: 192 hours.
Section I. Descriptive geometry. Unit 1. Introduction to the representation systems.	1.1. Projective geometry. projective invariants. 1.2. Orthogonal projection system. 1.3. Dihedral system. 1.4. Axonometric system. 1.5. Conic system.
Section I. Descriptive geometry. Unit 2. Dihedral system.	2.1. Representation of point, line, plane and volume. 2.2. Parallelism. Perpendicularity and distances. 2.3. Auxiliary views and changes of plane. 2.4. Intersections.
Section I. Descriptive geometry. Unit 3. Orthogonal projection system.	3.1. Point, straight line and plane. Line of maximum slope on a plane. 3.2. Intersections. Application to covers and roofs. 3.3. Straight lines, surfaces and lands. Generalities and applications.
Section I. Descriptive geometry. Unit 4. Curves of Engineering.	4.1. Involute and evolute. 4.2. Cycloid curve.
Section II. Standardized representation. Unit 1. Introduction - Technical drawing and standardisation.	1.1. Regulation, specification and standards. 1.2. Types of standardization. 1.3. Standardization entities. 1.4. The standardization in the technical drawing. 1.5. Basic standards of technical drawing.

Section II. Standardized representation. Unit 2. Fundamentals of technical drawing	2.1. Visualization and representation of corporeal forms. 2.2. Methods of the first and third dihedral. 2.3. Types of views. 2.4. Sectional drawings. 2.5. Other conventions: intersections, symmetrical parts, interrupted views, repetitive elements, details, etc.
Section II. Standardized representation. Unit 3. Components and methods of dimensioning	3.1. General principles. 3.2. Types of dimensions and methods. 3.3. Dimensioning components. 3.4. Symbols. 3.5. Placing of dimensions. 3.6. Special indications (radius, equidistant elements, etc.) 3.7. Other indications (lost dimensions, particular specifications, etc.). 3.8. Keyways and slots. 3.9. Conicity and tilting. 3.10. Profiles.
Section II. Standardized representation. Unit 4. Representation of standardized elements and assembly drawings.	4.1. Definition of a threaded joint. 4.2. Thread types. 4.3. Conventional representation of threads. 4.4. Representation of assembly drawings. 4.5. Dimensioning of threaded elements. 4.6. Specifications of the most common threads. 4.7. Representation of industrial mechanisms. 4.8. Standards for the elaboration of assembly drawings. 4.9. Identification of different parts. 4.10. Parts list. 4.11. Standard designation of materials. 4.12. Partial drawings (with dimensioning). 4.13. Numbering of plans. 4.14. Representation of standardized mechanical elements. 4.15. Screws, nuts and washers. 4.16. Springs and spring clips. 4.17. Fixed joints. 4.18. Axles and shafts. 4.19. Splines and grooves. 4.20. Bearings. 4.21. Gears, chains and pulleys.
Section II. Standardized representation. Unit 5. Geometric dimensioning and Tolerancing.	5.1. Fundamentals and needs of tolerancing. 5.2. Dimensional tolerances and fits, and representation. 5.3. Geometric tolerances and representation. 5.4. Surface treatments and qualities, and representation.
Section II. Standardized representation. Unit 6. Symbology and schematic representations.	6.1. Introduction and standards. 6.2. Symbology characteristics. 6.3. Types of symbols and codes. 6.4. Standardized symbols. 6.5. Graphic symbols for schemes. 6.6. Typology of schemes according to their nature and application. 6.7. Practical applications of the schematic representations in Engineering.
Practical Activity 1 (CAD 2D)	File formats and management. Setting. Drawing and modification tools (I). Line drawing by coordinates.
Practical Activity 2 (CAD 2D)	Drawing and modification tools (II). Object snap and trace.
Practical Activity 3 (CAD 2D)	Drawing and modification tools (III). Point and line formats.
Practical Activity 4 (CAD 2D)	Layer editing. Text and dimension formats. Scaling.
Practical Activity 5 (CAD 2D)	Presentation and drawing of plans. 2D sketching.
Practical Activity 6 (CAD 2D)	Blocks, attributes and external references.
Practical Activity 7 (CAD 3D)	Basic design procedure: from sketch to solid.
Practical Activity 8 (CAD 3D)	Sketching and modeling tools (I).
Practical Activity 9 (CAD 3D)	Sketching and modeling tools (II).
Practical Activity 10 (CAD 3D)	Assembly drawings
Practical Activity 11 (CAD 3D)	Generation of views and plans.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	38	38	76
Problem solving	6	0	6
Project based learning	0	10	10

