



**Teaching Guide**

Identifying Data					2024/25
<b>Subject (*)</b>	Verification and Validation		<b>Code</b>	730497215	
<b>Study programme</b>	Mestrado Universitario en Enxeñaría Industrial (plan 2018)				
Descriptors					
<b>Cycle</b>	<b>Period</b>	<b>Year</b>	<b>Type</b>	<b>Credits</b>	
Official Master's Degree	2nd four-month period	First	Obligatory	4.5	
<b>Language</b>	SpanishGalician				
<b>Teaching method</b>	Face-to-face				
<b>Prerequisites</b>					
<b>Department</b>	Ciencias da Navegación e Enxeñaría MariñaEnxeñaría Naval e Industrial				
<b>Coordinador</b>	Fraguela Díaz, Feliciano	<b>E-mail</b>	feliciano.fraguela@udc.es		
<b>Lecturers</b>	Fraguela Díaz, Feliciano Zaragoza Fernandez, Maria Sonia	<b>E-mail</b>	feliciano.fraguela@udc.es sonia.zaragoza1@udc.es		
<b>Web</b>					
<b>General description</b>	Knowledge of the legal framework for quality and industrial safety: verification and control procedures in accordance with European conformity regulations. Knowledge of the structure and application of Industrial Safety Regulations. Knowledge of facilities subject to safety regulations: main risks in the use of these facilities. Introduction to the analysis, design and calculation of the measures required for the quality and safety of facilities. Knowledge of applicable regulations and legislation. Use of bibliographic sources.				

**Study programme competences / results**

Code	Study programme competences / results
A22	IE6 - Knowledge and capabilities to perform verification and control of facilities, processes and products.
A23	IE7 - Knowledge and skills to perform certifications, audits, verifications, tests and reports.
B2	CB7 - That students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of ??study.
B4	CB9 - That the students know how to communicate their conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized audiences in a clear and unambiguous way.
B5	CB10 - That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B7	G2 - Project, calculate and design products, processes, facilities and plants.
B9	G4 - Conduct research, development and innovation in products, processes and methods.
B10	G5 - Carry out strategic planning and apply it to construction, production, quality and environmental management systems.
B13	G8 - Apply the knowledge acquired and solve problems in new or unfamiliar environments within broader and multidisciplinary contexts.
B15	G10 - Knowing how to communicate the conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized publics in a clear and unambiguous way.
B17	G12 - Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Engineer.
C1	ABET (a) - An ability to apply knowledge of mathematics, science, and engineering.
C3	ABET (c) - An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
C5	ABET (e) - An ability to identify, formulate, and solve engineering problems.
C7	ABET (g) - An ability to communicate effectively.
C8	ABET (h) - The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
C11	ABET (k) - An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Learning outcomes**

Learning outcomes	Study programme competences / results



Know the procedures for verification, diagnosis and control.	AJ22 AJ23	BJ2 BJ5 BJ7 BJ9 BJ13 BJ15 BJ17	CJ1 CJ3 CJ5
Know the structure and application of industrial safety regulations.		BJ4 BJ5 BJ9 BJ10	CJ8 CJ11
Be able to analyze an installation from a security point of view.	AJ22 AJ23	BJ2 BJ4 BJ5 BJ9	CJ7

