



**Teaching Guide**

| Identifying Data           |                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                            |                | 2023/24 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------|----------------|---------|
| <b>Subject (*)</b>         | Engineering drawing                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Code</b>   | 730G05003                                  |                |         |
| <b>Study programme</b>     | Grao en Enxeñaría Naval e Oceánica                                                                                                                                                                                                                                                                                                                                                                                                          |               |                                            |                |         |
| Descriptors                |                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                            |                |         |
| <b>Cycle</b>               | <b>Period</b>                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Year</b>   | <b>Type</b>                                | <b>Credits</b> |         |
| Graduate                   | 2nd four-month period                                                                                                                                                                                                                                                                                                                                                                                                                       | First         | Basic training                             | 6              |         |
| <b>Language</b>            | SpanishGalician                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                            |                |         |
| <b>Teaching method</b>     | Face-to-face                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                            |                |         |
| <b>Prerequisites</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                            |                |         |
| <b>Department</b>          | Enxeñaría Naval e Industrial                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                            |                |         |
| <b>Coordinador</b>         | Álvarez García, Ana                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>E-mail</b> | ana.alvarez1@udc.es                        |                |         |
| <b>Lecturers</b>           | Álvarez García, Ana<br>Ferreño González, Sara                                                                                                                                                                                                                                                                                                                                                                                               | <b>E-mail</b> | ana.alvarez1@udc.es<br>sara.ferreno@udc.es |                |         |
| <b>Web</b>                 | <a href="https://campusvirtual.udc.es/moodle/">https://campusvirtual.udc.es/moodle/</a>                                                                                                                                                                                                                                                                                                                                                     |               |                                            |                |         |
| <b>General description</b> | <p>The subject of graphic expression has a theoretical-practical nature and with it it is intended to ensure that the student:</p> <ul style="list-style-type: none"> <li>- Develop the ability to see, imagine, interpret and solve problems using a graphic language.</li> <li>- know the regulations and terminology of graphic expression in naval engineering.</li> <li>- Acquire skill in handling a CAD system (autocad).</li> </ul> |               |                                            |                |         |

**Study programme competences / results**

| Code | Study programme competences / results                                                                                                                                                                                                                                                                                             |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A5   | Have a capacity for the space vision and knowledge of the techniques of graphic representation, so much for traditional methods of metric geometry and descriptive geometry, as through the applications of design assisted by computer                                                                                           |
| B1   | That the students proved to have and to understand knowledge in an area of study what part of the base of the secondary education, and itself tends to find to a level that, although it leans in advanced text books, it includes also some aspects that knowledge implicates proceeding from the vanguard of its field of study |
| B2   | That the students know how to apply its knowledge to its work or vocation in a professional way and possess the competences that tend to prove itself by the elaboration and defense of arguments and the resolution of problems in its area of study                                                                             |
| B4   | That the students can transmit information, ideas, problems and solutions to a public as much specialized as not specialized                                                                                                                                                                                                      |
| B5   | That the students developed those skills of learning necessary to start subsequent studies with a high degree of autonomy                                                                                                                                                                                                         |
| B6   | Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.                                                                                                                                                                                                                                   |
| C1   | Using the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of its profession and for the learning throughout its life.                                                                                                                                                  |
| C2   | Coming across for the exercise of a, cultivated open citizenship, awkward, democratic and supportive criticism, capable of analyzing the reality, diagnosing problems, formulating and implanting solutions based on the knowledge and orientated to the common good.                                                             |
| C5   | Assuming the importance of the learning as professional and as citizen throughout the life.                                                                                                                                                                                                                                       |
| C6   | Recognizing the importance that has the research, the innovation and the technological development in the socioeconomic and cultural advance of the society.                                                                                                                                                                      |

**Learning outcomes**

| Learning outcomes                                                                                                                                                                                                                           | Study programme competences / results |                            |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------------------|----------------------|
| Know, understand and use the techniques of graphic representation, spatial conception, standardization, naval design fundamentals, drawing plans and computer-aided applications that can solve graphically technical application problems. | A5                                    | B1<br>B2<br>B4<br>B5<br>B6 | C1<br>C2<br>C5<br>C6 |