Seminars	18	22	40
Practices through ICT	22	22	44
Essay questions exam	16	0	16

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

Methodologies

	Description
Lecturing	Lecture session. Each thematic unit will be presented by the lecturer, and complemented with the comments of the students based on the assigned bibliography or other relevant information.
Problem solving	Exercises and / or study cases will be raised and solved individually or in groups.
Project based learning	A group project will be developed throughout the semester in which all of the members of the group have to collaborate by contributing and complementing the knowledge needed for its achievement.
Seminars	Intensive course (18 hours) for those students who have failed the subject at first call, prior to the exam in second call. Group tutoring with the lecturer.
Practices through ICT	Computer exercises will be carried out focused on the use of CAD software for the generation of technical drawings and plans.

Personalized assistance

Methodologies	Description
Problem solving	In the personalized tutoring, each student, individually, can discuss with the lecturer any problem related to their learning achievements in the subject. The lecturer will solve the questions of the students both in person, according to the tutoring schedule published on the web page of the CUD, as well as through telematic means (email, videoconference, FAITIC forums, etc.) with previous appointment.
Project based learning	The students will have at their disposal hours of tutoring with the lecturer to discuss any question related to the contents, organization and planning of the subject, with the development of the project, etc. The tutoring can be personalized, but group tutoring will be encouraged to solve problems related to the group activities, or simply to inform the lecturer about the development of the collaborative work. The lecturer will solve the questions of the students both in person, according to the tutoring schedule published on the web page of the CUD, as well as through telematic means (email, videoconference, FAITIC forums, etc.) with previous appointment.
Seminars	Group tutoring with the lecturer. The lecturer will solve the questions of the students both in person, according to the tutoring schedule published on the web page of the CUD, as well as through telematic means (email, videoconference, FAITIC forums, etc.) with previous appointment.

Assessment

	Description	Qualification	Training and Learning Results
Lecturing	Two evaluation tests/questionaries, in a continuous assessment, of short duration will be carried out throughout the semester. The tests will be carried out, proposed by the lecturer, at the most appropriate times within the classroom sessions of the subject. These two tests will be mandatory and required to pass the subject (percentage in the final qualification: 20%, 10% each assessment).	20	B3 C5 D2 B4 D9 B6
Problem solving	During the semester, different assembly mechanisms will be proposed for their representation in the computer sessions through the use of the CAD 2D/3D software. It will be assessed through two tests within the classroom sessions of the subject (percentage in the final qualification: 20%, 10% each assessment).	20	B4 C5 D2 D6 D9
Project based learning	Throughout the semester, the students will carry out a project related to the contents of the subject. The project will be developed in parallel to the subject syllabus and will cover most of the aspects reflected in the topics of the subject. The project will be carried out in small groups of students that will be established during the first three weeks of the term. The assessment of the project will have two components: 1) Project report (75%): same score for all the members of the group. 2) Final presentation (25%): individual score based on the presentation provided by each student.	20	B3 C5 D2 B4 D9 B6 D17
Practices through ICT	The evaluation of the abilities for using the CAD 2D/3D software is included in the 20% corresponding to the methodology of problems and/or exercises resolution, more specifically for the elaboration of plans and partial drawings of assembly mechanisms.	0	B4 C5 D2 D6 D9
Essay questions exam	A final exam will be carried out covering all the contents of the subject, both theoretical and practical, and that may include tests, reasoning questions, exercise solving and development of practical cases. It is required to achieve a minimum score of 4.0 points over 10 possible to pass the subject (percentage in the final qualification: 40%).	40	B3 C5 D2 B4 D9 B6

Other comments on the Evaluation

The final qualification will be determined based on the scores obtained in:

1. Final evaluation, through the assessments carried out in the calls and dates proposed by the University and the Center.

2. Continuous evaluation, through the assessment of the practical works and activities proposed throughout the semester.

A numerical rating system with values from 0.0 to 10.0 points will be used according to current legislation (R.D. 1125/2003 of September 5, B.O.E. No. 224 of September 18). The subject will be considered passed when the student achieves a minimum qualification of 5.0 points.

Those students who have not reached the minimum mark in the final exam of continuous assessment will obtain a maximum score of 4.5 points in continuous assessment.

All the students who have not passed the subject during the first call will have the possibility to recover the subject. The recovery plan consists of the right, already acquired, to perform a new exam, called extraordinary or second call, on the official dates, whose qualification will replace the previously obtained and, if it is higher, will be used for the calculation of the final marks.