Contents	
Topic	Sub-topic
The following blocks or topics develop the contents established in the Verification Report file.	Content of the Verification Report file:  Verification and control procedures in accordance with the European Conformity regulations.  Quality and Industrial Safety Regulations.  Regulations and applicable legislation relating to quality and industrial safety.  Exercises related to the design and analysis of facilities from the point of view of quality and security.
1. Security of installations: or legislative framework.	1.1. The Law of Industry. 1.2. The Infrastructure Regulation for Quality and Industrial Safety. 1.3. The Regulation of the Integrated Industrial Registry. 1.4. The Security Regulations. 1.5. Safety guidelines and regulations. 1.6. Health and safety legislation.
2. Machine installations.	2.1. Installation of machinery in the industry. 2.2. Other machinery installations. 23. CE marking and Declaration of Conformity to Standards. Annex: Safety and health at work. Risks in machinery installations.
3. Lifting and transportation facilities.	3.1. Lifting and transport systems. 3.2. Elevators and construction cranes. 3.3. Self-propelled lifts and cranes. 3.4. Fixed lifting and transport installations. 3.5. Safety standards for the construction and installation of electromechanical lifts (ITC MIE-AEM-1). 3.6. Tower cranes for works or other applications (ITC MIE-AEM-2). 3.7. Maintenance self-propelled trucks (ITC MIE-AEM-3). 3.8 Self-propelled mobile cranes (ITC MIE-AEM-4). Annex: Safety and health at work. Risks in lifting and transport installations



4. Gas storage and distribution facilities.	4.1. Types of gases. 4.2. Storage of compressed natural gas. 4.3. Storage of liquefied natural gas. 4.4. Piped distribution of natural gas. Gas pipelines and networks. 4.5. Storage and distribution of liquefied petroleum gases (LPGs). 4.6. receiving facilities. 4.7. Industrial gases and medical gases. 4.8. Technical regulations for the distribution and use of gaseous fuels. Annex: Safety and health at work. Risks in the gas sector
5. Petroleum product storage and distribution facilities.	5.1. Types of petroleum products. 5.2. Oil refineries and storage parks for oil products. 5.3. Petroleum liquid storage parks. 5.4. Storage facilities for consumption in the facility itself. 5.5. Vehicle supply facilities. Annex: Safety and health at work. Risks in the storage of petroleum products.
6. Electrical energy transformation and distribution installations.	6.1. The electrical system. 6.2. Power plants, substations and transformation centers. 6.3. High voltage power lines. 6.4. Low-voltage electrical installations. 6.5. Assessment and prevention of electrical risk. Annex: Safety and health at work. Risks in electrical installations.
7. Chemical product storage facilities.	7.1. Types of storage of chemical products. 7.2. Storage facilities for flammable and combustible liquids. 7.3. Ethylene oxide storage facilities. 7.4. Chlorine storage facilities. 7.5. Anhydrous ammonia storage facilities. 7.6. Storage facilities for bottles and cylinders of compressed, liquefied and dissolved gases under pressure. 7.7. Storage facilities for corrosive liquids. 7.8. Toxic liquid storage facilities. 7.9. Storage facilities for ammonium nitrate-based fertilizers with a high nitrogen content. 7.10. Storage facilities for organic peroxides. Annex: Safety and health at work. Risks in the storage of chemical products.
8. Compressed air installations. Pressure equipment.	8.1. Principles of design. 8.2. Compressors. 8.3. Dehumidifier: cooler and drop separator. 8.4. Accumulation and regulation tank. 8.5. Supply lines and consumption points. 8.6. Complementary elements. Annex: Safety and health at work. Risks in pressure equipment installations.