| Contents                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Topic                                                                                                       | Sub-topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| The following blocks or themes develop the contents established in the Verification Report card, which are: | Spatial vision development techniques. Metric and descriptive geometry. Graphic representation systems. Introduction to standardization and industry representation. Computer assisted drawing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 1. SUBJECT TOPICS                                                                                           | 1.1 Objective<br>1.2 Concept of the subject<br>1.3 Exhibition of the methodology<br>1.4 Exhibition of the program<br>1.5 Drawing instruments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2. BASIC GRAPHICAL EXPRESSION TECHNIQUES                                                                    | 2.1 Review of metric geometry and projective geometry<br>2.2 Descriptive geometry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 3. REPRESENTATION TECHNIQUES. STANDARDIZATION                                                               | 3.1 Presentation of plans<br>3.2 Presentation of the drawings<br>3.3 Sketch<br>3.4 Orthogonal views<br>3.5 Standardized views<br>3.6 Cuts and sections<br>3.7 Dimensioning<br>3.8 Dimensional tolerances<br>3.9 Graphic presentations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4. DIHEDRAL SYSTEM                                                                                          | 4.1 Point and line<br>4.2 Planes and belonging between straight point and plane<br>4.3 Intersection, parallelism and perpendicularity<br>4.4 Tilting, turning and shifting<br>4.5 Distances and angles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 5. APPLICATIONS OF ENGINEERING                                                                              | 5.1 Drawing in Mechanical Engineering<br>5.1.1 Mechanical sets. Representation of mechanical assemblies. Quartering. Plans and definition of each piece. Standardized pieces. Explosion sets<br>5.2 Connection elements:<br>5.2.1 Detachable connections: Threaded connections: Terminology. Forms of thread profiles. Symbology and representation. Dimension. Threaded holes. Screws: types, representation. Nuts Fixing systems. Keyed links: Types. Representation and dimension<br>5.2.2 Fixed connections: Welding. Types. Representation<br>5.3 Springs: Types: compression, traction, torsion. Flat springs. Representation. Dimension<br>5.4 Bearings: Sliding and rolling bearings. Elements of a bearing. Classification. Representation. Dimension. Standardization. Lubrication. Obturation. Fixings<br>5.5 Gears: Use. Representation. Dimension |
| 5. LAYOUT OF TECHNICAL DRAWINGS BY COMPUTER                                                                 | 5.1 Introduction to software<br>5.2 Coordinate system<br>5.3 Study of the orders of drawing, modification and visualization.<br>5.4 Representation of pieces                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Planning                       |                                  |                                      |                               |             |
|--------------------------------|----------------------------------|--------------------------------------|-------------------------------|-------------|
| Methodologies / tests          | Competencies / Results           | Teaching hours (in-person & virtual) | Student?s personal work hours | Total hours |
| Guest lecture / keynote speech | A5 B1 B2 B4 B5 B6<br>C1 C2 C5 C6 | 18                                   | 18                            | 36          |



|                                 |                                  |    |    |    |
|---------------------------------|----------------------------------|----|----|----|
| ICT practicals                  | A5 B1 B2 B4 B5 B6<br>C1 C5 C6    | 10 | 20 | 30 |
| Laboratory practice             | A5 B1 B2 B4 B5 B6<br>C1 C2 C5 C6 | 16 | 24 | 40 |
| Problem solving                 | B1 B2 B4 B5 B6 C1<br>C2 C5 C6    | 19 | 19 | 38 |
| Mixed objective/subjective test | A5 B1 B2 B4 B5 B6<br>C1 C2 C5 C6 | 1  | 1  | 2  |
| Personalized attention          |                                  | 4  | 0  | 4  |

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

| Methodologies                   |                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                   | Description                                                                                                                                                                                                                                                                                                                                                                                    |
| Guest lecture / keynote speech  | Oral presentation complemented by the use of audiovisual media and the Introduction of some questions directed to the students, with the purpose of transmitting Knowledge and facilitate learning.                                                                                                                                                                                            |
| ICT practicals                  | It will be formulated the realization of a set of exercises in autocad.                                                                                                                                                                                                                                                                                                                        |
| Laboratory practice             | Problem solving. The realization of a set of exercises is proposed, which will be delivered weekly.                                                                                                                                                                                                                                                                                            |
| Problem solving                 | Problem solving. The realization of a set of exercises is proposed, which will be delivered weekly                                                                                                                                                                                                                                                                                             |
| Mixed objective/subjective test | A test is proposed at the end of the course, of an eminently practical nature, in which the criteria and skills acquired are reflected. The exercises for the evaluation will be applications of cases in which the answer must be expressed, mainly, in a graphic way. No partial evaluations are proposed, although systems may be established that allow the release of part of the matter. |

| Personalized attention                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ICT practicals<br>Mixed objective/subjective test | <p>It will be carried out face-to-face in the classroom and in the office tutorials. It will also be carried out in a non face-to-face manner through the virtual campus and by e-mail.</p> <p>In addition, throughout the course the teaching staff will be available to students during tutorial hours to clarify any doubts that may arise. It is possible to make an appointment at other times via the teaching staff's e-mail address.</p> <p>In ITC work placements, students will have personalised tutorials and group tutorials to monitor their work.</p> <p>For students with academic dispensation, this will be carried out in person in the office tutorials and an appointment can be arranged at other times via the teaching staff's e-mail address.</p> |