One of the duties of every university student is to avoid the use or cooperation in fraudulent procedures in the evaluation tests, in the works developed or in official documents of the university (R.D. 1791/2010 of December 30, which approves the regulations of the university students). Therefore, if the lecturer had evidence, at any time, of the violation of the duty stated in the previous paragraph, this is:

- cheating in an exam.

- plagiarize totally or partially a work from any bibliographical source or from any web page,

- present the works of others as their own property,

- the use of any other malicious method in any of the evaluation tests,

The lecturer will inform the facts to the Director of the Center. In the case that the copy was in continuous evaluation, the student involved will be penalised with a final note in continuous evaluation of failed (0,0). If the copy was in Ordinary or Extraordinary Examination, the student will obtain a final rating of failed (0,0) in such call.

Sources of information

Basic Bibliography

IZQUIERDO ASENSI, F., **Geometría descriptiva I (Sistemas y perspectivas)**, 26ª edición, Grefol, 2008

IZQUIERDO ASENSI, F., **Geometría descriptiva II (Líneas y superficies)**, 26ª edición, Grefol, 2008

IZQUIERDO ASENSI, F., **Geometría descriptiva Superior y Aplicada**, 4ª edición, Paraninfo, 1996

LEICEAGA BALTAR, X.A., **Normas básicas de dibujo técnico**, AENOR, 1994

PÉREZ DÍAZ, J.L. Y PALACIOS CUENCA, S., **Expresión gráfica en la ingeniería**, Prentice Hall, 1998

Complementary Bibliography

Asociación Española de Normalización (AENOR), **Normas UNE de Dibujo Técnico**, (versión en vigor), Ed. AENOR,

AURIA J.M., IBÁÑEZ P. Y UBIETO P., **Dibujo Industrial. Conjuntos y despieces**, Thompson, 2000

BRUSOLA F., CALANDÍN E., BAIXAULI J.J. Y HERNANDIS B., **Acotación funcional**, Tébar Flores, 1986

CALANDÍN E., BRUSOLA F. Y BLANES J.G., **Prácticas de acotación funcional**, Tébar Flores, 1988

COMPANY P.P., GOMIS J.M., FERRER I. Y CONTERO M., **Dibujo normalizado**, Servicio de publicaciones de la Universidad Polité, 1997

COMPANY P.P., VERGARA M. Y MONDRAGÓN S., **Dibujo industrial**, Publicacions de la Universitat Jaume I, 2007

DOMÍNGUEZ, M., **Cuadernos de la UNED: doce ejercicios de dibujo y diseño de conjuntos resueltos y comentados**, Universidad Nacional de Educación a Distancia, 1998

GUIRADO J.J., **Introducción al dibujo de ingeniería: esquemas conceptuales básicos**, 3ª edición, Gamesal, 2001

GUIRADO J.J., **Iniciación a la Expresión Gráfica en la Ingeniería: los fundamentos proyectivos de la representación**, Gamesal, 2003

JIMÉNEZ I. Y CALAVERA C., **Sistema diédrico**, Paraninfo, 2011

MIRA J.R., COMPANY P.P. Y GARCÍA J.M., **Ejercicios de dibujo técnico resueltos y comentados**, Servicio de publicaciones de la Universidad Polité, 1987

TAIBO FERNÁNDEZ A., **Geometría descriptiva y sus aplicaciones**, Tébar Flores, 1983

Recommendations

Subjects that continue the syllabus

Graphic engineering/P52G381V01304

Other comments

There are no prerequisites to follow the course, although it is recommended that the student has some knowledge in technical drawing and geometry fundamentals at the level required in high school.
For the appropriate development of the practical classes and seminars, it is recommended that the student has the basic technical drawing tools: 45º and 60º setsquares, scale, compass and pencils or with different hardness.
It would also be advisable for the student to have a computer, with access to the Internet and software applications.

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===
Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

=== ADAPTATION OF THE METHODOLOGIES ===

A new methodology will be added: Synchronous online meeting (theory or practical session): it is given through a web videoconference platform. Each virtual classroom contains various display panels and components, whose design can be customised to best suit the needs of the class. In the virtual classroom, the lecturer (and authorised participants) can share their computer screen or files, use a whiteboard, chat, stream audio and video, or participate in interactive online activities (surveys, questions, etc.).

=== ADAPTATION OF THE TESTS ===

The evaluation tests will be carried out by combining the FAITIC-Moodle platform for online teaching and the Remote Campus of the University of Vigo.