<p>9. Refrigeration installations.</p>	<p>9.1. Refrigeration.            9.2. Compression refrigeration installations.            9.3. Refrigeration installations without compression.            9.4. Safety regulations for refrigeration installations.            9.5. Refrigerants.            9.6. secondary fluids.            9.7. cooling systems.            9.8. Classification of premises.            9.9. Classification of refrigeration installations.            9.10. Main risk factors in refrigeration installations.            Annex: Safety and health at work. Risks in refrigeration installations.</p>
<p>10. Heating installations in the production of hot sanitary water.</p>	<p>10.1. General description.            10.2. Heat generation equipment.            10.3. Heat carrier fluid distribution system.            10.4. Regulation system.            10.5. Heat emitters.            10.6. Sanitary hot water installation.            10.7. Regulation of heating installations and production of sanitary hot water.            10.8. Safety in heat and cold generation.            10.9. Safety in pipe and duct networks.            10.10. Fire protection.            10.11. Security of use.            10.12. Mounting.            10.13. Maintenance and use.            Annex: Safety and health at work. Risks in heating and domestic hot water production installations.</p>
<p>11. Radioactive and radiodiagnostic facilities.</p>	<p>11.1. Introduction.            11.2. Biological effects of ionizing radiation.            11.3. Measurement of ionizing radiation.            11.4. Uses of ionizing radiation.            11.5. Nuclear and radioactive facilities.            11.6. Protection measures against ionizing radiation.            Annex: Safety and health at work. Risks in radioactive and radiodiagnostic facilities.</p>
<p>12. Fire protection installations.</p>	<p>12.1. Basic concepts.            12.2. Fire classes.            12.3. Ignition sources origin of fire.            12.4. Fire protection.            12.5. Passive fire protection.            12.6. Active fire protection.            Annex: Safety and health at work. Risks in fire protection installations.</p>

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Objective test	A22 A23 B13 C1 C3 C5 C7	2	0	2
Guest lecture / keynote speech	A22 A23 B2 B4 B17 B9	10	25	35
Collaborative learning	A23 B4 B5 B7 C8 C11	7	14	21



Document analysis	B15 B10 C5 C8	0	5	5
Case study	B2 B13 B15 B17 C1 C3 C5 C8 C11	12	30	42
Personalized attention		7.5	0	7.5

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

Methodologies	
Methodologies	Description
Objective test	Written test used to assess learning, knowledge, abilities and skills. You can mix multiple-choice and short-choice questions.
Guest lecture / keynote speech	Oral presentation complemented with the use of audiovisual media and the introduction of some questions addressed to students, in order to transmit knowledge and facilitate learning.
Collaborative learning	Small groups will be organized small groups in which the students work together in solving tasks assigned by the teaching staff to optimize their own learning and that of the other members of the group.
Document analysis	Audiovisual and bibliographic documents relevant to the subject matter will be used with activities specifically designed for their analysis.
Case study	The student is faced with a specific problem (case), which describes a real situation of professional life, and must be able to analyze a series of facts, referring to a particular field of knowledge or action, to arrive at a reasoned decision through a process of discussion in small working groups.

Personalized attention	
Methodologies	Description
Case study Collaborative learning	<p>Students' needs and queries related to the study of topics related to the subject will be addressed individually or in a small group, providing them with guidance, support and motivation in the learning process. This activity may be carried out face-to-face (directly in the classroom and at the times that the teacher is assigned to office tutorials) or non-face-to-face (via email or the virtual campus).</p> <p>Small groups will be organized small groups in which the students work together in solving tasks assigned by the teaching staff to optimize their own learning and that of the other members of the group.</p> <p>In order to pass the subject, it must be borne in mind that it is the responsibility of the students to access the teaching material via Moodle, its study and work with it, class attendance and its use, noting the verbal and written indications of the teaching staff, resorting to the same for the resolution of doubts. Students who do not attend all classes (whether or not due to academic dispensation) are bound by the same responsibilities, and must maintain contact with the rest of the students and with the teaching staff in order to be informed of any changes in the development of the subject. and to compile the indications and additional teaching material that could be provided during the course.</p>

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Case study	B2 B13 B15 B17 C1 C3 C5 C8 C11	The skill in handling the applied concepts and the adequacy of the results will be taken into account.	20
Guest lecture / keynote speech	A22 A23 B2 B4 B17 B9	Participatory attendance in master classes will be taken into account. The participation and intervention of the students in the questions, tasks and debates that may arise during the development of the classes will be valued.	5