| Assessment          |                                  |                                                                                                                                                                                |               |
|---------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Methodologies       | Competencies / Results           | Description                                                                                                                                                                    | Qualification |
| Laboratory practice | A5 B1 B2 B4 B5 B6<br>C1 C2 C5 C6 | Descriptive geometry + industrial drawing + Tests<br>In the modality of continuous evaluation several works and tests related to the topics of the program will be carried out | 10            |
| ICT practicals      | A5 B1 B2 B4 B5 B6<br>C1 C5 C6    | Practices with autocad.<br>Continuous evaluation and supervised jobs.                                                                                                          | 10            |



|                                 |                                  |                                                                                                                                                                                                                                                                                                                                                                |    |
|---------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Mixed objective/subjective test | A5 B1 B2 B4 B5 B6<br>C1 C2 C5 C6 | The test will evaluate the acquisition of criteria, which is derived from an adequate assimilation of the acquired knowledge, as well as the attainment of the necessary skill for a correct graphic representation. His character will be eminently practical. The level of execution required will be the same as in the work carried out during the course. | 60 |
| Problem solving                 | B1 B2 B4 B5 B6 C1<br>C2 C5 C6    | Descriptive geometry + industrial drawing + Tests<br>In the modality of continuous evaluation several works and tests related to the topics of the program will be carried out.                                                                                                                                                                                | 20 |

### Assessment comments

1st call: continuous assessment will be followed. In order to pass the subject, students must participate in the classroom in the guided monitoring of all the proposed activities.

2nd call: the mixed test will have a 100% grade.

Early sitting (December): the exam will be graded 100%.

For students with academic dispensation and part-time students, the tests will be the same as those established for the rest of the students. In the second and early opportunity in December they will have to take a mixed test with a 100% grade.

"The fraudulent completion of the tests or assessment activities shall be governed by article 14.4. which reads as follows: ? Na realización de traballos, o

plaxio e a utilización de material non orixinal, incluído aquel obtido a través

da internet, sen indicación expresa da súa procedencia e, se é o caso, o

permiso do seu autor/a, poderá ser considerada causa de cualificación de

suspensio na actividade. Todo iso sen prexuízo das responsabilidades

disciplinarias ás que puidese haber lugar tras o correspondente procedemento "

### Sources of information

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Basic</b>         | <ul style="list-style-type: none"> <li>- AENOR (2000). Dibujo técnico. Normas básicas. Madrid. AENOR</li> <li>- Chevalier, A. (2009). Dibujo industrial. Madrid : Limusa</li> <li>- Rodríguez de Abajo , F.J.; Álvarez Bengoa, V (2003). Dibujo industrial. San Sebastián. Donostiarra</li> <li>- Molero Vera, J. (2013). AutoCAD 2013: guía rápida. Barcelona : Inforbooks</li> <li>- Montañó La Cruz, F. (2015). AutoCAD 2015. Madrid: Anaya Multimedia</li> <li>- Saldaña Albillos, Marcelino. (1992). Dibujo técnico: 60 ejercicios resueltos (típicos del 1er curso). Madrid :ETSII, Sección de Publicaciones</li> <li>- Gomis Martí, José María. (1993). Ejercicios de dibujo técnico &amp;quot;curvas y superficies&amp;quot;. Valencia : Universidad Politécnica, Servicio de Publicaciones, D.L.</li> <li>- Defez García, Beatriz. (2010). Ejercicios de planos acotados en ingeniería. Valencia : Editorial de la UPV</li> <li>- Cobos Gutiérrez, C. (2003). Ejercicios de representación gráfica en ingeniería. Madrid : Tébar</li> <li>- Jiménez, I.; Calavera, C. (2011). Sistema Diédrico. Madrid: Paraninfo S.A.</li> </ul> |
| <b>Complementary</b> | <ul style="list-style-type: none"> <li>- Leiceaga, J. (1994). Normas básicas de dibujo técnico. Madrid. AENOR</li> <li>- González Vázquez, A.; Izquierdo Asensi, F.; Navarro de Zuvillaga, J. y Placencia Valero, J. (1983). Dibujo Técnico. Madrid, Anaya</li> <li>- Rodríguez de Abajo, F.J. (1994). Curso de Dibujo Geométrico y de Croquización. San Sebastián. Donostiarra</li> </ul> <p>Además de los textos que se indican, se proporcionan direcciones de páginas Web, elaboradas por otros docentes, que contienen material docente de utilidad, y son de acceso libre</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

### Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