Objective test	A22 A23 B13 C1 C3 C5 C7	Written test used to assess learning, knowledge, abilities and skills. You can mix multiple-choice and short-choice questions.	60
Collaborative learning	A23 B4 B5 B7 C8 C11	Collaborative participation with the rest of the group will be valued, as well as the quality of the result achieved.	10
Document analysis	B15 B10 C5 C8	The use of the recommended sources as well as any extension of the application information will be taken into account.	5

### Assessment comments

In addition to successfully completing the objective test, to pass the subject it is necessary to have completed all the exercises that have been proposed as compulsory throughout the course. The exercises may be solved individually or as part of one of the groups that will have been formed at the beginning of the course. In order to pass the subject, it must be borne in mind that it is the responsibility of the students to access the Virtual Campus to the teaching material, its study and work with it, class attendance and its use, noting the verbal and written indications of the teaching staff, resorting to the same for the resolution of doubts. Students who do not attend all classes (whether or not due to academic dispensation) are bound by the same responsibilities, and must maintain contact with the rest of the students and with the teaching staff in order to be informed of any changes in the development of the subject. and to compile the indications and additional teaching material that could be provided during the course. The evaluation procedure is the same in all calls, second chance, advanced call and the extraordinary. Fraudulent performance of the tests or evaluation activities will directly imply the qualification of "0" in the subject, in the corresponding call, thus invalidating any qualification obtained in all the evaluation activities for the extraordinary call.

### Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- (). Ley 21/1992, de 16 de julio, de Industria. Boletín Oficial del Estado</li> <li>- (). Real Decreto 2200/1995, de 28 de diciembre, por el que se aprueba el Reglamento de la Infraestructura para la Calidad y la Seguridad Industrial. Boletín Oficial del Estado</li> <li>- (). Reglamento (UE) 1025/2012 sobre Normalización Europea. <a href="https://eur-lex.europa.eu/legal-content/ES/ALL/?uri=celex:32012R1025">https://eur-lex.europa.eu/legal-content/ES/ALL/?uri=celex:32012R1025</a></li> <li>- (). Reglamentos de Seguridad. Boletín Oficial del Estado</li> <li>- Agencia Europea para la Seguridad y la Salud en el Trabajo (). Guías Técnicas. <a href="http://osha.europa.eu/fop/spain/es/good_practice/index.stm">http://osha.europa.eu/fop/spain/es/good_practice/index.stm</a></li> <li>- Instituto Nacional de Seguridad e Higiene en el Trabajo (). Guías Técnicas. <a href="http://www.insht.es">http://www.insht.es</a></li> <li>- Instituto Nacional de Seguridad e Higiene en el Trabajo (). Notas Técnicas de Prevención. <a href="http://www.insht.es">http://www.insht.es</a></li> </ul>
<b>Complementary</b>	

### Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Other comments



The orientation of the subject will be eminently practical, for which exercises will be developed on the application of legislation, regulations, and standards. To avoid dealing with a large amount of paper documentation, it is recommended that you attend classes with a laptop to be able to access the applicable documents and legal texts via the web. To help achieve a sustainable immediate environment and meet the objective of action number 5: "Healthy and environmentally and socially sustainable teaching and research" of the "Green Campus Ferrol Action Plan": a) The delivery of the documentary works carried out in this matter will preferably be requested in virtual format or computer support, and may be done through Moodle, in digital format, without the need to print them. In the case of being done on paper, plastics will not be used, the prints will be double-sided on recycled paper, and the printing of drafts will be avoided. b) The full integration of students who, for physical, sensory, mental, socio-cultural or gender reasons, experience difficulties in gaining suitable, equal and beneficial access to university life will be facilitated. c) As stated in the different regulations applicable to university teaching, the gender perspective must be incorporated in this area (non-sexist language will be used, bibliography of authors of both sexes will be used, intervention in class of students will be encouraged ...). d) Work will be done to identify and modify prejudices and sexist attitudes and influence the environment to modify them and promote values of respect and equality. e) Situations of gender discrimination should be identified and actions and measures proposed to correct them.

**(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.**